Aalto University
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Employee stock option valuation in mergers and acquisitions: Story of lost time values

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Abstract
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EMPLOYEE STOCK OPTION VALUATION IN MERGERS AND ACQUISITIONS: STORY OF LOST TIME VALUES

PURPOSE OF THE STUDY

The purpose of the study is to show how target employee stock options (ESOs) are valued in mergers and acquisitions, and to answer whether the possibility of company being bought should affect the stock option values. I also investigate whether the valuation methods used in transactions retain the total value of ESOs including both the intrinsic and the time value components, what factors determine the choice of valuation method, and what are the implications of different methods to the option valuation.

DATA

Data set consists of option valuation method observations in mergers and acquisitions in 2008 and 2009, in which the target is publicly listed on either NYSE or Nasdaq. Total number of transactions in the sample is 381, and the number of option valuation method observations is 316 after excluding observations with no information available.

RESULTS

Findings of the study show that two main valuation methods emerge. Usually, target option holders receive the intrinsic value of options (the offer value over the exercise price) and the options are forfeited, or then the options are converted to new options of the acquirer or the surviving corporation. Options are more likely to be converted if transaction is paid in stock, when the transaction value is high, and when the acquirer is publicly listed or based in the US.

Converting options retains the time value of options and therefore generally retains or increases the option value. Paying the intrinsic value and forfeiting options may result to either lower or higher option value, and the outcome is mainly driven by the takeover premium and option moneyness. For instance, in 21% of the cases when the intrinsic value is paid, the strike price of all options exceeds the offer value and the payoff to the option holders equals to zero. Findings suggest that ESO valuation in corporate transactions can have a significant effect on option value and therefore it should be in incorporated into the valuation models.

KEYWORDS

Employee stock options, option valuation, mergers and acquisitions

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HENKILÖSTÖOPTIOIDEN ARVONMÄÄRITYS YRITYSKAUPOISSA: TARINA MENETETYISTÄ AIKA-ARVOISTA

TUTKIELMAN TAVOITTEET

Tutkimuksen tavoitteena on osoittaa miten henkilöstöoptiot arvostetaan yrityskaupoissa sekä tulisiko tämän vaikuttaa optioiden arvoon. Tutkimus pyrkii myös osoittamaan säilyttävtäkö eri arvostustavat optioiden arvon kokonaisuudessaan sisältäen sekä option perus- että aika-arvon, mitkä asiat vaikuttavat arvostustavan valintaan, ja mitkä ovat eri arvostustapojen vaikutukset henkilöstöoptioiden arvonmääritykseen.

LÄHDEAINEISTO

Aineisto koostuu optioiden arvostustavoista yrityskaupoissa vuosina 2008 ja 2009, joissa kohdeyhtiön pörssi on joko NYSE tai Nasdaq. Otokseen sisältyvien yrityskauppojen määrä on 381. Lopullinen otos sisältää 316 havaintoa, joissa tieto optioiden arvostustavasta on saatavilla.

TULOKSET

Tutkimuksen tulokset osoittavat, että yrityskaupan yhteydessä kohdeyhtiön optionhaltijat saavat joko option perusarvon (option toteutushinnan ylittävä osa tarjouksen arvosta) ja optiot keskeytetään tai optiot muunnetaan uusiksi ostavan yrityksen optioiksi. Optioiden muuntaminen on todennäköisempää, jos vastike koostuu ostajan omista osakkeista, yrityskaupan arvo on korkea, ja jos ostaja on julkisesti noteerattu tai Yhdysvaltalainen yhtiö.

Optioiden muuntaminen säilyttää option aika-arvon ja tästä syystä pääsääntöisesti säilyttää tai kasvattaa option arvoa. Perusarvon maksaminen ja option keskeyttäminen voi joko laskea tai kasvattaa option arvoa, riippuen lähinnä kohteen osakkeen arvon ylittävän tarjoushinnan suuruudesta sekä tarjoushinnan ja option toteutushinnan välisestä suhteesta. Esimerkiksi 21 prosentissa tapauksista optionhalijat eivät saaneet mitään korvausta optioiden keskeyttämisestä, sillä toteutushinta ylitti tarjouksen arvon ja lisäksi optioista maksettiin vain sen perusarvo. Tutkimustulokset osoittavat että henkilöstöoptioiden arvostus yrityskaupoissa voi merkittävästi vaikuttaa option arvoon, jonka takia tämä tulisi ottaa huomioon arvonmääritysmalleissa.

AVAINSANAT

Henkilöstöoptiot, optioiden arvonmääritys, yrityskaupat

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1. Introduction

In a cash acquisition of AT&T Wireless by Cingular, employee stock options (ESO) were terminated and holders were paid the difference between the offer value and the strike price of options. If options were out-of-the-money, that is when the strike price exceeds the offer value, options were to be terminated with no compensation what so ever. As a result, former officers of MediaOne, a company that AT&T earlier acquired in stock for stock transaction, decided to seek compensation for the cashed out options. The plaintiffs claimed that AT&T Wireless violated the terms of the option plan under which the options had been granted, when it cashed out the options without any compensation for the lost time value of the options.[1] Reason for the dispute was a paragraph in the option plan that required appropriate adjustments to preserve each plan participant's economic position with respect to the options. Earlier in the stock for stock merger of MediaOne, AT&T converted the options to the options of AT&T and hence retained the 'economic position' of options.

In its ruling, the Court of Delaware concluded that 'economic position' means the full economic value of the options including the intrinsic value and the time value of options. Consequently, the Court ruled that the plaintiffs were entitled to an additional $11 million in damages, calculated using the Black & Scholes option valuation formula.[2] In its opinion, the Court also noted that as a general rule, the value of a stock option is tied to that of the underlying security, and therefore if the underlying security is converted into the right to receive a fixed sum of cash, the value of the option will also be measured by reference to that same amount of cash. This implies that in general, out-of-the-money stock options can be cancelled for no consideration in a transaction without the consent of option holder, unless the option plan specifically states otherwise.

ESOs have number of features that prevent their valuation using standard option valuation models such as the model of Black and Scholes (1973) (B-S model) or the binomial model of

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[1] Court opinions discussed include *Lillis v. A T & T Corp., 2007 WL 2110587 (Del. Ch., July 20, 2007)* and *AT & T Corp. v. Lillis, (Del. Supr., May 22, 2008)*.

[2] The decision by the Chancery Court was later on first reversed by the Supreme Court, and then subsequently reaffirmed. See opinion *AT & T Corp. v. Lillis, (Del. Supr., March 9, 2009)* for further details.

Cox, Ross and Rubinstein (1979). These features include, for instance, a vesting period during which they cannot be exercised, selling and hedging restrictions, and generally a significantly longer maturity compared to the traded options (see for instance Rubinstein, 1994; Hull and White, 2004). Due to the selling and hedging restrictions, ESO holders need to exercise the options and sell the shares in order to realize a cash benefit or diversify their portfolios, resulting to options being exercised well before maturity (see for instance Huddart and Lang, 1996; Carpenter and Yermack, 1998; Bettis et al., 2005). Despite the exhaustive number of studies on ESO valuation that try to take the distinctive features of ESOs into account, the valuation in company transactions has so far received little attention. It is clear that in a stock for stock merger for instance, something will happen to options of the target company as the underlying security no longer exists following the transaction. Hence the question is what option holders receive in lieu for their options and how is the value of those options determined.

Despite the lack of studies on the topic, several authors discuss the threat of takeover and its effect on option value. Considering traded options, Black (1989) states the B-S model to be used in situations where in reality there should be a large difference between the market prices and prices provided by the model, such as when a cash takeover is likely to end the life of the option or warrant. Similarly, Jennergren and Näslund (1996) consider traded options whose lives are stochastic because option contracts can be prematurely cancelled when company is being bought.

Yet few papers mention the possibility of company being bought and consequently the effect on ESO value as the vesting conditions are relaxed. Maller et al. (2002) assume ESOs to vest following a takeover bid despite the vesting or performance criteria of the options. Although not included in their valuation model, authors suggest modeling the probability of a takeover by a similar approach to the one used to model employee departure. Furthermore, authors note that forgoing valuable vesting conditions in the event of a takeover is not costless to the shareholders when they remain shareholders of the combined entity. Szimayer (2004) takes the issue a step further and presents a reduced form model that incorporates both the possibility of employee departure and takeover, since according to the author both events terminate the ESO contract. Author argues that the main difference between the takeover and employee departure is that a takeover prior the vesting of ESOs assigns option a certain fixed

value, whereas early departure forfeits the option. In addition to assuming a fixed cash payment for the unvested ESOs, author models the takeover after vesting to result in options being exercised and option holders receiving an additional fixed cash payment. As a side note, Szimayer (2004) also states that in general a takeover increases the value of an ESO, although no explicit reasoning is provided. A book by Ferenczy (2008) discusses the changes in the vesting status of options when a takeover takes place and notes that in acquisitions option holders are usually given a possibility to exercise the options before the forfeiture. However, the book states that in mergers it is common to convert options into equivalent options in the surviving company based on the exchange ratio.

Also empirical evidence suggests corporate transactions to be of importance when considering the valuation of ESOs. Ikäheimo et al. (2006) use data of listed ESOs in Finland to compare market values and theoretical B-S model values. Surprisingly they find markets to value ESOs significantly below the value predicted by B-S model even though listed ESOs can be owned by investors who are not constrained by the same restrictions than the employees. In addition, ESOs are not anymore forfeited if employee leaves the company and therefore one would assume market prices to equal to B-S prices. Deviations of as much as 50% are reported and average difference is almost 15%. They find the time to expiration to have a major influence on the undervaluation and suggest the possibility of change in the corporate structure to lower the cost of ESOs to shareholders. ESOs are assumed to expire in case of merger resulting to the loss of time value of options. Urtti (2009) studies ESOs in corporate transactions in Finland and concludes that the hypothesis by Ikäheimo et al. (2006) of lost time value could be studied further. Author finds that in majority of cases option holders effectively receive the intrinsic value of options and in some cases a small fixed amount of cash is paid if options are out-of-the-money. Other valuation methods include determining the payoff using the B-S value or quoted market price of options.

The purpose of this study is to show how ESOs are valued in company transactions to answer whether it should affect the stock option values. Scarce literature on the topic mainly considers the changes in vesting status of the options, although the Court of Delaware and Ferenczy (2008) suggest alternative ESO valuation methods to exist in corporate transactions. Discussed methods include paying the intrinsic value of options and converting the options into equivalent options in the surviving corporation, and in addition Urtti (2009) shows that at

least in Finland other valuation methods exist. According to my knowledge, there exist no previous studies that would investigate ESOs in transactions in the US beyond the theoretical discussion. Also, the emphasis of the discussions seems to be in changes in the vesting status, not the possibility of ESOs being valued in a completely different ways from transaction to another.

The research question in this study is *"How are ESOs valued in mergers and acquisitions in the US?"* I also aim to answer whether the valuation methods retain the total value of ESOs including both the intrinsic and time value, what factors determine the valuation method used, and what are the implications of different methods to the option valuation.

I collect the information of option valuation method in 381 transactions during 2008 and 2009 in which target is listed on either NYSE or Nasdaq. Based on the 316 option valuation method observations, I show that two main categories emerge. First, in 67% of the cases option holders are paid only the intrinsic value of options (the difference between the offer value and the exercise price) causing them to lose the time value of options. On average, offering only the intrinsic value of options sacrifices 5.7 years of remaining option life, highlighting the fact of ESOs being long maturity options and the time value constituting a significant component of the option value. The most common method in this category is to offer the intrinsic value for all options despite their vesting status. Second, in 30% of the cases options are converted to new options of the acquirer or the surviving corporation, and therefore the time value of options is retained. The most common method in this category is to convert all outstanding options of the target. Other interesting individual methods also exists, such as paying 50% of the B-S value for the out-of-the-money options and offering restricted stock units in lieu of terminating the out-of-the-money options.

I am able to find strong support for certain target, acquirer, and transaction characteristics affecting whether the intrinsic value is paid and time value lost or whether the options are converted and the time value retained. Based on the univariate evidence and estimated logistic regression models, I find the method of payment to have large impact on the ESO valuation method. Options are significantly more likely to retain time value if the acquirer uses stock in a transaction and consequently the use of cash is negatively related to retaining time value as options tend to be paid intrinsic value in cash deals. In addition, options are more likely to be converted and hence retain the time value when transaction becomes larger in terms of the

transaction value. Also publicly listed and US acquirers are more likely to convert options and therefore not sacrifice the time value of options.

I also illustrate that at most of a time, converting options in transaction yields a value above the one produced by ordinary option valuation model prior the transaction, unless the volatility of the new underlying stock is significantly below the volatility of the target company. Instead, using the intrinsic value method can result to either lower or higher option value compared to pre-transaction option value even though the time value of options is lost. The outcome is mainly affected by how large a premium is paid and the moneyness of the option. The fraction of out-of-the-money options after taking the premium into account is 21% of the observations in which the intrinsic value is paid, in which it is clear that the time value is lost since the payoff to the option holders is equal to zero. Finally, due to the cost of issuing new incentive instruments, I anticipate the acquirer to prefer converting options if it seeks to retain the employees holding the options. Option holders instead are likely to prefer receiving the intrinsic value although the time value is lost, since they are likely to receive new incentive instruments if they retain their positions.

My findings contribute to the existing literature by highlighting the importance of the possibility of company being bought to the valuation of ESOs, and the investigation of the valuation method determinants lays out the foundation for the development of pricing models that predict how options are valued in these situations. Incorporating the findings of the study to the pricing models would produce more accurate estimates of ESO expenses to the companies, as well as more precise estimates of ESO values to the option holders. This may, however, require companies to adopt some more flexible valuation model than B-S.

Rest of the study is structured as follows. Chapter 2 lays out the theoretical foundation of the study by discussing the previous literature with focus on the ESO valuation. Chapter 3 presents the research design and data of the empirical part of the study. Chapter 4 shows the identified ESO valuation methods and depicts the overall use of alternative methods. Chapter 5 considers the determinants of valuation methods by first defining the investigated explanatory variables and showing the univariate evidence, followed by the multivariate analysis conducted by estimating logistic regression models using various model specifications. Chapter 6 discusses the results from the previous chapters and implications to option valuation. Chapter 7 concludes.

2. Theoretical background

This chapter reviews the theoretical background underlying the study. First section briefly reviews the distinctive characteristics of ESOs compared to the traded options and discusses the valuation of ESOs. Second section talks about the scarce literature of ESO valuation in corporate transactions. I review the previous evidence on how might companies value stock options in the transactions, what might determine the valuation method used, and how the ESO valuation in mergers and acquisitions could be taken into account in the valuation models. Last section focuses on the topical subject of accounting treatment and valuation of ESOs.

2.1 Valuation and characteristics of ESOs

This section takes a brief look at the overwhelming literature on ESO valuation. First, I briefly discuss ESOs in general and present how the value of ESOs can be different to the different parties such as the option holders and the companies who grant the options. Second, the main issues in valuing ESOs using ordinary option pricing models are explained. Finally, alternative approaches and models to value ESOs are presented and discussed.

ESOs are contracts between the employee and the employer that give the holder the right to buy a share of stock at the pre-specified exercise price. Because of the separation of the ownership and the management of firms, stock options are granted to the employees to align the interests of the parties, such as the increased risk taking of the executives (see for instance Agrawal and Mandelker, 1987; Jensen and Murphy, 1990). Among others, Murphy (1999) shows that the stock options are widely used and that the fraction of options out of the total compensation is significant. For instance, the author shows that the share of options exceeds 30% out of the total value of compensation for the CEOs in S&P500 firms.

When considering ESOs it is important to make the distinction between different values. According to Ingersoll (2006) there are three alternative values when considering ESOs; market value, subjective value, and objective value. Similar classification is used in the majority of studies in the field. First, market value or risk-neutral value is the value the option would have if it were held by an un-constrained agent. This is rarely of interest when focusing on ESOs except when comparing the ESO pricing models against the ordinary option pricing

models for instance. Second, the subjective value or the value to the option holder is less than the market value due to option being in an undiversified portfolio and being exercised suboptimally from the market perspective as shown later on. Subjective value can vary from one holder to another due to differences in risk aversion and diversification. Third, the objective value is the cost to the company who grant the options, and it recognizes the suboptimal exercise of option holders but not the discount due to poor diversification for instance. Therefore the objective value is generally considered to be somewhere between the market value and the subjective value. Finally, the value of option is generally considered to consist of two components. Intrinsic value of the options is equal to the difference between the value of the underlying asset and the exercise price of the option. This is also equal to the value realized by the option holder when the option is being exercised. Time value instead is the difference between the option value and the intrinsic value, and therefore the intrinsic value and the time value components sum up to the total value of the option.

Pricing of traded options as presented by Black and Scholes (1973) (B-S model) relies on the construction of a portfolio containing a riskless asset and the underlying stock that duplicates the return on the options. Furthermore, Merton (1973) shows that an option on a non-dividend paying stock should never be exercised before the maturity to maximize the option value. In addition to the B-S model, a binomial model of Cox, Ross and Rubinstein (1979) provides an alternative method to value ordinary options.

However, ESOs have number of features that prevent their valuation using standard option valuation models such as B-S model. As noted by Rubinstein (1995) and Hull and White (2004) for instance, most ESOs have a vesting period during which they cannot be exercised, and if the employee leaves the company during that period the options are forfeited. If the employee leaves after the vesting period, options usually need to be exercised immediately or they are forfeited. In addition, employees are not permitted to sell their options and generally not allowed to hedge their positions by taking short positions in the company's stock. Therefore they need to exercise the options and sell the shares in order to realize a cash benefit or diversify their portfolios. Therefore the utility maximizing exercise strategy can be quite different from the strategy that maximizes the market value of an option and managers tend to exercise their options well before maturity (see for instance Huddart and Lang, 1996; Carpenter and Yermack, 1998; Bettis et al., 2005). Compared to the exchange traded options,

ESOs have significantly longer maturities and their exercise leads to some dilution as new treasury stock is issued upon the exercise. Murphy (1999) shows that most employee stock options expire in ten years and are granted with an exercise price equal to the market price of the underlying stock on the date of grant.

Majority of ESO valuation studies focus on the objective value of ESOs meaning the ESO cost to the firm. Option exercise behavior of employees affects the objective value of ESOs due to the changes in the option maturity, and consequently two main approaches have emerged how to model the exercise patterns of the option holders. Utility maximization based models assume that the option holders exercise their options according to the policy that maximizes their subjective utility. Utility-based models are presented for instance by Huddart (1994), Kulatilaka and Marcus (1994), and Rubinstein (1995). Binomial models developed by these authors model the ESO exercise scheme that maximizes the expected utility of employees by considering for instance the risk aversion, investment opportunities, and wealth of the employees.

However, several other authors have developed so called reduced form models that model early exercise as an exogenous factor. Clear benefit of the reduced form models is that there is no need to explicitly model unobservable variables such as the risk aversion or the outside wealth of the employees. Nevertheless, sufficient historical data of option exercises is needed in estimation of the exogenous factors. Among others, Carpenter (1998), Carr and Linetsky (2000), Hull and White (2004), and Ammann and Seiz (2004) present binomial models with exogenous early exercise and forfeiture. Hull and White (2004) for instance assume the early exercise to happen when the stock price is a certain multiple of the exercise price.

Some of the latest literature on the subject is focused on the comparison of the utility based and the reduced form models. In addition to their own reduced form model, Ammann and Seiz (2004) include the above mentioned utility maximization based models and the reduced form models presented by Hull and White (2004) in their model comparison. They show that all of the models yield virtually identical option prices as long as they are calibrated to the same expected life, and therefore the method used to derive the exercise policies of the options holders has little effect.

In addition, ESO valuation by the managers, or the subjective value of ESO, is investigated in relation to the analysis of the incentive effects of options. For an excellent overview of the empirical and theoretical research on executive compensation see Murphy (1999). General view seems to support the notion of option holders valuing their options below the objective value of the options. Among others, Lambert et al. (1991) and Hall and Murphy (2002) show that ESOs can be worth substantially less to the risk averse and non-diversified employees than what they are worth to the issuing company.

In contrast, some of the latest papers suggest the executives to actually price their options above the B-S value. Hodge et al. (2005) state that based on their interview study, managers systematically overvalue options relative to the B-S value, and that the overvaluation is associated with high expected future stock price. Sautner et al. (2010) make similar observations and conclude that optimism and overconfidence measures are significantly related to the options values, while they find no association with risk aversion.

2.2 Mergers and acquisitions and ESO valuation

The section browses the very limited body of research on ESO valuation in mergers and acquisitions. First, previous work focusing on the role of the option plans and other agreements in determining what happens to the options in transactions is presented. Although mainly from the practitioner oriented sources, these publications offer some very valuable information on the topic. Second, there are some theoretical academic papers that suggest company transactions to have an effect on ESO valuation. These papers serve an important purpose in providing information on how the valuation model could incorporate the threat of corporate transactions, and also to illustrate the potential valuation implications.

2.2.1 Possible determinants of ESO valuation

According to the book by Ferenczy (2008), when a company with stock options changes control, meaning it is involved in a merger or acquisitions for instance, something significant usually happens to option plans. Often the issues related to the options will primarily depend on what the option plan or option agreement provide, as most of the issues are contractual in nature. However, author also notes that the type of transaction and the relative bargaining

power of the executives and the shareholders will affect the outcome. Regarding the option plans and agreements, they usually include a change-in-control provision that defines when a change-in-control takes place, what triggers it, and what the consequences are. Ferenczy (2008) notes that in general, at least an acquisition of substantially all assets or merger constitutes the change-in-control event, but also a stake purchase of certain percentage or the current shareholders losing the control of the board might act as triggers.

Ferenczy (2008) also discusses the alternative actions following the change-in-control event, and claims that there are generally two choices how stock options will vest on these situations. Either only vested options remain vested and unvested options remain unexercisable forever, or then all options become exercisable. A third and relatively rare alternative is also mentioned in which all unexercised options are terminated. Ferenczy (2008) also discusses the effect of the transaction type on change-in-control provisions. In acquisitions, it is common to give the option holders a notice of the pending transaction before the deal actually takes place, so that they have an opportunity to exercise their options. If options are not exercised before the transaction takes place, it is common for options to expire simultaneously. In contrast to the acquisitions, author states that in mergers it is common to convert the options into equivalent options in the surviving corporation based on the exchange ratio. Author does not discuss the issue in detail and also no explanation is given why the transaction type should have an effect.

Somewhat contrary with Ferenczy (2008), the Delaware Court of Chancery suggests in its opinion the method of payment to affect the option valuation in the transactions, instead of the type of the transaction.

> "The court recognizes that, as a general rule, the value of a derivative instrument, such as a stock option, is tied to the value of the security into which it is exercisable. If, as the result of a transaction, the underlying security is converted into the right to receive a fixed sum of cash, the value of the option will ordinarily also be measured by reference to that same amount of cash." [3]

[3] Lillis v. A T & T Corp., 2007 WL 2110587 (Del. Ch., July 20, 2007)

In addition, the Court notes that the option agreements are no more or less than contracts that must be construed in accordance with normal rules of contract interpretation. Taken together, the Court opinion implies that underwater stock options may be cancelled for no consideration in a change-in-control transaction without the option holder's consent unless the option plan specifically states otherwise. The rationale is further enforced by the opinion of the Delaware Supreme Court

> "In the case of a stock for stock merger, option holders expect to have their old options replaced with new options because the old (underlying) stock is being replaced with new (underlying) stock. In such a transaction, by its very nature, the "economic position" of the options will invariably incorporate the expected time value of the new options. But where the stock and the options are to be cashed out in a merger, the option holders can have no expectation of receiving replacement options in new stock. Instead, option holders will, and expect to, receive only cash representing intrinsic value for their options." [4]

Going forward, a survey conducted by The National Association of Stock Plan Professionals (NASPP) and Deloitte Consulting LLP (2007) on to the use of equity awards sheds some light on the change-in-control practices. Over 500 companies granting equity awards responded to the questionnaire, most of them being headquartered in the US. Regarding the questions on the vesting of awards in change-in-control situations, 54% of respondents state that the vesting is automatically accelerated on all unvested awards and 17% say that vesting is automatically accelerated for a portion of unvested awards. However, these actions can be undertaken at the discretion of the board in 32% and 30% of companies correspondingly.

Concerning the actual treatment and the value the option holders can receive, 7% of companies say that awards are automatically paid in cash and 14% say that awards are automatically assumed by the acquirer (essentially meaning the same as converting options to equivalent options in the surviving company as discussed earlier). Again, these actions can be undertaken at the discretion of the board in 31% and 35% of the companies correspondingly. Finally, in line with Ferenczy (2008) only 2% say that awards are automatically canceled for no compensation, whereas this can be done at the discretion of the board in 22% of the respondents.

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[4] AT & T Corp. v. Lillis, (Del. Supr., May 22, 2008)

From the results one can draw rather good understanding of different methods and notice that treatment is in no means universal. Perhaps the most interesting observation is that the boards of directors seem to have a great discretion over the actions following the change-in-control events. In addition, simply looking at the agreements do not tell the whole story, as companies and option holders might actually negotiate resolution other than dictated by the agreements. When interpreting the results, one should note that NASPP survey does not have separate data for options and other equity awards, and the definition of change-in-control can vary between companies. However, it was noted by the Editor of NASPP that most companies use the same change-in-control provisions for all types of equity awards issued under the same plan (89% of companies answered have a plan that allows to issue various awards under the one plan).

Report by Frederic W. Cook & Co. (2005), a compensation consultancy, takes somewhat different approach in investigating change-in-control provisions as they look at the actual agreements that companies have filed with the US Securities and Exchange Commission (SEC) and analyze the provisions of the top 50 NYSE and Nasdaq companies. The report mainly focuses on other aspects of executive compensation than options, such as severance payments and health and welfare benefits, but it still offers some interesting insights. It is reported that 85% of the companies in their sample provide some type of change-in-control protection, typically provided through both individual agreements and plan agreements. Relatively more companies quoted on NYSE do not have any provisions compared to companies listed on Nasdaq. This is explained in the report by the higher average market capitalization of NYSE companies and hence a lower threat of being an acquisition target.

According to the report, most common triggers used to define change-in-control are:

- Change in the majority of members of the Board of Directors
- Sale of all or substantially all of the company's assets
- Liquidation or dissolution of the company
- Voting power acquisition
- Merger, consolidation or reorganization

First three are reported to be 'standard definitions' in all arrangements, while the definitions of the last two vary. Interestingly, in case of a voting power acquisition, most Nasdaq

companies use 50% voting power as a trigger for change-in-control, whereas the corresponding figure for the NYSE companies is 20%. In addition, some companies have a provision specifying that a change-in-control only takes place if ownership of former owners decreases below certain limit. In this case the majority of both Nasdaq and NYSE companies use 50% threshold, although among NYSE companies also higher values are observed, meaning that a change-in-control is more likely to take place even with buyer owning a smaller share of the company. Based on these observations authors conclude that Nasdaq companies have more stringent standards in what comes to the change-in-control provisions.

In addition, the report studies the acceleration of equity incentive plans when change-in-control takes place. In 64% of cases the vesting of equity awards is accelerated and in 20% of cases vesting is accelerated given the 'double trigger' provision, meaning involuntary termination such as firing of option holder following the change-in-control. For the rest of the cases acceleration only takes place at the discretion of committee, obviously referring to the compensation committee of board of directors. Results are very similar for both Nasdaq and NYSE. Report fails to describe how situations with different treatments for different kinds of equity awards are handled, and they only collect the information from the equity plans instead of individual agreements.

Results reported by Equilar (2009), a consultancy, are in the same vein with the findings of Frederic W. Cook & Co. (2005). Equilar (2009) studies severance and change-in-control payments at Fortune 100 companies, using proxy statements filed by the companies as a source. Results are reported separately for different equity awards, and it is shown that among CEOs, provisions offering full acceleration of options following change-in-control is found in 90.1% of companies and partial acceleration in 4.2% of companies. Values reported for stock and performance shares are lower, which can explain the slightly different results compared to the results of Frederic W. Cook & Co. (2005) that investigates equity awards in general.

In sum, it is clear that option plans and agreements have a big role in determining what constitutes a change-in-control and consequently what can happen to the options thereafter. However, board of directors can often decide on something else as well, and obviously acquirer can also seek other resolutions with the option holders. Therefore I consider change-in-control provisions to generally form a lower bound for the option values in corporate transactions.

2.2.2 Possible implications to ESO valuation

Several authors discuss the threat of takeover and its effect on option value. Considering traded options, Black (1989) states the B-S option pricing model being used in situations where there should be a large difference between the market prices and the prices provided by the model, such as when a cash takeover is likely to end the life of the option or warrant. Jennergren and Näslund (1996) consider options whose lives are stochastic because the option contracts can be prematurely cancelled, and develop an extension of the B-S formula that incorporates the stochastic life feature. Example of such a situation is when the option holder leaves her job and the stock options are forfeited. With traded options instead, the stochastic life feature can follow from a possibility of company being taken over or being involved in a merger, as many exchanges will terminate the option contracts if there is a cash settlement. However, if the shareholders receive shares of the acquiring company, then the option contract is transferred to an equivalent amount of acquirer shares and the maturity remains the same. I verify the claims by looking at the rules of NYSE Liffe[5], and find that in stock only deals the exercise price and the number of shares the options entitle to, are generally adjusted using the exchange ratio. Instead, in cash deals the options are settled at their theoretical fair value calculated with the Cox Ross Rubenstein option valuation method (the binomial model). These rules, however, can vary from one exchange to another and due to the short maturities of the traded options the impact of merger or acquisition is less severe compared to the ESOs.

Yet a few papers mention the possibility of company being bought and consequently the effect on ESO value as the vesting conditions are relaxed. Maller et al. (2002) make an assumption of ESOs typically vesting following a takeover bid despite the performance or vesting criteria of options. Similar to Jennergren and Näslund (1996), authors consider a takeover to be another early exercise event similar to the employee departure. Although not included in their valuation model, authors suggest modeling the probability of a takeover similar to the modeling of the employee departure. Furthermore, authors note that forgiving valuable vesting conditions in the event of a takeover is not costless to shareholders when they remain shareholders of the combined entity. Szimayer (2004) takes a step further and

[5] NYSE Liffe's Corporate Actions Policy, version 5.0 (December 22, 2009).

presents a reduced form model that incorporates both the possibility of employee departure and of takeover, since according to the author both events terminate the ESO contract. Szimayer (2004) argues that the main difference between the takeover and the employee departure is that a takeover prior the vesting of ESOs assigns option a certain value, whereas early departure forfeits the option. In addition to assuming a fixed cash payment for the unvested ESOs, author models the takeover after vesting to result in options being exercised and the option holders receiving an additional fixed cash payment. As a side note, Szimayer (2004) also states that in general a takeover increases the value of an ESO, although no explicit reasoning is provided. Along the lines, also Ingersoll (2006) notes that many incentive stock options vest sooner or even immediately in events such as sale, IPO or merger.

In addition, empirical evidence suggests company restructurings to be of importance when considering the ESO valuation. Ikäheimo et al. (2006) use data of listed ESOs in Finland to compare market values and theoretical B-S model values. Surprisingly they find markets to value ESOs significantly below the value predicted by the B-S model even though listed ESOs can be owned by investors who are not constrained by the same restrictions than the managers. In addition, listed ESOs are always fully vested and therefore not anymore forfeited if the employee leaves the company, and hence one would assume the market prices to be very close to the B-S values. Deviations of as much as 50% are reported and the average difference is almost 15%. Authors identify a number of factors to affect the price differential. They find time to expiration to have a major influence on the undervaluation and suggest the possibility of change in the corporate structure to lower the cost of ESOs to shareholders. ESOs are assumed to expire in case of merger resulting to the loss of time value of options.

Urtti (2009) further studies ESOs in corporate transactions in Finland between 2000 and 2009. Author identifies 45 mergers and acquisitions in which target company has options and finds out that in only three cases B-S valuation model is used to determine the pay-off and in five cases the market price of listed ESO is used as a basis for the valuation. In 22 cases option holders are either paid the intrinsic value or given a possibility to exercise options prior to transaction, effectively yielding the same outcome from the valuation point of view. In addition, in seven cases a certain minimum price was paid in instead of the intrinsic value if option were out-of-the-money. In the rest of the cases, the valuation method was either not

disclosed or there were no modifications to the options. Author concludes that no uniform rule is used in option valuation in corporate transactions and that the hypothesis of Ikäheimo et al. (2006) of lost time value of ESOs could be studied further.

In sum, to some extent the previous literature addresses the issue of option valuation in corporate transactions, but mainly concentrates on the effects to the vesting of ESOs. Although this could be the case, the possibility of ESOs being valued in a completely different way from transaction to another is suggested at least by Ferenczy (2008) and the Court of Delaware. Surveys and reports by practitioners indicate that option plans and agreements can have an essential role in determining how options are valued when change-in-control takes place, but they also stress that a great amount of latitude still exists.

2.3 Accounting valuation of ESOs

This section discusses the accounting valuation of ESOs and explains the treatment and expensing from the viewpoint of two main accounting standards issued by Financial Accounting Standards Board (FASB) and International Accounting Standards Board (IASB). FASB is the standard setter in the US and it issues Statements of Financial Accountings Standards (SFAS), whereas IASB is a London based organization that issues International Financial Reporting Standards (IFRS) that are used in the European Union and in the United Kingdom for instance. Although the two accounting standards are very close to each other regarding the treatment of ESOs, the main focus here will be on the standards issued by the US organization FASB as the data used in this study are from the US as well.

In US, prior to the issuance of the current accounting standards on ESO expensing, SFAS 123 allowed companies to use the measurement approach of Accounting Principles Board Opinion No. 25 (APB 25). APB 25 allowed companies to use the intrinsic value method in expensing stock options, where the expense is equal to the difference between the share price and the exercise price of the option at the grant date. As Murphy (1999) shows, it is a common practice to set exercise price equal to share price at the time of issuance and therefore companies avoided showing any option related expenses on their income statements. Other alternative was to use grant date fair value method recommended by SFAS 123 where option expense equals to the intrinsic value and the time value of options, calculated with an option

pricing model. According to Brown and Lee (2007) most companies chose to use the intrinsic value method, yet the grant date fair values were still mandatory to be disclosed in the footnotes.

In response to the rapidly growing use of the options and in their efforts to harmonize the US and the international accounting standards in regard to the equity awards, FASB and IASB issued standards related to fair value accounting in 2004. Both IFRS 2 and SFAS 123 revised (SFAS 123R) require firms to recognize the cost of employee stock option grants using grant date fair value. Neither of the standards requires using some certain approach in deriving the fair value, but SFAS 123R for instance states that

> "A lattice model (for example, a binomial model) and a closed-form model (for example, the Black & Scholes-Merton formula) are among the valuation techniques that meet the criteria required by this Statement for estimating the fair values of employee share options and similar instruments… This Statement does not specify a preference for a particular valuation technique or model in estimating the fair values of employee share options and similar instruments".

However, based on my reading of hundreds of annual and quarterly reports of the companies included in the sample of this study, an overwhelming majority of companies apply the B-S model and only a few companies have adopted the use of the binomial model or Monte Carlo simulation to derive the option expense.

All the ESO valuation models discussed earlier in the chapter that aim to determine the objective value of the stock options, are developed to estimate the cost to the issuing company. The models consider the parameters required by the SFAS 123 and now SFAS 123R that include the exercise price of the option, contractual life of the option, price of the underlying share at the grant date, expected volatility of the share price, expected dividends or expected dividend yield, risk-free interest rate, and the effects of early exercise by employees. In closed-form models such as the widely applied B- S model, the early exercise is taken into account by estimating the expected life of the option, while in the binomial model the expected life is an output of the model. In regard to the expected life, in addition to the previous exercise patterns of employees for instance, any other relevant information can be considered as stated in SFAS 123R.

> "[SFAS 123R] requires that the fair value of an employee share option or similar instrument be based on its expected term, rather than its contractual term… However, expected term might be estimated in some other manner, taking into account whatever relevant and supportable information is available, including industry averages and other pertinent evidence such as published academic research."

Requirement to expense ESOs seem to have triggered many insensible actions by companies, when considering that the changes should not have any effect on the firm value if investors have been able to determine the same information already prior to the fair value accounting from the footnotes of the companies. Despite the guidance of the accounting standards, managers can still use discretion over the valuation model assumptions used in determining the ESO values. As a consequence, an emerging body of research suggests that managers opportunistically use allowable discretion to bias ESO fair values downward especially to manage the reported earnings. Aboody et al. (2006) examine four key option valuation inputs disclosed following the footnote disclosure of SFAS 123. These include expected option life, expected volatility, expected dividend yield and the risk-free interest rate. Authors find firms to underestimate the disclosed ESO expenses by understating the above mentioned valuation model inputs. As firms have greatest latitude in determining the expected option life and stock price volatility, the evidence supports strongest discretion for these inputs. Johnston (2006) documents discretion over volatility only and Hodder et al. (2006) find that on average firms choosing assumptions that underestimate the ESO values have incentives to manage earnings and to camouflage the size and the value of compensation packages.

Choudhary et al. (2009) show that companies accelerated the vesting of ESOs before SFAS 123R becoming effective to avoid recognizing existing unvested ESOs at fair value in the financial statements. Authors report the likelihood of the accelerated vesting to be higher if acceleration has a greater effect on the future ESO compensation expense, and if the firms suffer greater agency problems. In addition, there is a negative stock price reaction around the announcement of the acceleration decision indicating wealth transfer from owners to ESO holders. In addition, Brown and Lee (2007) examine factors associated with firms' decisions to cut back on option based compensation around the issuance of SFAS 123R. They document reduction in the use of ESOs to be associated with the level of ESO expenses to be recognized, strength of corporate governance, institutional ownership, debt contracting concerns, and pressure to meet or beat earnings benchmarks.

Stock option expensing is also shown to have material effect on the diluted earnings of the companies. According to Botosan and Plumlee (2001) the median reduction in diluted earnings per share due to expensing of stock options is 14% and reduction in return on assets is 13.6 %. Their data set consists of 100 companies identified to be 'America's Fastest-Growing Companies' by Fortune magazine, probably causing upward bias to the figures. Also other studies find significant effects on diluted earnings. For instance, Street and Cereola (2004) investigate effects on companies reporting under IFRS and find average annual stock option expense recognition on diluted EPS to be approximately 40% with large variation between the countries. Similarly Chalmers and Godfrey (2005) reported negative effect of approximately 20% on Australian companies' financial performance ratios and interestingly find that the materiality of the impact is neither industry specific nor restricted to high growth firms.

In sum, changes in the accounting standards have lead to a significant number of studies on ESO valuation and on implications to the firms. Although the standards provide thorough guidance on deriving the value of ESOs, companies are still free to use any valuation model that fulfills the requirements and also significantly affect the way the parameters are estimated.

3. Research design and data

This chapter starts by presenting the research design of the empirical section of the study. In addition, I describe in detail how the sample is selected and data collected. Finally, sample summary statistics of the transactions and various acquirer and target characteristics are presented.

3.1 Research design

Empirical section of the study is composed of two parts. In the first part, I construct a sample of transactions for which I hand collect the information on ESO valuation methods from the disclosures of the companies. Sample of ESO valuation methods includes all employee stock options issued by the companies, and therefore the sample includes both the options granted

to the executives and other employees of the firm, as well as the options granted both to the current and to the former employees. However, if different valuation methods are applied to options issued under different option plans or different holder groups, such as executives and other employees, a corresponding number of valuation method observations is recorded. Based on these data, alternative valuation methods are identified and discussed, and the results on the overall use of valuation methods are presented. In addition, I classify the valuation methods in two categories based on whether the time value component of the option is lost or retained.

In the second part, I strive to identify the determinants of ESO valuation methods in mergers and acquisitions, and consequently whether the time value of options is either retained or lost. First, I identify possible determinants based on the previous studies and other related evidence. The association between the identified determinants and the valuation methods is then investigated and the univariate evidence is presented and discussed. Second, using the identified determinants a multivariate analysis is conducted by estimating logistic regression models in which the dependent variable indicates whether or not the options lose their time value in the transaction.

3.2 Selection of sample transactions

Data set consists of mergers and acquisitions in 2008 and 2009, in which target is publicly listed on either the New York Stock Exchange (NYSE) or the Nasdaq Stock Market (Nasdaq). This constitutes a perfect setting for the study, as the US is an active market for mergers and acquisitions, and as shown by Murphy (1999), the majority of publicly listed US companies use options as part of the compensation.

Due to strict reporting environment in the US enforced by SEC, I anticipate the information on corporate actions to be extensively disclosed and the disclosures to be readily available making the data collection feasible. Also, compared to the Europe for instance, disclosures are invariably available in English. From the accounting point of view, the US market also constitutes an interesting sample to investigate following the adoption of SFAS 123R and the fair value accounting of option grants.

Transactions to be included in the sample do not need to be completed, and therefore the sample consists of pending, withdrawn, completed and partially completed deals. This removes any selection bias that might result from including only the successful deals. After imposing a restriction of target being publicly listed, sample includes no subsidiary sales, asset sales or other types of divestitures. These events are not likely to trigger any change-in-control provisions and therefore no adjustments are made to the option contracts. Acquirer instead can be an entity of any type, such as a public or private company, a fund, or a trust.

As the data collection for the selected transactions is extremely time consuming, I aim to construct a sample with good hit rate for the option valuation method information. Initial list of transactions in 2008 and 2009 with NYSE or Nasdaq listed target includes 2,322 transactions. This list is further filtered by removing transactions that are classified as repurchases, self tenders, or stake purchases, as I anticipate the repurchases and self tenders to have little impact on stock options. Same applies to stake purchases that are unlikely to trigger the change-in-control provisions, since the buyer is not seeking to acquire the majority of the shares or is only increasing its stake after already having a majority ownership. Also deals with undisclosed dollar value and deals classified as intended are excluded since there is not likely to be a formal offer available. Procedure leaves us with 445 transactions. Transactions flagged as restructurings, debt restructurings, or target being bankrupt, are excluded resulting to 412 transactions.

Table I

Filtering of the transaction sample

Table shows filtering of transactions to be included in the sample and for which the option valuation information in transactions is collected. Initial sample consists of mergers and acquisitions in 2008 and 2009.

Target listed in Nasdaq or NYSE (years 2008 and 2009)		2,322
Repurchases, self tenders, stake purchases, undisclosed dollar value, intended transactions	–	1,886
Restructurings, debt restructurings, and bankrupt targets	–	24
Misclassified in the database	–	29
Target has no options	–	2
Sample for which option valuation data collected		381

Furthermore, I identify and exclude 29 misclassified transactions that should have been excluded based on the discussed criteria. Most of the misclassified transactions are cases in which the stock exchange of target is misclassified, deal is represented more than once in a

data set, or cases in which buyer is not actually seeking to acquire a majority[6]. In case of a duplicate event of one buyer-acquirer combination existing multiple times in the data set, only the most recent one is included. However, if there are multiple companies bidding for one company, all of these are included in the sample as individual events. Finally, in two cases the target does not have any stock options outstanding are excluded. Filtering of sample as summarized in Table I yields 383 transactions for which the option valuation data are collected. Among the excluded transactions, a clear majority of the events are repurchases while the second largest group of excluded events is stake purchases.

3.3 Data collection and sources of data

Two main sources of data are utilized in the study. Transaction data is retrieved from the SDC Platinum database, whereas the company disclosures including the information on ESO valuation in a given transaction are hand-collected via EDGAR (Electronic Data Gathering, Analysis, and Retrieval system) of SEC.

In addition to retrieving the list of transaction from SDC Platinum following the above discussed criteria, I also retrieve a range of transaction related variables from SDC that are later on used in the investigation of valuation method determinants. Most important variables are the method of payment, form of transaction, and various target and acquirer characteristics. Also the transaction value is retrieved from the same source.

Disclosures filed with SEC are used to determine the ESO valuation method in a transaction. The SEC rules require disclosures about the proposed merger or acquisition whether or not it is completed. With mergers, if a shareholder vote is required, the information can be found from the proxy statement on Form Schedule 14A or from the information statement on Form Schedule 14C. In addition, issuers must file documents relating to merger agreements such as the definitive merger agreement. This and other material about the merger will be included as exhibits to the Form 8-K or subsequent quarterly or annual report filed on Form 10-Q or 10-K respectively. Most of the time the ESO valuation method is found from the definitive merger

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[6] In few cases only convertible shares or warrants are bought where no change-in-control provisions are triggered until they are exercised at some point in the future. These cases are also excluded.

agreement under Form 8-K, although the same agreement is usually disclosed under other forms as well such as proxy statements if a shareholder vote is required.

With tender offers, parties who will own more than five percent of the securities of a firm must file a Schedule TO with the SEC. The target company must file with the SEC its response to the tender offer on Form Schedule 14D-9. In many cases the tender offer itself do not outline the final ESO valuation method, as it is later on negotiated with the company being acquired and then disclosed in a mutual definitive agreement. Therefore, if a tender offer is not successful the information regarding the option valuation may not available.

Both Nasdaq and NYSE rules require shareholder vote when material changes are made to option plans. However, it is stated in a SEC release discussing the NYSE and Nasdaq rules that *"shareholder approval will not be required to convert, replace or adjust outstanding options or other equity-compensation awards to reflect the transaction"*.[7] Therefore information on option valuation in corporate transactions is not usually found from the proxy statements of the firms, unless some extraordinary adjustments are being made.

In addition to option valuation method, two other variables are collected for the transactions with option valuation method available. First, remaining life of all outstanding options is collected from companies' annual or quarterly reports, forms 10-K and 10-Q respectively. This value indicates the option amount weighted average remaining contractual life for the options, basically meaning the remaining time to maturity of the options. Second, I collect the expected life of options from the same filings that indicate the value the company is using in B-S model for the fair value calculations. Variable is collected for the most recent time period, so if the filing presents the expected life variable for the last three years separately, the most recent one is collected.

For the remaining life and the expected life variables the latest report, either annual or quarterly, is used. Sometimes companies do not disclose either or both of the variables in their quarterly reports, in which case the latest annual report is used to find the missing variable or variables. Companies using valuation model other than B-S, such as Binomial model or

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[7] SEC Release No. 34-48108; File Nos. SR-NYSE-2002-46 and SR-NASD-2002-140, June 30, 2003.

Monte Carlo simulation, do not necessarily disclose the expected life of options as that is not used as an input in the calculations.

3.4 Summary statistics

Table II presents the statistics for certain sample characteristics related to transactions. All variables are dichotomous and therefore the reported values equal to the proportion of that characteristic in the whole sample, and in NYSE and Nasdaq subsamples (defined by the stock exchange of the target company). In addition, the difference in the proportions and the statistical significance of the association between each of the characteristics and target exchange subsamples is reported.

Table II

Descriptive statistics of mergers and acquisitions in 2008 and 2009

Table shows descriptive statistics for mergers and acquisitions during 2008 and 2009 in which target company is listed on either Nasdaq or NYSE (N=381). Excluded are repurchases, self tenders, stake purchases, (debt) restructurings, intended transactions, and transactions with undisclosed dollar value, bankrupt target, and no target options. Reported values are delineated by the target stock exchange. All variables are dichotomous; *Year 2009*, equal to one if transaction announced on 2009; *Completed*, equal to one if transaction is (partially) completed; *Stock*, equal to one if stock is used as method of payment; *Cash*, equal to one if cash is used as method of payment; *Cash and Stock*, equal to one if both cash and stock are used; *Tender Offer*, equal to one if tender offer is being made; *Public Acquirer*, equal to one if acquirer is publicly listed; *US Acquirer*, equal to one if acquirer nation is US. Reported p-values for the differences between NYSE and Nasdaq samples based on the Pearson $\chi 2$ (1df) test for independence of categories. All data from SDC Platinum database. * denotes significance at the 10% level, ** at the 5% level, and *** at the 1% level.

	All (N = 381)	NYSE (N = 88)	Nasdaq (N = 293)	Difference	p-value
Year 2009	0.415	0.409	0.416	-0.007	0.751
Completed	0.606	0.557	0.621	-0.064	0.279
Cash	0.790	0.727	0.809	-0.082	0.099*
Stock	0.302	0.511	0.239	0.272	0.000***
Cash and Stock	0.181	0.307	0.143	0.163	0.000***
Tender Offer	0.223	0.136	0.249	-0.113	0.026**
Public Acquirer	0.617	0.750	0.577	0.173	0.003***
US Acquirer	0.892	0.864	0.901	-0.037	0.321

From Table II, number of transactions announced is lower in 2009 than 2008, and out of all transactions 60.6% are completed or partially completed. See Appendix A for monthly transaction activity. For neither of the variables, there are no large differences between the NYSE and Nasdaq subsamples. In comparison, Schwert (2000) studies transactions in which target firms are listed on NYSE or AMEX during 1975 and 1996 show that 75% of the deals

in the sample are completed. Yet one should note that 19% of the transactions in the sample of this study are still pending so the eventual fraction of completed deals is likely to increase. Considering the method of payment, cash is used in 79.0% and stock is used in 30.2% of the transactions. Both cash and stock are used in 18.1%, implying that the proportions of cash only and stock only transactions equal to 60.9% and 12.1% respectively. The association between the method of payment characteristics and the target exchange are all statistically significant. In NYSE subsample the share of stock deals is significantly higher compared to the Nasdaq sample and well correspond with the statistics reported by Schwert (2000) for instance. Author reports 58% of transactions to be paid in cash only compared to 24% of transactions in which only stock is used as method of payment.

Tender offer is conducted in 22.3% of all transactions while the rest of the transactions are classified as mergers. There is also a statistically significant association between making a tender offer and the target exchange. When target is listed on Nasdaq, tender offer is conducted in 24.9% of the cases whereas for NYSE subsample the corresponding value is only 13.6%. Looking at the acquirer characteristics, in 61.7% of transactions acquirer is publicly listed and there is a statistically significant 17.3 percentage point difference between NYSE and Nasdaq subsamples.

Panel A in Table III presents statistics for certain characteristics of target companies in the sample. Average and median transaction values are significantly higher for NYSE listed targets and the association is statistically significant. For instance, median transaction value in Nasdaq is $124 million, whereas in NYSE it is $2,635 million. Similarly, based on the total asset value, companies listed on NYSE are significantly larger compared to the Nasdaq companies. Transaction value and the value of total assets for the whole sample are much closer to the Nasdaq subsample values, as the majority of transactions in the sample have a Nasdaq listed target (76.9%).

Table III

Target characteristics in mergers and acquisitions in 2008 and 2009

Table shows descriptive statistics for mergers and acquisitions during 2008 and 2009 in which target company is listed on either Nasdaq or NYSE (N=381). Excluded are repurchases, self tenders, stake purchases, (debt) restructurings, intended transactions, and transactions with undisclosed dollar value, bankrupt target, and no target options. In Panel A, *Transaction Value* equals to the total value of consideration offered. *1-Day Premium* calculated with offer value and previous day closing price.. In Panel B, option *Remaining Life* and *Expected Life* are collected from most recent annual or quarterly report filed with the Securities and Exchange Commission prior to the announcement of transaction. *Option moneyness* is defined as max[(offer value - average strike price)/average strike price, 0]. Reported p-values for the differences between NYSE and Nasdaq samples based on the two tailed t-test for means and Mann–Whitney–Wilcoxon test for medians. All data are not available for all observations. All data from SDC Platinum database unless otherwise stated. * denotes significance at the 10% level, ** at the 5% level, and *** at the 1% level.

Panel A: Transaction characteristics					
	All	NYSE	Nasdaq	Difference	p-value
Transaction Value ($M)					
N	381	88	293		
Mean	1,985	6,532	620	5,912	0.000***
Median	201	2,635	124	2,511	0.000***
Standard Deviation	6,747	12,100	2,742	9,358	
Total Assets, LTM ($M)					
N	378	88	290		
Mean	5,407	21,875	410	21,465	0.000***
Median	165	1,760	99	1,661	0.000***
Standard Deviation	45,323	92,410	1,155	91,254	
1-Day Premium (%)					
N	357	87	270		
Mean	47.4	30.2	53.0	-22.8	0.005***
Median	34.9	32.6	36.7	-4.2	0.023**
Standard Deviation	65.7	40.4	71.2	-30.8	
Panel B: Stock option characteristics					
	All	NYSE	Nasdaq	Difference	p-value
Remaining Life (years)					
N	293	65	228		
Mean	5.66	5.23	5.78	-0.55	0.023**
Median	5.70	5.40	5.80	-0.40	0.021**
Standard Deviation	1.72	1.71	1.71	0.01	
Expected Life (years)					
N	279	61	218		
Mean	5.30	5.15	5.34	-0.20	0.309
Median	5.10	5.00	5.20	-0.20	0.226
Standard Deviation	1.35	1.18	1.39	-0.22	
Moneyness					
N	271	76	195		
Mean	0.90	0.91	0.89	0.02	0.935
Median	0.40	0.30	0.40	-0.10	0.276
Standard Deviation	1.86	2.12	1.76	0.37	

Interestingly there is also some variation in the target one-day premiums between the two exchanges, measured as the difference between the previous day closing price and the offer value. In Nasdaq median premium is 36.7% whereas in NYSE the corresponding value is

32.6%. This is likely to be related to the fact of larger and more mature companies trading in NYSE, compared to more technology focused Nasdaq. Andrade et al. (2001) report similar premiums in transactions with both the acquirer and the target being publicly listed and US based firms.[8] According to the authors, median premium paid during the years from 1990 to 1998 was 34.5%, only 0.4 percentage points below the median premium in this study.

Panel B in Table III presents summary statistics for the target stock option related variables. The mean and median remaining life of the options is 5.7 years. Remaining life equals to the option amount weighted average of all outstanding options of the company. Mean value among the NYSE companies is 0.55 years lower than among the Nasdaq companies, and the difference in means is statistically significant. As shown in Figure I, the distribution of the remaining lives is slightly skewed to the right, probably resulting from the fact that the option holders tend to exercise their options prior to the contractual maturity. Yet the values of remaining life range from below one to almost ten years, which is in line with the results reported by Murphy (1999) who shows that the majority of companies issue options with maturity of ten years. Going forward, the distribution of expected lives in Figure I, an estimate used by companies in option fair value calculations looks very different from the remaining life distribution as the values are more concentrated around the mean.

Finally, Figure I presents the frequency distribution of moneyness factor that I define as

$$Moneyness = \max\left[\frac{Offer\ value - Strike\ \ price}{Strike\ price}, 0\right] \quad (1)$$

where offer value refers to the final offer value per common share in monetary terms and the strike price refers to average strike price for options outstanding. Approach loosely follows Carter and Lynch (2001) who use a measure for options being out-of-the-money. Moneyness indicates how many fold the intrinsic value is compared to the strike price, and therefore in-the-money options assume values greater than zero. As there is no information available for out-of-the-money options in the data set, moneyness variable always assumes value of zero if all options are out-of-the-money.

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[8] Included are companies listed on New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and Nasdaq.

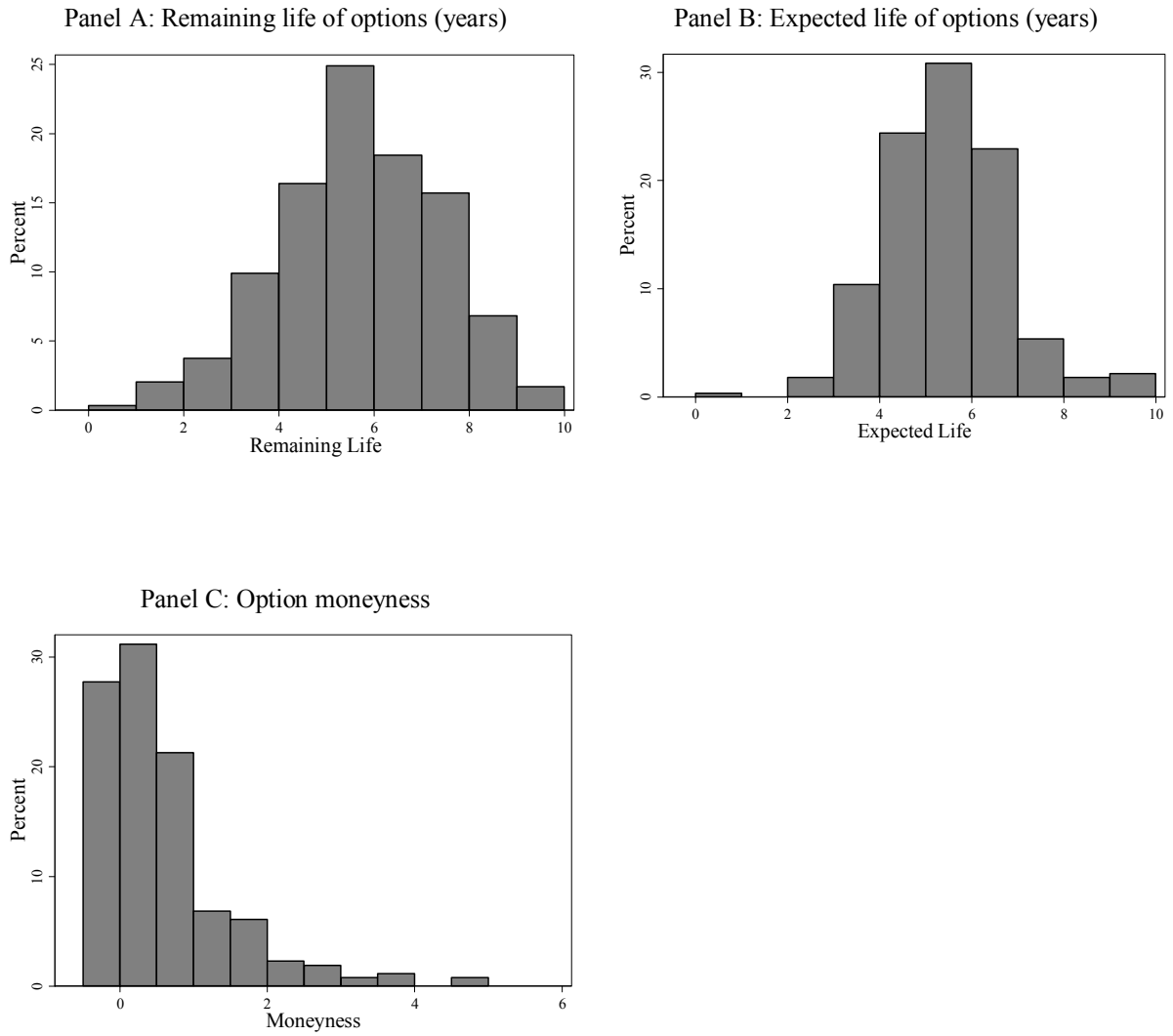

Figure I: Distributions of target stock option variables

Figures show the frequency distributions for certain stock option related variables for the target company in mergers and acquisitions during 2008 and 2009 in which target company is listed on either Nasdaq or NYSE. Excluded are repurchases, self tenders, stake purchases, (debt) restructurings, intended transactions, and transactions with undisclosed dollar value, bankrupt target, and no target options. *Remaining Life* (N=293) and *Expected Life* (N=273) are collected from most recent annual or quarterly report filed with the Securities and Exchange Commission prior to the announcement of transaction. Remaining Life is the option amount weighted average contractual time to expiration and Expected Life is the estimate used in fair value calculations for the most recent period. *Option moneyness* (N=263, 24 extreme observations with values above five are omitted from the histogram) is defined as max[(offer value - average strike price)/average strike price, 0] for which the data are retrieved from SDC Platinum database.

From Figure I, the values of moneyness factor in Panel C are heavily skewed to the left that is mainly due to assigning a value of zero for the out-of-the-money options. First bar on the left stands for the options with the strike price above the offer value, representing 26.9% of the observations. For the same reason the mean value reported in Table III must be interpreted

with caution, and the median value of 0.40 provides a better understanding of the moneyness among the sample firms. Value of 0.40 indicates that the offer value exceeds the average strike price of options of that particular company by 40%. In comparison with the reported median premium of 34.9%, it seems that prior the transaction the median moneyness is likely to be significantly lower.

4. ESO valuation methods in mergers and acquisitions

This section presents the results on the use of different ESO valuation methods in mergers and acquisitions. I first depict the different valuation methods identified among the transactions and how they are categorized. Then I move on showing how frequently each of the methods is used.

4.1 Identified valuation methods

Each identified method is thoroughly explained and illustrative examples from the disclosures are given. Names assigned for the different groups of valuation methods are to some extent self-invented, and the same terminology might not be used in all the offers, agreements, and option contracts. More importantly, classification is not based on the technical treatment of the options, but on implications to option value. If for instance the option value is derived in a same manner, but the holder receives either cash or stock in consideration, these cases are classified under the same category.

4.1.1 Intrinsic value

When intrinsic value of options is paid, the option holder only receives a payment equal to the offer value over the exercise price of the option. In case the options are out-of-the-money they are cancelled for no consideration. In all cash transactions the offer value is simply the cash offer being tendered to the stockholders. If both cash and stock are offered or if the transaction is a stock for stock deal, the acquirer share price is used to determine the cash equivalent offer value. Acquirer share price is usually defined as an average closing price

during the last few days preceding the closing of the deal, but in some cases only the last closing price or even the maximum price during the preceding 60 day period is used. [9]

Intrinsic value method was used in an acquisition by Pfizer of Wyeth.

> "By virtue of the Merger, each option to purchase shares of Company Common Stock under the applicable Company Stock Plans that is outstanding immediately prior to the Effective Time, whether or not then vested and exercisable (collectively, the "Options" or "Company Stock Options") shall become fully vested and exercisable immediately prior to, and then shall be canceled at, the Effective Time, and the holder thereof shall, subject to Section 1.9(f), be entitled to receive an amount in cash equal to the product of (i) the excess, if any, of (1) the Per Share Amount over (2) the exercise price per share of Company Common Stock subject to such Option, with the aggregate amount of such payment rounded up to the nearest cent, and (ii) the total number of shares of Company Common Stock subject to such fully vested and exercisable Option as in effect immediately prior to the Effective Time (the "Option Consideration"). The Option Consideration shall be paid in a lump sum as soon as practicable after the Effective Time but in no event later than ten (10) Business Days following the Effective Time." [10]

In nearly all of the cases the intrinsic value is paid to all options whether vested or not. However, in some occasions the intrinsic value is paid to vested options only. In these cases only holders of vested options receive a payment, and unvested options are simply terminated without any consideration. There are also offers that promise the payment only to the vested options, but further add that all accelerated vesting provisions are taken into account without specifying to which options this applies. Also the transactions stating that all options are terminated with no payment are classified to the same category, as effectively the situation is the same as the holder can exercise the vested portion of the options prior to the deal. All of these transactions are classified as 'Intrinsic value for vested'. When interpreting the results, one should note that if all the options are fully vested, then paying the intrinsic value for the vested options only is essentially the same as paying the intrinsic value for all of the options.

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[9] Denbury Resources acquisition of Encore, Form 8-K filed on 2009-11-03.

[10] Form 8-K filed on 2009-01-29.

In Oracle's acquisition of Sun Microsystems, non-employees were to receive the intrinsic value only for the vested part of their options.

> "Company Compensatory Award that is held by a person who is not an employee of, or a consultant to, the Company or any Subsidiary of the Company immediately prior to the Effective Time (the "Cashed Out Compensatory Awards") shall not be assumed by Parent pursuant to this Section 2.06 and shall, immediately prior to the Effective Time, be cancelled and extinguished and the vested portion thereof shall automatically be converted into the right to receive an amount in cash equal to the product obtained by multiplying (x) the aggregate number of shares of Company Common Stock that were issuable upon exercise or settlement of such Cashed Out Compensatory Award immediately prior to the Effective Time and (y) the Merger Consideration, less any per share exercise price of such Cashed Out Compensatory Award." [11]

Clinical Data agreed to acquire Avalon Pharmaceuticals and it was agreed that all options of Avalon shall be cancelled.

> "At the Effective Time, each Company Option that is outstanding and unexercised immediately prior to the Effective Time, whether or not vested, shall be cancelled and shall be of no further force and effect. Prior to the Effective Time, the Company shall take all actions that may be necessary (under the Option Plans and otherwise) to effectuate the provisions of this Section 5.4(a) and to ensure that, from and after the Effective Time, all Company Options have been canceled and all holders of Company Options have no rights with respect thereto other than those specifically provided in this Section 5.4(a)." [12]

Consideration offered is in most cases a lump sum of money. Other less used alternative is that the option holder actually needs to exercise the options to realize the value. In addition, there are some cases in which both cash and stock are offered in the same basis than for the common stock holders. In these cases the intrinsic value, the offer value over the option exercise price, is converted to 'common stock equivalents' by dividing the intrinsic value with the target share price, and then offering them the same consideration than common stock holders are promised.[13] Also in one case, holder was able to choose to receive the intrinsic

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[11] Form 8-K filed on 2009-04-20.

[12] Form 8-K filed on 2008-10-30

[13] See for instance Stone Energy's acquisition of Bois d'Arc Energy, Form 8-K filed on 2008-05-01.

value in either cash or in parent common stock.[14] Other alteration of the intrinsic value method is to the payment according to the original vesting schedule of the options and not immediately following the transaction.

In some cases all option holders receive certain minimum value for giving up their options. In addition to in-the-money option holders receiving the intrinsic value of the options, out-of-the-money option holders also receive a small fixed payment. The sample includes only few cases like this, and the minimum value is always relatively low. In an acquisition of Lineage Power Holdings by Cherokee International, it is stated that *"If the exercise price per share of any Company Stock Option equals or exceeds the Merger Consideration, the cash amount payable therefor shall be $0.01 per share."*.[15]

In sum, as the name implies, using intrinsic value method to value options clearly destroys the time value of options. Only exception is the minimum value method in which out-of-the-money option holders receive even a small compensation in lieu of termination of their options. Offering intrinsic value for the vested options only obviously further increases the value destruction.

4.1.2 Options converted

In connection of an acquisition or a merger, it can be agreed that the options are converted to the options of the acquirer or the surviving corporation. In some occasions this is referred to as 'assuming options' and 'assumed options', having the same meaning. In these cases, material terms of the option contracts remain the same, but the underlying asset is not anymore the stock of the target. In addition, exercise price and number of options are adjusted using the exchange ratio of stock-for-stock deal, or in a cash deal using the exchange ratio calculated with the cash consideration and the acquirer share price.

Bank of America agreed to convert all outstanding options of Merrill Lynch & Co in a merger between the two.

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[14] Ares Capital bid for Allied Capita, Form 8-K filed on 2009-10-30.

[15] Form 8-K filed on 2008-09-30.

> "[Company Options] shall be converted into an option (an "Adjusted Option") to purchase, the number of whole shares of Parent Common Stock that is equal to the number of shares of Company Common Stock subject to such Company Option immediately prior to the Effective Time multiplied by the Exchange Ratio (rounded down to the nearest whole share), at an exercise price per share of Parent Common Stock (rounded up to the nearest whole penny) equal to the exercise price for each such share of Company Common Stock subject to such Company Option immediately prior to the Effective Time divided by the Exchange Ratio, and otherwise on the same terms and conditions (including applicable vesting requirements and any accelerated vesting thereof) as applied to each such Company Option immediately prior to the Effective Time" [16]

Some agreements specifically state that in addition to converting the options, also the vesting is accelerated for all options. However, in many cases accelerated vesting can take place although it is not explicitly stated in the transaction agreement if option agreement includes a change-in-control provision dictating this.

Additional restrictions can also be attached to option conversion. I identify individual cases in which only in-the-money options are converted, such as Sprint Nextel's successful acquisition of Virgin Mobile USA[17], and cases in which options are converted only if strike price is lower than certain defined value. In practice the latter case leads to termination of deep out-of-the-money options, such as in a $20 per share tender offer for CV Therapeutics by Gilead Sciences.

> "At the Effective Time, each Company Option that is outstanding and unexercised as of immediately prior to the Effective Time, whether or not vested, that has an exercise price per share not greater than $41.00 shall be assumed by Parent…"[18]

Finally, I identify cases in which the exercise price of converted options cannot be lower than the par value of the underlying common stock. For instance, this restriction was included in the agreement between Basic Energy Services and Grey Wolf, the latter being the acquirer.[19]

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[16] Form 8-K filed on 2008-09-18.

[17] Form 8-K filed on 2009-07-28.

[18] Form 8-K filed on 2009-03-18.

In sum, converting options retains both intrinsic value and time value of options. However, there are individual cases in which certain options, such as out-of-the-money options, are not converted but simply terminated with no compensation. In spite of retaining the intrinsic and time value of option when converted, this does not indicate that the option value would not change. Now the underlying asset is different and the change in the volatility of the underlying stock can increase or decrease the option value.

4.1.3 Other

A small number of valuation methods exist that do not fit under the intrinsic value or options converted categories. Assigning these to category 'Other' serves the purpose of not creating too complex classification system that would distort the analyses on determinants of option valuation methods. However, it is important to make sure that this category includes only relatively small amount of observations, as interpreting any results from the analyses regarding other methods is not really meaningful.

As discussed earlier, if different valuation methods are applied to different option plans or different holder groups, more than one valuation method is assigned to that transaction. However, if more than one valuation method is applied to same options for same holders, such as cases in which in-the-money options are paid intrinsic value and out-of-the-money options are converted, then method is classified to be 'Other'. Majority of transactions in this category are different kinds of combinations of other methods, in which option moneyness, vesting status of options, or holder decision determines the option valuation method.

Nevertheless, this category also includes some of the most interesting valuation methods in the whole sample. South Korean Arigene Co Ltd offered to pay intrinsic value for the options of Trimeris Inc, but also 50% of B-S value for options with non-positive intrinsic value. This is the only transaction in the sample with B-S or similar model being used for any purposes when valuing options.

> "In connection with this cancellation, the Company will seek a release of claims related to the Company Stock Options from each holder; for this release, for any options not

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[19] Form 8-K filed on 2008-04-22.

> anticipated to receive payment under Section 2.9(b), the Purchaser or Parent will pay an amount as set forth on Section 2.9 of the Company Disclosure Schedule equal to fifty percent (50%) of the Black & Scholes value with respect to the remaining life of such option as determined using the assumptions currently in use by the Company and the Closing Payment."[20]

Other interesting method is used by TD Ameritrade Inc when acquiring Thinkorswim Group Inc. The agreement states that the options of Thinkorswim Group shall be converted to the options of the parent, but out-of-the-money option holders will be offered restricted stock units (RSUs) in lieu of terminating the options.

> "To the extent permitted by applicable Law and Governmental Authorities, the Company shall make an offer to all holders of Underwater Options outstanding under the Company Option Plans immediately prior to the Effective Time, pursuant to which the holder affirmatively would agree in writing to the cancellation of all (but not less than all) of his or her Underwater Options in exchange for the grant by the Company to such holder of an award of restricted stock units (the "Option Exchange Program"). The Company and the Parent shall work together in good faith to determine the terms and conditions of both the Option Exchange Program and the restricted stock units to be granted thereunder…"[21]

Although the option exchange offer was still pending on the shareholder approval, the exact terms were disclosed and nearly all eligible option holders participated in the offer. In the same filing Thinkorswim Group also talks about the reasoning behind the exchange offer.

> "We believe that these underwater options may have little value as either an incentive or retention tool. The exchange offer is intended to re-incentivize the eligible individuals who participate in the exchange program…"[22]

Last case discussed in this category is a bid by Ligand Pharmaceuticals for Pharmacopeia. In an agreement between the two, it is said that company will offer to cancel any options for an undetermined cash consideration. If option holders do not participate to cancellation offer, options under certain plans will be converted and other options will be paid intrinsic value.

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[20] Form 8-K filed on 2009-10-05.

[21] Form 8-K filed on 2009-01-12.

[22] Form SC TO-I filed on 2009-04-17.

> "Prior to the Merger 1 Effective Time, the Company shall offer to cancel, effective immediately prior to the Merger 1 Effective Time, any of the Company Options granted under the Company Stock Plans (a "Cancellation Offer") in exchange for the payment of an amount to be determined by the Company up to $0.20 per share of Company Common Stock subject to such Company Options (each such payment, an "Option Cancellation Payment"); provided, however, that in no event shall the Option Cancellation Payments exceed $1,000,000 in the aggregate."[23]

In sum, these individual cases show that although in most cases options are either paid intrinsic value or converted to new options, many other methods exist as well. Wording in these agreements, such as "*Company shall offer to cancel…*" and "*Company will seek a release of claims...*", also indicate that the valuation is not dictated by the option plan agreements or individual contracts. From the valuation point of view it is hard to make any clear conclusions as methods in this category are so diverse.

4.1.4 Not available

Information on stock option valuation is not available for all the transactions in the sample. There are two major groups of cases that fall into this category. First, acquiring company can only have issued a non-binding indication of interest to the acquirer, such as letter of intent. Even though this is usually filed with SEC and hence the content is available to the public, most of the time it only states the most important terms such as the offer price. Database for the transactions treats these cases as any other transactions, and therefore it is impossible to determine in advance whether the information is actually available or not. Including only completed deals would decrease the number of cases without the information to almost zero, but could cause other biases as discussed earlier. Example of transaction where option valuation method is not disclosed is Microsoft's attempt to buy Yahoo!, at which Microsoft only issued a proposal without ever proceeding with a formal offer after the board of Yahoo! rejected the proposed bid. [24]

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[23] Form 8-K filed on 2008-09-25.

[24] Form 8-K filed on 2008-02-01.

Second, quite often the valuation method is not disclosed in tender offer statements. However, if the transaction succeeds or at least both parties agree on it, a definitive mutually negotiated agreement is usually disclosed that contains the option valuation information. Hence, many of the transactions in this category are unsuccessful tender offers.

In addition to these two types of transactions, there are some cases in which a deal is completed and target has options, but valuation method is still not disclosed. In many cases it is stated that the buyer will honor all contracts and agreements, probably meaning that the valuation method is determined solely based on the option contracts. As the investigation of the actual option plans agreements is out of the scope of this study, these cases are also classified as information not being available.

In sum, information on option valuation in mergers and acquisitions is quite well disclosed. However, method is often not disclosed if no formal offer is made or no mutual agreement is disclosed following tender offer. Also, companies may simply make a reference to option plans or agreements when stating how options are treated without explicitly stating the method.

4.2 Use of identified methods and effect on time value of options

Summary of option valuation methods is shown in Table IV. Number of transactions is 381 and due to the possibility of multiple observations per transaction, number of observations exceeds the number of transactions and equals to 399 including the observations with no information available.

In total, 316 observations of disclosed valuation methods are found from 298 different transactions. There are 83 transactions in which information is not disclosed, corresponding to 21% out of the whole sample. Only eight out of the 83 transactions with no information on option valuation method are completed while the rest are either withdrawn or pending. As discussed earlier, transactions with no information available are by and large cases in which no formal offer is made that would outline the details of the transaction. Therefore, these transactions do not offer us much of an insight regarding the option valuation methods, and hence the transactions with no information available are excluded from the forthcoming analyses.

Table IV

ESO valuation methods in mergers and acquisitions

Table summarizes employee stock option valuation methods in mergers and acquisitions during 2008 and 2009. Sample consists of events in which target company is listed on either Nasdaq or NYSE. Final sample of 381 transactions is constructed by excluding repurchases, self tenders, stake purchases, (debt) restructurings, intended transactions, and transactions with undisclosed dollar value, bankrupt target, and no target options. Valuation methods are classified according to information found from the disclosures filed with Securities and Exchange Commission. Number of observations exceeds number of transactions as in some cases different options of the company are valued in different ways. *Intrinsic value* refers to method in which option holder essentially receives a value equal to offer price over the strike price of the option. *Options converted* refers to method in which options are converted to new options of acquirer or surviving entity with essentially the same terms and conditions. *Intrinsic or converted* refers to method in which holder can choose between the two above mentioned methods. *Miscellaneous* refers to methods not assigned to any other category.

	No. of observations	% of total	% of total method disc.
Intrinsic value (Time value lost)	210	53 %	66 %
All options paid intrinsic value	*186*	*47 %*	*59 %*
Vested options paid intrinsic value	*19*	*5 %*	*6 %*
Options paid intrinsic value according to original vesting schedule	*3*	*1 %*	*1 %*
Options paid intrinsic with minimum value	*2*	*1 %*	*1 %*
Options converted (Time value retained)	96	24 %	30 %
All options converted	*75*	*19 %*	*24 %*
All options converted with acc. vesting	*16*	*4 %*	*5 %*
Options converted with restrictions	*5*	*1 %*	*2 %*
Other	10	3%	3%
Intrinsic or converted	*3*	*1 %*	*1 %*
Miscellaneous	*7*	*2 %*	*2 %*
Not available	83	21 %	
Total	399		
Total, method disclosed	316		
Transactions	381		
Transactions, method disclosed	298		

Table IV shows that on average, option holders are most likely to receive intrinsic value for all of the options despite the vesting status. Intrinsic value for all options is paid in 59% of cases or 186 times out of the 316 observations in which the method is disclosed. As shown in the table, other variants of intrinsic value are significantly less used in practice. In 19 cases only vested options are cashed out, whereas only in three cases intrinsic value is paid for all the options following the original vesting schedule. In two cases a certain minimum value is paid if intrinsic value does not exceed it. When considering all the cases in which intrinsic value is paid with some additional characteristics or not, there are 67% or 211 cases like that in the sample. This category of observations is further classified as 'Time value lost' as option valuation is based on the intrinsic value of options only.

Second largest group are the transactions in which options are converted to the acquirer options or to the options of the surviving corporation. In 75 (24%) cases options are converted and in 16 (5%) cases options are converted and simultaneously vesting of all options is accelerated. In addition, there are two cases in which only in-the-money options are converted and out-of-the-money options are terminated. In three transactions options are converted only if the strike price of the option is below certain level. As a group, cases in which options are converted add up to 96 cases representing 30% of all transactions in which the valuation method is disclosed. This category of observations is further classified as 'Time value retained' as converted options retain both intrinsic and time value of options.

In addition, there are three cases in which holder can choose between receiving the intrinsic value and converted options. Also, there are seven cases in which valuation method is none of the ones mentioned previously. The group mainly includes cases in which the valuation method consists of elements from other methods, but also more unorthodox cases such as paying 50% of B-S value for options with non-positive intrinsic value are present. Although interesting as such, these cases are unlikely to have any material effect on the analysis due to very low number of observations.

Finally, there are 18 transactions in which more than one option valuation method is applied for different option plans or different option holder groups, such as for the management team and the other employees. These are not shown as a separate group in the table, but both valuation methods are assigned to their appropriate categories as individual observations. In all cases both intrinsic value and option conversion methods are used, of which in four cases intrinsic value is paid for vested options only.

In sum, two main categories of valuation methods clearly emerge. First, in intrinsic value method option holders are paid only the intrinsic value of options causing them to lose the time value of options. The most common method in this category is to offer the intrinsic value for all options despite their vesting status. Second, in options converted method options are converted to new options of the acquirer or the surviving corporation, and therefore the time value of options is retained. The most common method in this category is to convert all outstanding options of the target. These two categories of valuation methods, 'Intrinsic value' and 'Options converted', are used in the following analysis to study what determines the valuation method used and consequently whether the time value is lost or not.

5. Determinants of ESO valuation methods

This section investigates the determinants of ESO valuation methods in mergers and acquisitions, and consequently either losing or retaining the time value of options. First, investigated determinants and related univariate evidence are presented. Second, multivariate analysis is conducted by estimating various logistic regression models. All analyses are conducted using statistical software package Stata 11.

Table V

Filtering of sample for the analysis of valuation method determinants

Table shows the filtering of option valuation observations in mergers and acquisitions used in the analysis of valuation method determinants. Valuation methods are classified according to information found from the disclosures filed with SEC. Number of observations exceeds number of transactions as in some cases different options of the company are valued in different ways. *Intrinsic value* refers to method in which option holder essentially receives a value equal to offer price over the strike price of the option. *Options converted* refers to method in which options are converted to new options of acquirer or surviving entity with essentially the same terms and conditions. *Intrinsic or converted* refers to method in which holder can choose between the two above mentioned methods. *Miscellaneous* refers to methods not assigned to any other category.

Sample for which option valuation data collected	381
Option valuation method not available	-83
Sample of transactions, method disclosed	298
Two option valuation methods in one transaction	+ 18
Sample of option valuation method observations	316
Valuation method classified as *Other*	– 7
Valuation method classified as *Intrinsic or converted*	– 3
Sample for analysis of valuation method determinants	306

Sample for the analysis of valuation method determinants consists of all option valuation method observations classified in the 'Intrinsic value' or 'Options converted' categories, and therefore ten observations classified as 'Other' are excluded from the analysis. Table V summarizes the filtering of the sample for the analysis of valuation method determinants.

5.1 Investigated determinants and univariate evidence

Purpose of this section is to justify why each of the determinants discussed could have an effect on option valuation method and subsequently on either losing or retaining time value in corporate transactions. In addition, univariate analysis of each of the determinants is conducted against the option valuation method category.

Previous literature offers very limited help in defining the possible causes of option valuation method in transactions, and hence the determinants to be tested are to large extent based on other related studies and common sense. Investigated determinants are all either continuous variables, or variables coded as dichotomous for the purposes of the regression analysis in the next section. Univariate analysis is conducted by using Pearson Chi-square test for the association between the dichotomous variables and the option valuation method. For continuous variables two-tail t-test is used to investigate the differences in the means and Mann–Whitney–Wilcoxon test to examine the differences in the medians.

5.1.1 Transaction characteristics

A. Form of Transaction

In general, tender offers and negotiated mergers are both means of conducting a takeover offer. However, in tender offer, the offer is made directly to the shareholders of the target, whereas in merger the acquirer negotiates with the management (see for instance Martin, 1996). Even in tender offers it is still common that the acquirer asks target management for their approval (Weston et al., 2004).

Ferenczy (2008) suggests that the form of transaction can affect whether option holders receive the intrinsic value or new options in the surviving corporation. Author makes a distinction between acquisitions and mergers, and notes that in acquisitions option holders are likely to receive intrinsic value and in mergers new options of the surviving corporation.

I use dummy variable that assumes value of one if tender offer is conducted and zero otherwise (all other cases are classified as mergers). Table VII shows that in 22.9% of the valuation method observations transaction is made via tender offer. However, in the intrinsic value subsample the figure is 27.6% compared to 12.5% in the options converted subsample, indicating a strong relation between the form of transaction and the ESO valuation method. The relation is also statistically significant with p-value of 0.003.

B. Method of payment

Method of payment is studied to be closely related with the form of transaction. Martin (1996) finds out that tender offers tend to be cash financed, and concludes that one important reason

is that cash deals are faster to consummate than mergers as stock deals must be made in accordance with the Securities Act of 1933. Fishman (1989) proposes that acquirers are more likely to use cash instead of stock to preempt competition when competing bidders exist.

Nonetheless, as shown in the study by Martin (1996), form of transaction does not directly dictate the method of payment. In my data both tender offers and mergers are present in cash deals, but the proportion of tender offers is significantly higher in a subsample of cash deals (30.6%) compared to proportion in the total sample (22.3%). In contrast, the deals in which the method of payment includes stock, tender offer is made in only 8% of transactions. Hence the method of payment and form of transaction are not complete substitutes with each other and both variables need to be controlled in multivariate analysis.

In addition to the form of transaction, many other determinants are shown to affect the choice of method of payment. For instance, Martin (1996) shows that acquiring firms with lower cash balances relative to the price of the acquisition tend to use stock financing, and among others Travlos (1987) reports that using stock to finance a takeover conveys the negative information that the bidding firm is overvalued. Instead of controlling for the various individual variables affecting the method of payment, I only include dummy variables that indicate the realized method of payment. Table VIII shows the statistics for dummy variables for cash and stock that assume value of one if the corresponding consideration is part of the method of payment.

Going forward, given that the options are equity instruments I hypothesize that if the acquirer decides to use own stock instead or in addition to cash, options are more likely to be converted than paid the intrinsic value. Similarly, in its opinion the Delaware Court of Chancery outlines a 'general rule' stating that the value of a derivative instrument is tied to the value of the security into which it is exercisable. [25] Therefore in cash deals the option holders can be paid the intrinsic value of options, whereas in the stock deals option holders expect to have their old options replaced with new options as the underlying stock is replaced with new underlying stock.

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[25] Lillis v. A T & T Corp., 2007 WL 2110587 (Del. Ch., July 20, 2007)

Based on Table VI, cash only deals are prevailing in the Intrinsic value subsample representing 72.9% of the observations, compared to 57.8% in the whole sample. In contrast, only 25.0% of observations in Options converted sample are paid in cash only. The proportions in the subsample are the opposite when examining the share of stock deals. When options are converted, in 34.4% of the cases only stock is used, compared to mere 4.3% when intrinsic value is paid. Combination of cash and stock is used in 35.4% of the observations when options are converted and in 8.6% when intrinsic value is paid.

Table VI

Method of payment in ESO valuation method subsamples

Table shows the method of payment delineated by ESO valuation method used. *Intrinsic value* refers to option valuation method in which option holder essentially receives a value equal to offer price over the strike price of the option. *Options converted* refers to method in which options are converted to new options of acquirer or surviving entity with essentially the same terms and conditions. Observations not classified into these categories are omitted (10 observations). Valuation methods are classified according to information found from the disclosures filed with Securities and Exchange Commission. Sample consists of 306 option valuation observations in mergers and acquisitions during 2008 and 2009 in which target company is listed on either Nasdaq or NYSE. Excluded are repurchases, self tenders, stake purchases, (debt) restructurings, intended transactions, and transactions with undisclosed dollar value, bankrupt target, no target options, option valuation method not disclosed, and observations not classified to either lose or retain the time value of options. All data from SDC Platinum database unless otherwise stated.

	Options converted		Intrinsic value		All observations	
	N	Percent	N	Percent	N	Percent
Cash Only	24	25.0 %	153	72.9 %	177	57.8 %
Stock Only	33	34.4 %	9	4.3 %	42	13.7 %
Cash and Stock	34	35.4 %	30	14.3 %	64	20.9 %
Other	5	5.2 %	18	8.6 %	23	7.5 %
Total	96	100.0 %	210	100.0 %	306	100.0 %

To test the statistical significance of the association between the method of payment and the option valuation method, I construct two dichotomous variables representing whether the method of payment includes cash and stock. Therefore the proportion of cash dummy variable for instance is equal to the share of 'Cash Only' and 'Cash and Stock' observations in Table VI. Results are shown in Table VII. For both cash and stock dummy variables the association with the ESO valuation method is statistically significant with p-value of 0.000.

In sum, based on the univariate evidence the method of payment has a large influence on the option valuation method and losing or retaining the time value of options. Especially in the Intrinsic value subsample the method of payment usually includes cash (87%), but in the Options converted subsample the situation is less straightforward.

Table VII

Univariate evidence of transaction characteristics in ESO valuation method subsamples

Table shows univariate evidence of transaction related valuation method determinants. *Intrinsic value* refers to option valuation method in which option holder essentially receives a value equal to offer price over the strike price of the option. *Options converted* refers to method in which options are converted to new options of acquirer or surviving entity with essentially the same terms and conditions. Observations not classified into these categories are omitted (10 observations). Valuation methods are classified according to information found from the disclosures filed with Securities and Exchange Commission. Dichotomous variables are coded as follows. *Year 2009*, equal to one if transaction announced on 2009; *Stock*, equal to one if stock is used as method of payment; *Cash*, equal to one if cash is used as method of payment; *Tender offer*, equal to one if tender offer is being made; *Completed*, equal to one if transaction is (partially) completed. *Log of Transaction Value* is the logarithm of the total value of consideration offered. Test statistics related to reported p-values; (a) Pearson $\chi 2$ (1df) test for independence of categories, (b) two tailed t-test for difference in means, (c) Mann–Whitney–Wilcoxon test for difference in medians. Sample consists of 306 option valuation observations in mergers and acquisitions during 2008 and 2009 in which target company is listed on either Nasdaq or NYSE. Excluded are repurchases, self tenders, stake purchases, (debt) restructurings, intended transactions, and transactions with undisclosed dollar value, bankrupt target, no target options, option valuation method not disclosed, and observations not classified to either lose or retain the time value of options. All data from SDC Platinum database unless otherwise stated. * denotes significance at the 10% level, ** at the 5% level, and *** at the 1% level.

	All observations	Options converted (Time value retained)	Intrinsic value (Time value lost)	Difference	p-value
N	306	96	210		
Year (dummy)	0.438	0.469	0.424	0.045	0.462[a]
Stock (dummy)	0.346	0.698	0.186	0.512	0.000[a***]
Cash (dummy)	0.788	0.604	0.871	-0.267	0.000[a***]
Tender Offer (dummy)	0.229	0.125	0.276	-0.151	0.003[a***]
Completed (dummy)	0.755	0.729	0.767	-0.038	0.479[a]
Log of Transaction Value					
Mean	2.430	2.711	2.302	0.410	0.001[b***]
Median	2.360	2.675	2.270	0.405	0.001[c***]
Standard deviation	0.879	0.917	0.832		

C. Transaction value

I hypothesize the transaction value to increase the probability of converting options due to several possible reasons. First, the cash needed to pay the intrinsic value of options is likely to be significantly higher in transactions with high transaction value. Although this may not hold in relative terms compared to the transaction value, the higher absolute value of cash needed to compensate for the options can make acquirer to prefer converting options. For instance, Murphy (1999) shows that that the CEO compensation is higher in larger companies, and also the share of options out of the total compensation is higher. Second, in a large transaction the acquirer is can seeking to retain a significant number of target employees. If all options become fully vested and are paid the intrinsic value, a significant amount of new incentive instruments such as options need to be issued in addition to paying the intrinsic value.

Table VII shows that the median transaction value in options converted subsample is $473 million (logarithmic value of 2.675) compared to $186 million (logarithmic value of 2.270) in the intrinsic value subsample. Statistical tests for the differences in mean and median are statistically significant with p-values of 0.001, and hence the univariate evidence supports the hypothesis of larger transactions being related with converting options in transactions.

D. Announcement year and completion status

Transaction completion status and the year of announcement are tested mainly for the control purposes. However, I hypothesize that if the option holders who participate in the merger negotiations, such as the executive team or the board of directors, prefer in general either of the valuation methods over the other, then the valuation method can be associated with transaction completion status.

As shown in Table VII, proportions of dummy variables indicating whether the transaction is announced in 2009 and whether it is completed or not are both roughly equally presented in the options converted and intrinsic value subsamples. In addition, tested associations are also statistically insignificant indicating no association between the valuation methods and transaction completion status or the announcement year.

5.1.2 Acquirer characteristics

A. Acquirer public status

Perhaps one of the most obvious determinants for the option valuation method is whether acquirer is publicly listed or not. Private acquirer is very unlikely to convert options as it does not have a quoted market price for its shares and therefore apparent issues related to valuing options arise. Table VIII shows that the acquirer is publicly listed in 94.8% of the cases in which the options are converted compared to 56.7% when the intrinsic value is paid. The relation between the public status and the valuation method is highly statistically significant with p-value of 0.000 and therefore strongly supports the hypothesis of acquirer being publicly listed affecting the option valuation method.

B. Acquirer nation

I hypothesize two possible explanations why US acquirers are more likely to convert options, and foreign acquirers more likely to pay the intrinsic value and terminate the options. First, non-US companies not converting options could be related to the differences in legislation and rules of exchanges for instance, as the requirements for the option plans can vary. In addition, in non-US countries a shareholder vote can be required to issue new equity awards even in conjunction with a merger or an acquisition. Therefore, it is likely to be more convenient for foreign buyers to simply pay the intrinsic value for options and terminate the plans if possible. Second hypothesized explanation is that as the US companies are ranked highest in the international comparison of granting ESOs (Murphy, 1999), it is more likely with foreign buyers that other types of compensation instruments are in use instead of the options.

Table VIII shows that the proportion of US buyers is higher when the options are converted (94.8%) compared to the cases in which the intrinsic value is paid (87.6%). The association between the acquirer nation and the valuation method is statistically significant with p-value of 0.054. Although in the whole sample there are relatively few cases with foreign buyer, the evidence suggests that US (foreign) acquirers are more (less) likely to convert options than to pay the intrinsic value. Given that the first explanation of different legislation holds, we would anticipate to make similar observations with the data from other countries as well.

Table VIII

Univariate evidence of acquirer and target characteristics in ESO valuation method subsamples

Table shows univariate evidence of acquirer and target related valuation method determinants. *Intrinsic value* refers to option valuation method in which option holder essentially receives a value equal to offer price over the strike price of the option. *Options converted* refers to method in which options are converted to new options of acquirer or surviving entity with essentially the same terms and conditions. Observations not classified into these categories are omitted (10 observations). Valuation methods are classified according to information found from the disclosures filed with Securities and Exchange Commission. Dichotomous variables: *Public Acquirer*, equal to one if acquirer is publicly listed; *US Acquirer*, equal to one if acquirer nation is US. *NYSE*, equal to one if target listed on NYSE. Continuous variables: *Remaining Life* is the option amount weighted average contractual time to expiration, collected from most recent annual or quarterly report filed with the Securities and Exchange Commission prior to the announcement of transaction. *Option moneyness* is defined as max[(offer value - average strike price)/average strike price, 0]. Test statistics related to reported p-values; (a) Pearson $\chi 2$ (1df) test for independence of categories, (b) two tailed t-test for difference in means, (c) Mann–Whitney–Wilcoxon test for difference in medians. Sample consists of 306 option valuation observations in mergers and acquisitions during 2008 and 2009 in which target company is listed on either Nasdaq or NYSE. Excluded are repurchases, self tenders, stake purchases, (debt) restructurings, intended transactions, and transactions with undisclosed dollar value, bankrupt target, no target options, option valuation method not disclosed, and observations not classified to either lose or retain the time value of options. All data from SDC Platinum database unless otherwise stated. * denotes significance at the 10% level, ** at the 5% level, and *** at the 1% level.

	All observations	Options converted (Time value retained)	Intrinsic value (Time value lost)	Difference	p-value
Public Acquirer (dummy)	0.686	0.948	0.567	0.381	0.000[a***]
US Acquirer (dummy)	0.899	0.948	0.876	0.072	0.054[a*]
NYSE (dummy)	0.232	0.375	0.167	0.208	0.000[a***]
N	306	96	210		
Option Remaining Life (N)	296	89	206		
Mean	5.706	5.660	5.726	-0.067	0.764[b]
Median	5.800	5.600	5.800	-0.200	0.651[c]
Standard deviation	1.750	1.832	1.717	0.116	
Option Moneyness (N)	228	76	152		
Mean	0.947	0.803	1.019	-0.216	0.399[b]
Median	0.400	0.300	0.500	-0.200	0.135[c]
Standard deviation	1.823	1.329	2.025	-0.696	
Options Out-of-the-money (dummy)	0.237	0.289	0.211	0.079	0.186[a]
N	228	76	152		

5.1.3 Target characteristics

A. Target Exchange

Frederic W. Cook & Co. (2005) show in their report that NYSE companies have less change-in-control provisions in option plans and agreements compared to Nasdaq companies that should lead to greater latitude in deciding the option valuation method. Although the anticipated effect of having more latitude is somewhat vague, I hypothesize that options of NYSE companies are less often paid intrinsic value compared to Nasdaq companies. Rationale is that as most of the change-in-control provisions, less prevalent among NYSE companies, provide the accelerated vesting, acquirer does not bother to convert options as big portion of those are likely to be exercised immediately. Therefore when the target is listed on NYSE, the acquirer more often has a real alternative to convert options to facilitate the retention of employees, and perhaps spare some cash as well.

Table VIII shows that the exchange of the target and the option valuation method are related and that the association is statistically significant with p-value of 0.000. Proportion of cases in which the target is quoted on NYSE (Nasdaq) is significantly higher (lower) when options are converted than when intrinsic value is paid. Overall, target is listed on NYSE in only 23.2% of the cases and in Nasdaq in 76.8% of the cases, whereas in the options converted sample the corresponding proportions are 37.5% and 62.5%. Therefore the univariate evidence supports the hypothesis of the effect of the exchange, although it can be that being listed on NYSE only acts as a proxy for the higher transaction value (or vice versa) which was shown to be associated with converting options as well.

B. Option moneyness

Other things equal, when option gets more in-the-money, option delta will decrease and the intrinsic value will converge towards the option value. Therefore, the deeper in-the-money the options are, the less value is sacrificed when paying only the intrinsic value compared to converting options. In addition, holders of in-the-money options are likely to prefer receiving intrinsic value over converted options, especially compared to the holders of out-of-the-money options who would receive nothing. Therefore I anticipate the moneyness to be higher in the intrinsic value subsample compared to option converted cases.

I define the variable for the option moneyness as

$$Moneyness = \max\left[\frac{Offer\ value - Strike\ \ price}{Strike\ price}, 0\right] \quad (1)$$

where the offer value refers to the final offer value per common share in monetary terms and the strike price refers to average strike price for options outstanding. Approach loosely follows Carter and Lynch (2001) who calculate a measure for option being out-of-the-money. Moneyness indicates how many fold the intrinsic value is compared to strike price, and therefore in-the-money options assume values greater than zero. As there is no information available for out-of-the-money options, moneyness variable always assumes value of zero if all options are out-of-the-money. All data are retrieved from SDC database, and it is available for only 228 observations. In 174 (76%) cases options are in-the-money, and in 54 (24%) cases all options are out-of-the-money.

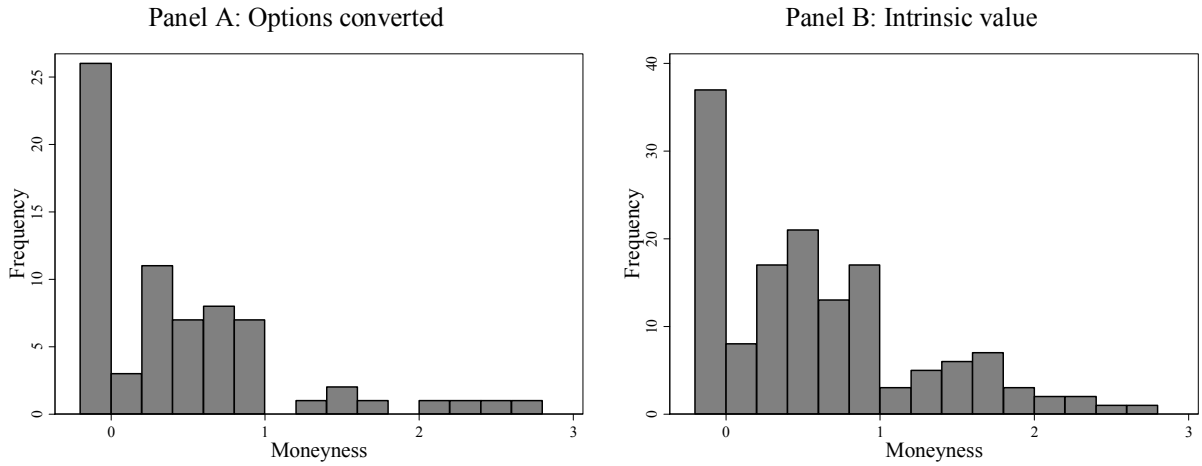

Figure II: Distribution of target option moneyness in valuation method subsamples

Figures show the frequency distributions for target stock options moneyness defined as max[(offer value - average strike price)/average strike price, 0]. Bar to the left from zero shows the portion of out-of-the-money options. Histograms present 143 (Options converted) and 70 (Intrinsic value) observations, 15 extreme values omitted from the graphs. *Intrinsic value* refers to option valuation method in which option holder essentially receives a value equal to offer price over the strike price of the option. *Options converted* refers to method in which options are converted to new options of acquirer or surviving entity with essentially the same terms and conditions. Observations not classified into these categories are omitted (10 observations). Valuation methods are classified according to information found from the disclosures filed with SEC, all other data from SDC Platinum database. Sample consists of option valuation observations in mergers and acquisitions during 2008 and 2009 in which target company is listed on either Nasdaq or NYSE. Excluded are repurchases, self tenders, stake purchases, (debt) restructurings, intended transactions, and transactions with undisclosed dollar value, bankrupt target, no target options, option valuation method not disclosed, and observations not classified to either lose or retain the time value of options.

Table VIII shows that the mean and median moneyness values are higher in the intrinsic value subsample, but the p-values of the test statistics are not statistically significant. Looking at the histograms in Figure II, it is evident that the moneyness variable is heavily skewed to the left and it is hence far from being normally distributed. Therefore the non-parametric Mann–Whitney–Wilcoxon test with p-value of 0.135, yet still considered to be statistically insignificant, is more appropriate compared to the t-test that results to considerably higher p-value of 0.399. In addition, I further test the effect of the option moneyness by investigating the proportions of the out-of-the-money options in the subsamples. When options are converted, approximately 29% of options are out-of-the-money, and when the intrinsic value is paid the corresponding value is 21%. However, the association is not statistically significant (p-value of 0.186) and therefore the univariate evidence offers little support for the hypothesis of target option moneyness affecting the option valuation method.

C. Remaining life of options

I hypothesize that if the remaining life of outstanding options is high, more time value would be lost if only intrinsic value had been paid and therefore options would be converted to retain the time value. This would specifically apply if acquirer wants to retain the incentive effect of options to keep option holders working for the company. In addition, executives of target company may respond to the proposed deal more favorably if their newly issued options with long maturity are converted rather than terminated. As the variable describes the weighted average remaining life of all options outstanding for a particular company, there is likely to be less extreme observations than there would be if investigating the same measure for individual option plans or option holdings by individuals.

Student's t-test test for mean is conducted to compare differences in the remaining life in intrinsic value and option conversion samples. Surprisingly, Table VIII shows that on average the maturities are longer when intrinsic value is paid compared to cases in which options are converted. However, differences in mean and median are statistically insignificant with p-value of 0.764 and 0.651 respectively.

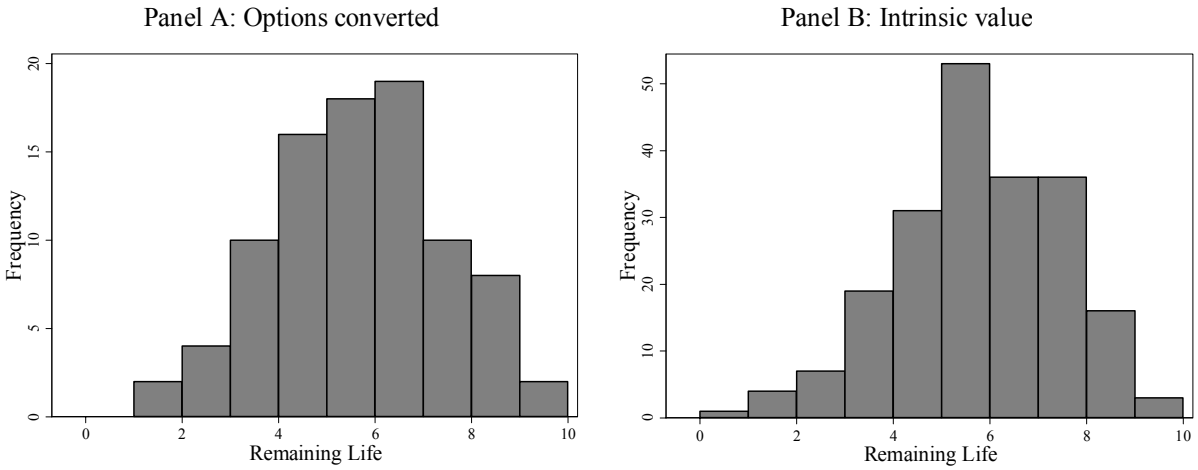

Figure III: Distribution of remaining life of target options in valuation method subsamples

Figures show the frequency distributions for remaining life of target stock options collected from SEC filings. *Remaining Life* is the option amount weighted average contractual time to expiration and *Expected Life* is the estimate used in option fair value calculations for the most recent period prior the transaction announcement. Histograms present 206 (Options converted) and 89 (Intrinsic value) observations. Excluded are rumored deals, stake purchases, repurchases, debt restructuring and bankruptcy cases, and transactions in which target does not have options or option valuation method is not disclosed. *Intrinsic value* refers to option valuation method in which option holder essentially receives a value equal to offer price over the strike price of the option. *Options converted* refers to method in which options are converted to new options of acquirer or surviving entity with essentially the same terms and conditions. Observations not classified into these categories are omitted (10 observations). Valuation methods are classified according to information found from the disclosures filed with SEC, all other data from SDC Platinum database. Sample consists of option valuation observations in mergers and acquisitions during 2008 and 2009 in which target company is listed on either Nasdaq or NYSE. Excluded are repurchases, self tenders, stake purchases, (debt) restructurings, intended transactions, and transactions with undisclosed dollar value, bankrupt target, no target options, option valuation method not disclosed, and observations not classified to either lose or retain the time value of options.

5.2 Logistic regression of valuation determinants

The results from the univariate analysis are further tested in a multivariate analysis conducted by estimating logistic regression models. First, logistic models in general are briefly discussed, followed by the model specifications used in this study. Second, the results of the regressions are presented, interpreted, and discussed.

5.2.1 Model specification

Logistic regressions are used to investigate determinants of ESOs losing time value in mergers and acquisitions. The same sample of option valuation method observations is used as previously in the univariate analysis. The sample includes all observations in which options are classified to either lose or retain the time value.

Logistic regression (often referred to as Logit regression) is used when the dependent variable is dichotomous. In logistic regression, data is fitted to a logistic curve and the best fit is found by using iterative maximum likelihood estimation. Logistic models are commonly used in finance domain to analyze certain events or survey results, such as Brenner et al. (2000), and Carter and Lynch (2001) who use logistic regression to investigate determinants of ESO reprising events.

Logistic model is of form

$$\log\left(\frac{p}{1-p}\right) = \alpha + \beta_1 X_1 + \ldots + \beta_k X_k \qquad (2)$$

where p is the probability that the dependent variable Y=1 and X_1, …, X_k are the independent variables. β_1, …, β_k are the regression coefficients that are estimated from the data.

Table IX

Description of logistic regression variables

Table presents variables used in different logistic regression specifications. Panel A describes dependent variable whereas Panel B presents independent variables. All data from SDC Platinum database unless otherwise stated.

Panel A: Dependent variable		
Time Value Retained	=	Dependent variable is a dummy that is equal one if options retain time value in transaction, zero if time value is lost. Information is collected from the SEC filings.
Panel B: Independent variables		
Year	=	Dummy control variable that is equal to one if transaction is announced in 2009 and zero if transaction is announced in 2008.
NYSE	=	Dummy variable that is equal to one if target is listed on New York Stock Exchange and zero if company is Nasdaq listed.
Stock	=	Dummy variable equal to one if method of payment involves stock.
Cash	=	Dummy variable equal to one if method of payment involves cash.
Tender Offer	=	Dummy variable equal to one if tender offer is being made.
Log Value	=	Logarithm of transaction value in millions of US dollars.
Public Acquirer	=	Dummy variable equal to one if acquirer is publicly listed.
US Acquirer	=	Dummy variable equal to one if acquirer's nation is US.
Remaining Life	=	Weighted average remaining life of options outstanding in years. Information is collected from the SEC 10-K and 10-Q filings disclosed prior the transaction.
Completed	=	Dummy variable equal to one if transaction is completed or partially completed.
Moneyness	=	Variable indicates the average relative moneyness of outstanding options, calculated as max[(offer value – strike price) / strike price, 0].

Table IX describes both the independent and dependent variables included in the alternative model specifications. Same dummy dependent variable, indicating whether the time value is retained, is used in all model specifications. This dummy variable assumes value of one if options retain time value in transaction, and zero otherwise. To recap, time value retained dummy is equal to one if options are converted to new options of acquirer or surviving entity, and equal to zero if option holders receive only the intrinsic value for their options. Independent variables and the rationale for their inclusion are discussed in the previous section.

Variable correlations are presented in Table X for all independent variables as well as the dependent variable. Looking at the dependent variable, a statistically significant correlation is reported with all the variables that were deemed to be associated with the valuation method in the univariate analysis. Conducting a tender offer and using cash as a method of payment are negatively correlated with retaining the time value, whereas a positive and statistically significant correlation is shown for using stock, acquirer being public or from the US, target being listed on NYSE, and the log of transaction value.

In addition, many other variables have relatively high and statistically significant correlations, indicating possible problems with multicollinearity. Although multicollinearity does not weaken the explanatory power of the model as a whole, it can lead to inflated standard errors with individual independent variables. This is taken into account by examining various model specifications especially with highly correlated variables, and investigating the set of independent variables that yields the best results.

Table X

Variable correlations

Table presents correlation matrix for all investigated variables. Ten observations not classified to either lose or retain the time value of options in transaction are omitted. Number of observations is 306 for all variables except *Remaining Life* (n=295) and *Moneyness* (n=228). *Time Value Retained* dummy is equal to one if option valuation method retains the time value of option; *Year* dummy is equal to one if transaction announced in 2009 and zero if in 2008; *NYSE* dummy is equal to one if target is listed on NYSE, zero if on Nasdaq; *Stock* dummy is equal to one if stock is used as method of payment; *Cash* dummy is equal to one if cash is used as method of payment; *Tender Offer* dummy is equal to one if tender offer is being made; *Log Value* is log of transaction value; *Public Acquirer* dummy is equal to one if acquirer is public; *US Acquirer* dummy is equal to one if acquirer nation is US; *Remaining Life* is weighted average of remaining life of target options outstanding; *Completed* dummy is equal to one if transaction is (partially) completed; *Moneyness* is a measure of option moneyness defined as max[(offer value - strike price)/strike price, 0]. Sample consists of 306 option valuation observations in mergers and acquisitions during 2008 and 2009 in which target company is listed on either Nasdaq or NYSE. Excluded are repurchases, self tenders, stake purchases, (debt) restructurings, intended transactions, and transactions with undisclosed dollar value, bankrupt target, no target options, option valuation method not disclosed, and observations not classified to either lose or retain the time value of options. * denotes significance at the 10% level, ** at the 5% level, and *** at the 1% level.

	Time Value Retained	Tender Offer	Stock	Cash	Log Value	Year	Completed	Public Acquirer	US Acquirer	NYSE	Moneyness	Remaining Life
Time Value Retained	1											
Tender Offer	-0.17***	1										
Stock	0.50***	-0.23***	1									
Cash	-0.30***	0.17***	-0.31***	1								
Log Value	0.22***	0.08	0.14***	0.13**	1							
Year	0.04	0.01	0.13**	-0.03	-0.07	1						
Completed	-0.04	0.21***	0.01	0.03	0.00	-0.21***	1					
Public Acquirer	0.38***	0.07	0.48***	-0.19***	0.28***	0.01	0.09*	1				
US Acquirer	0.11*	-0.01	0.09*	-0.08	-0.18***	0.08	-0.07	-0.13**	1			
NYSE	0.23***	-0.12**	0.25***	-0.10**	0.55***	-0.02	-0.07	0.15***	-0.07	1		
Moneyness	-0.06	0.16***	0.05	0.12**	0.12**	0.08	-0.10*	0.12**	-0.03	0.01	1	
Remaining Life	-0.02	0.07	-0.07	-0.12**	-0.07	-0.11*	0.16***	0.08	-0.08	-0.12**	0.03	1

5.2.2 Stepwise regression

I start specifying the model using a stepwise regression with backward elimination approach. In backward elimination, all candidate explanatory variables are initially included in the model and then the statistical significance of each variable is tested. The variables deemed as not statistically significant are deleted. Equation for the initial model is

$$\begin{aligned} Time\ Value\ Retained_i = \\ & \alpha_i + \beta_1 Year_i + \beta_2 NYSE_i + \beta_3 Stock_i + \beta_4 Cash_i \\ & + \beta_5 Tender\ Offer_i + \beta_6 Log\ Value_i + \beta_7 Public\ Acquirer_i \\ & + \beta_8 US\ Acquirer_i + \beta_9 Remaining\ Life_i \\ & + \beta_{10} Completed_i + \varepsilon_i \end{aligned} \tag{3}$$

As a decision rule in backward elimination approach, variable with the highest test statistic value is removed from the model and the regression is run again. Procedure is finished when no more variables can be removed based on the decision rule (see for instance Christensen, 1997). According to Hosmer and Lemeshow (2000), traditional approach to statistical model building involves seeking the most parsimonious model that still explains the data. By minimizing the number of variables in the model, it is more likely to be numerically stable and be more easily generalized. In addition, estimated standard errors become lower and the model is less dependent on the observed data set.

To test the statistical significance in backward elimination procedure, I use significance level of 0.2 and utilize both Wald Chi-Square Test and Likelihood Ratio Test statistics. Both tests yield the identical results in terms of final model as well as the order in which the variables are deleted from the initial model. Table XI presents the steps in backward elimination and test statistics for the variables included, as well as the goodness of fit measures for the model as a whole.

Table XI

Stepwise logistic regression of ESOs retaining time value in M&A

Table presents the results of logistic regressions of ESOs losing time value in mergers and acquisitions on various target, acquirer, and transaction variables. P-values are reported in parentheses. Model specifications based on the stepwise backward elimination approach using criteria based on Wald test and p-value of 0.2. Model on the left most column includes all identified independent variables. Dependent variable *Time Value Retained* is a dummy that obtains value of one if options are categorized to retain time value in transaction and zero otherwise. Each column presents results for different model specification including the independent variables that have value in that column. *Year* dummy is equal to one if transaction announced in 2009 and zero if in 2008; *NYSE* dummy is equal to one if target is listed on NYSE, zero if on Nasdaq; *Stock* dummy is equal to one if stock is used as method of payment; *Cash* dummy is equal to one if cash is used as method of payment; *Tender Offer* dummy is equal to one if tender offer is being made; *Log Value* is log of transaction value; *Public Acquirer* dummy is equal to one if acquirer is public; *US Acquirer* dummy is equal to one if acquirer nation is US; *Remaining Life* is weighted average of remaining life of target options outstanding; *Completed* dummy is equal to one if transaction is (partially) completed. Sample consists of 306 option valuation observations in mergers and acquisitions during 2008 and 2009 in which target company is listed on either Nasdaq or NYSE. Excluded are repurchases, self tenders, stake purchases, (debt) restructurings, intended transactions, and transactions with undisclosed dollar value, bankrupt target, no target options, option valuation method not disclosed, and observations not classified to either lose or retain the time value of options. * denotes significance at the 10% level, ** at the 5% level, and *** at the 1% level.

Independent Variable = Time Value Retained (dummy equal to one if options converted and time value retained)						
Intercept	-4.67***	-4.69***	-5.13***	-5.28***	-5.23***	-5.27***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Stock	1.55***	1.44***	1.45***	1.51***	1.52***	1.47***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Cash	-1.04***	-0.99***	-0.96***	-1.01***	-1.01***	-1.12***
	(0.004)	(0.007)	(0.009)	(0.008)	(0.008)	(0.005)
Log Value	0.61***	0.61***	0.63***	0.73***	0.73***	0.80***
	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)	(0.002)
Public Acquirer	1.60***	1.68***	1.71***	1.68***	1.69***	1.86***
	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)
US Acquirer	1.30**	1.33**	1.44**	1.44**	1.44**	1.38**
	(0.024)	(0.021)	(0.015)	(0.014)	(0.014)	(0.019)
Tender Offer		-0.34	-0.48	-0.5	-0.49	-0.44
		(0.415)	(0.279)	(0.255)	(0.270)	(0.328)
Completed			0.40	0.40	0.37	0.34
			(0.279)	(0.270)	(0.343)	(0.393)
NYSE				-0.29	-0.29	-0.51
				(0.537)	(0.531)	(0.310)
Year					-0.07	-0.10
					(0.828)	(0.761)
Remaining Life						-0.03
						(0.777)
Observations	306	306	306	306	306	295
Log likelihood	-134.01	-133.67	-133.08	-132.89	-132.86	-126.66
Likelihood-ratio χ^2	112.67***	113.35***	114.54***	114.92***	114.97***	107.94***
McFadden's adj. R^2	0.264	0.261	0.259	0.255	0.249	0.238
BIC	-84.055	-79.005	-74.471	-69.131	-63.455	-51.070
AIC	0.915	0.919	0.922	0.927	0.934	0.933

In Table XI, the initial model with all the independent variables is presented in the right-most column and the resulting model defined using the backward elimination approach is model in the left-most column. For each variable in each alternative model specification, value for logistic regression coefficients and two-tail p-value for z-test are reported. In addition, for each model number of observations, log likelihood, likelihood-ratio chi-square test, McFadden's adjusted R^2, Akaike information criterion (AIC) and Bayesian information criterion (BIC) are reported.

Likelihood-ratio χ^2 is statistically significant in all specifications meaning that at least one of the independent variables is not equal to zero. AIC, BIC and McFadden's adjusted R^2 are all common goodness of fit measures used with logistic regressions that attempt to find a model that best fits the data with minimum number of free variables. Looking at the McFadden's adjusted R^2 of different model specifications, one should notice that the value increases in each step of the model building process. Measure takes into account the likelihood of the model compared to likelihood of constant only model, and adjusts the value based on number of independent variables. Despite its name, one should note that in logistic regressions no R^2 measures similar to ordinary least squares (OLS) regression can be calculated, and hence the values are not comparable. AIC and BIC are often used in comparison of alternative model specifications, and here they also support the selection of model with least independent variables. With AIC and BIC, lower value is interpreted as better fit.

Interestingly, five variables that are present in the resulting model after stepwise procedure, namely dummy variables Stock, Cash, Log Value, Public Acquirer, and US Acquirer, are statistically significant in all investigated combinations of the model. Public Acquirer, dummy for acquirer nation being US, is statistically significant at 0.05 level, while others are statistically significant at either 0.01 or 0.001 level. None of the other variables show any statistical significance in any of the model specifications.

First variable to be eliminated from the initial model is Remaining Life that measures the weighted average remaining life of target company's options outstanding. It was anticipated that if the remaining life of options is high, more time value would be lost and hence options would be converted in transaction to retain the time value. However, it might be that option moneyness that is tested in the following analyses has a larger effect than remaining life in explaining valuation method and implications to time value. Also, it is possible that a measure

of remaining life of options of CEO or board of directors only should be used, as these option holders are likely to have influence over the terms of the transaction.

Second variable to be eliminated is Year dummy that is equal to one if transaction is announced in year 2009 and zero if in 2008. This control variable was included to capture any possible year effects, especially as the observation period is only two years. Based on the results we cannot conclude that the announcement year would have any effect on options retaining or losing time value.

Third variable to be eliminated is NYSE dummy that is equal to one if company is listed on NYSE and zero if on Nasdaq. I hypothesized the options of NYSE companies to be more frequently converted than Nasdaq companies, since in Nasdaq change-in-control provisions are more prevalent and usually force accelerated vesting of all options. Therefore acquirer may not have an incentive to convert options as large portion could be converted immediately. However, in this model specification NYSE dummy variable is highly insignificant and is eliminated from the model. Therefore the statistically significant association found in the univariate analysis is likely to results from NYSE dummy acting as a proxy for larger companies and higher transaction value, as the transaction value is present in the presenting regression model as well.

Fourth variable to be eliminated a dummy variable indicating whether the transaction is completed or not. Not surprisingly this variable proves to be statistically insignificant and is eliminated from the model.

Finally, dummy variable for making a tender offer is the sixth variable to be eliminated from the model. Making a tender offer is shown to be closely related with method payment as discussed in the previous section, as well as associated with option valuation method based on the univariate evidence. However, based on the regression model, dummy variable for tender offer is statistically insignificant while the variables for the method of payment are highly statistically significant. To verify the outcome, I run additional regressions with Tender Offer dummy included while omitting Stock, Cash, and finally both Stock and Cash dummy

variables. None of the specifications yield better goodness of fit of the model, and also none of the specifications result in Tender Offer turning to be statistically significant.[26]

Statistical significance of variables can be affected by the order in which the variables are eliminated, and hence I further test the robustness of the model specification by adding each of the removed variables to the model one by one. Also, while adding NYSE variable to the model I test removing Log Value variable as these are highly positively correlated with each others. None of these procedures result to making any of the removed variables statistically significant at 0.05 level or increase the goodness of fit of the model measured with AIC or McFadden's adjusted R^2. Also, using stepwise forward procedure instead of backward elimination yields the exact final model.[27] Results for the additional model specifications are shown in Appendix B. Finally, resulting model specification and statistical significances of variables remain intact if Huber-White robust standard errors are used or industry dummies based on NAICS classification are included.[28]

5.2.3 Effect of option moneyness

Final step in model the building is to test the effect of option moneyness by including a variable measuring the option moneyness to the model. As noted earlier, data set used in this study does not have information for option moneyness for all transactions and values are given only for in-the-money options. Therefore effect of moneyness is investigated separately, as the significant decrease in the sample size can disturb the analysis.

As shown in Table IX, moneyness is calculated as the difference between offer value and average strike price, divided by the average strike price. If options are out-of-the-money and calculations yield a negative value, variable assumes values of zero. Inclusion of moneyness variable reduces number of observations in regression sample from 306 to 228. To alleviate

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[26] Results not reported here, available on request.

[27] Stepwise regression using forward procedure starts with the constant only model and adds a variable to the model that would have the highest p-value. Iterative procedure is continued until none of the variables to be added would have a p-value over a certain limit, here 0.20.

[28] Results not presented here, available on request.

the possible biases emerging from the use of different samples, the results for the specifications with and without moneyness variable are estimated using the same sample for which the option moneyness information is available.

Table XII

ESO time value retention in M&A for subsample with data on option moneyness

Table presents the results of logistic regressions of ESOs losing time value in mergers and acquisitions with and without *Moneyness* that measures the option moneyness as max[(offer value - strike price)/strike price, 0]. Dependent variable *Time Value Retained* is a dummy that obtains value of one if options are categorized to retain time value in transaction and zero otherwise. Each column presents results for different model specification including the independent variables that have value in that column. *Stock* dummy is equal to one if stock is used as method of payment; *Cash* dummy is equal to one if cash is used as method of payment; *Log Value* is log of transaction value; *Public Acquirer* dummy is equal to one if acquirer is public; *US Acquirer* dummy is equal to one if acquirer nation is US; *Completed* dummy is equal to one if transaction is (partially) completed. Sample consists of option valuation observations in mergers and acquisitions during 2008 and 2009 in which target company is listed on either Nasdaq or NYSE. Excluded are repurchases, self tenders, stake purchases, (debt) restructurings, intended transactions, and transactions with undisclosed dollar value, bankrupt target, no target options, option valuation method not disclosed, and observations not classified to either lose or retain the time value of options. * denotes significance at the 10% level, ** at the 5% level, and *** at the 1% level.

	With Moneyness			Without Moneyness		
	Coef.	Std. Err.	p-value	Coef.	Std. Err.	p-value
Intercept	-5.491	1.247	0.000***	-5.420	1.239	0.000***
Stock	1.354	0.369	0.000***	1.342	0.367	0.000***
Cash	-0.755	0.441	0.087*	-0.830	0.433	0.055*
Log Value	0.465	0.220	0.035**	0.448	0.219	0.041**
Public Acquirer	2.063	0.652	0.002***	2.029	0.651	0.002***
US Acquirer	2.155	0.809	0.008***	2.130	0.805	0.008***
Moneyness	-0.094	0.095	0.324			
Observations			228			228
Log likelihood			-101.720			-102.250
Likelihood-ratio $\chi 2$			86.81***			85.75***
McFadden's adjusted R^2			0.251			0.254
BIC			-54.235			-58.603
AIC			0.954			0.950

Regression results are presented in Table XII. Model without the moneyness is the exact specification that was deemed to be the best model based on stepwise regression presented in Table XI. Model with moneyness is the same model except that it includes moneyness variable. For both models the sample only consists of observations with option moneyness information available.

Starting with the goodness of fit measures, model with moneyness variables is slightly worse based on any measure that considers the number of free parameters. One should also note that goodness of fit of the model without the moneyness variables significantly deteriorates compared to the regression with full sample, as BIC value for instance increases from -84.1 to -58.6. Moneyness variable itself is far from any conventional statistical significance level with p-value of 0.324. Instead of using moneyness variable, I also test including a dummy variable that assumes value of one if options are out-of-the-money. This does not result to better fit of the model or improved information criteria scores, and also the dummy variable itself is insignificant.

In sum, based on this investigation I find no support for including a variable for target option moneyness to the regression model as it does not increase the goodness of fit and the effect of the variable itself is statistically insignificant.

5.2.4 Logistic regression results

This section reports and interprets the results of the model defined with stepwise regression using backward elimination approach. As noted in the previous section, model specification is robust to inclusion of any of the removed variables and also to replacing any included variable with highly correlated eliminated variable. Equation for the resulting model is

$$\begin{aligned} Time\ Value\ Retained_i = \\ \alpha_i + \beta_1 Stock_i + \beta_2 Cash_i + \beta_3 Value_i \\ + \beta_4 Public\ Acquirer_i + \beta_5 US\ Acquirer_i + \varepsilon_i \end{aligned} \tag{4}$$

Table XIII reports the regression results. When interpreting the results, one should keep in mind that retaining time value of options is equivalent to the valuation method of converting options to the options of the acquirer or the surviving corporation. In contrast, losing time value is equal to the method of only paying the intrinsic value to the option holders, meaning the offer value over the strike price of option.

Table XIII

Determinants of ESOs retaining time value in M&A

Table presents the results of logistic regressions of ESOs losing time value in mergers and acquisitions. Dependent variable *Time Value Retained* is a dummy that obtains value of one if options are categorized to retain time value in transaction and zero otherwise. Each column presents results for different model specification including the independent variables that have value in that column. *Stock* dummy is equal to one if stock is used as method of payment; *Cash* dummy is equal to one if cash is used as method of payment; *Log Value* is log of transaction value; *Public Acquirer* dummy is equal to one if acquirer is public; *US Acquirer* dummy is equal to one if acquirer nation is US; *Completed* dummy is equal to one if transaction is (partially) completed. Sample consists of 306 option valuation observations in mergers and acquisitions during 2008 and 2009 in which target company is listed on either Nasdaq or NYSE. Excluded are repurchases, self tenders, stake purchases, (debt) restructurings, intended transactions, and transactions with undisclosed dollar value, bankrupt target, no target options, option valuation method not disclosed, and observations not classified to either lose or retain the time value of options. * denotes significance at the 10% level, ** at the 5% level, and *** at the 1% level.

	Coef.	p-value	Odds Ratio	Std. Err. of Odds Ratio	95% Conf. Interval for Odds Ratio	
Intercept	-4.67	0.000***				
Stock	1.55	0.000***	4.73	1.53	2.51	8.90
Cash	-1.04	0.004***	0.35	0.13	0.17	0.72
Log Value	0.61	0.001***	1.84	0.34	1.28	2.65
Public Acquirer	1.60	0.002***	4.96	2.58	1.79	13.76
US Acquirer	1.30	0.024**	3.66	2.11	1.18	11.30
Observations		306				
Log likelihood		-134.01				
Likelihood-ratio $\chi 2$		112.67***				
McFadden's adjusted R^2		0.26				
BIC		-84.06				
AIC		0.92				

Interpretation of coefficients in logistic model differs from interpretation in OLS regression. Coefficients indicate the amount of change expected in the log odds when there is a one unit change in the independent while keeping all of the other variables constant. Based on the coefficients, we can calculate a measure called odds ratio that is equal to the base of natural logarithm *e* to the exponent equal to the regression coefficient. Interpretation of odds ratio (see for instance Gould, 2000) is that if the odds ratio is equal to 1.5, then the odds of the event are 50% greater when value of variable increases by one unit than without the increase. Correspondingly, if the odds ratio is equal to 0.5, then every unit increase halves the odds of the event compared to no change in that variable. Finally, if odds ratio is equal to one we deem independent variable to have no effect on the value of dependent variable, as the natural logarithm of one is equal to zero. With dummy variables interpretation is identical. However, in a study like this we are more interested in the direction, magnitude, and statistical significance of coefficients than their exact values.

Effect of method of payment is captured with dummy variables for using stock and cash. Table XIII shows that using stock (value of stock dummy is equal to one) significantly increases the probability of options retaining the time value. Stock variable is statistically significant at 0.001 level. Based on the estimated model, value of the coefficient of stock is the second highest out of the variables in the model indicating a large contribution to the choice of option valuation method and retaining the time value. Using cash instead (value of cash dummy is equal to one) seems to significantly reduce the probability of retaining the time value. In other words, using intrinsic value method and therefore losing time value are associated with using cash in transactions. Cash is also statistically significant at 0.01 level. In addition, when both stock and cash are involved the probability of retaining time value increases as the sum of the coefficients is positive. In previous sections, the relation between making a tender offer and option valuation method were found to be statistically significant and also highly correlated with method of payment variables. However, the results of regression analysis support the view that the method of payment is the true determinant of the valuation method, and making a tender offer simply acts as a proxy for using cash.

The results also show that when transaction value increases the options are more likely to be converted and retain the time value as anticipate. Log Value refers to logarithm of transaction value and the effect of variable is highly statistically significant with p-value of 0.001. Perhaps the most prominent explanation is that the highly valued and large companies are more likely to have significant amounts of options in use, and therefore paying the intrinsic value of options requires large amounts of cash. Also, paying intrinsic value and terminating the options could further warrant for the issuance of new incentive instruments even further increasing the cost to the acquiring company.

Finally, acquirer characteristics related dummy variables for acquirer being public and from the US are found to be highly statistically significant with p-values of 0.002 and 0.024 respectively. Quite obviously, publicly listed acquirers are significantly more likely to convert options and consequently retain the time value of options. This naturally follows from the fact that private companies are very unlikely convert options due to evident problems of defining option values for instance. However, more interestingly we can see that acquirer nation being US is also positively related to retaining the time value of options. Again, the direction of the

effect is as predicted, since I hypothesized the non-US companies who are to convert options of the target to face various difficulties related to legislation and accounting for instance.

Table XIV

ESO time value retention in M&A for method of payment subsamples

Table presents the results of logistic regressions of ESOs losing time value in mergers and acquisitions on various target, acquirer, and transaction variables, for different subsamples based on the method of payment. *Cash* (*Stock*) subsample refers to observations in which method of payment includes cash (stock). *Cash only and Stock only* subsample essentially excludes the observations in which both cash and stock are used, or neither cash nor stock is used. P-values are reported in parentheses. Dependent variable *Time Value Retained* is a dummy that obtains value of one if options are categorized to retain time value in transaction and zero otherwise. Each column presents results for different model specification including the independent variables that have value in that column. *Stock* dummy is equal to one if stock is used as method of payment; *Cash* dummy is equal to one if cash is used as method of payment; *Log Value* is log of transaction value; *Public Acquirer* dummy is equal to one if acquirer is public; *US Acquirer* dummy is equal to one if acquirer nation is US. Sample consists of 306 option valuation observations in mergers and acquisitions during 2008 and 2009 in which target company is listed on either Nasdaq or NYSE. Excluded are repurchases, self tenders, stake purchases, (debt) restructurings, intended transactions, and transactions with undisclosed dollar value, bankrupt target, no target options, option valuation method not disclosed, and observations not classified to either lose or retain the time value of options. * denotes significance at the 10% level, ** at the 5% level, and *** at the 1% level.

	Method of payment subsamples				
	All	Cash only and Stock only	Cash only	Cash	Stock
Intercept	-4.67***	-5.29***	-5.62***	-5.65***	-0.69
	(0.000)	(0.000)	(0.000)	(0.000)	(0.515)
Stock	1.55***	2.58***		1.27***	
	(0.000)	(0.000)		(0.001)	
Cash	-1.04***				-1.37***
	(0.004)				(0.005)
Log Value	0.61***	0.35	0.29	0.51**	0.60**
	(0.001)	(0.168)	(0.348)	(0.016)	(0.015)
Public Acquirer	1.60***	1.85***	1.90***	1.86***	
	(0.002)	(0.002)	(0.001)	(0.001)	
US Acquirer	1.30**	1.50**	1.97*	1.40**	0.69
	(0.024)	(0.037)	(0.062)	(0.039)	(0.407)
Observations	306	219	177	241	104
Log likelihood	-134.01	-82.00	-60.51	-101.64	-61.19
Likelihood-ratio $\chi 2$	112.67***	87.12***	19.47***	62.71***	13.02***
McFadden's adj. R^2	0.264	0.307	0.082	0.191	0.008
BIC	-84.055	-65.563	-3.943	-40.771	0.915
AIC	0.915	0.795	0.729	0.893	1.292

To further investigate the effect of the method of payment I estimate the regression model for the various subsamples based on the method of payment. In Table XIV, the subsample including the observations in which method of payment is only cash or only stock essentially excludes the observations paid with combination of cash and stock. Naturally in this model

specification, either of the method of payment dummy variables needs to be omitted due to perfect multicollinearity. Here I omit the cash variable, although the choice does not affect the interpretation of the results. Interestingly, variable for the transaction value turns out to be insignificant while the other variables remain highly statistically significant. Same applies to the results for the subsample of cash only deals. The findings imply that the transaction value has the largest effect in the cross-section where both cash and stock are used, and therefore when investigating the samples with mixed method of payment being excluded produces insignificant effect for the transaction value variable. The interpretation is further supported by the statistically significant effect of the transaction value in a subsample where method of payment includes cash, and also in a subsample where method of payment includes stock, since these subsamples also include the cases in which both stock and cash are used.

Table XV

Classification of ESOs retaining the time value based on the estimated model

Table presents the classification measures for the sample based on the estimated model of $log(p/1-p)= -4.67 + 1.55 * Stock_i - 1.04 * Cash_i + 0.61 * Log\ Value_i + 1.60 * Public\ Acquirer_i + 1.30 * US\ Acquirer_i + \varepsilon_i$, where p refers to probability of options retaining the time value in transaction. Observation classified as true if the probability is greater or equal to 0.5. Dependent variable Time Value Retained is a dummy that obtains value of one if options are categorized to retain time value in transaction and zero otherwise. Stock dummy is equal to one if stock is used as method of payment; Cash dummy is equal to one if cash is used as method of payment; Log Value is log of transaction value; Public Acquirer dummy is equal to one if acquirer is public; US Acquirer dummy is equal to one if acquirer nation is US; Completed dummy is equal to one if transaction is (partially) completed. Sample consists of 306 option valuation observations in mergers and acquisitions during 2008 and 2009 in which target company is listed on either Nasdaq or NYSE. Excluded are repurchases, self tenders, stake purchases, (debt) restructurings, intended transactions, and transactions with undisclosed dollar value, bankrupt target, no target options, option valuation method not disclosed, and observations not classified to either lose or retain the time value of options.

Panel A: Classification table

	Actual		
Predicted	Y=1	Y=0	Total
$\hat{Y}$=1	55	26	81
$\hat{Y}$=0	41	184	225
Total	96	210	306

Panel B: Classification measures

Sensitivity	Pr($\hat{Y}$=1|Y=1)	57.29 %
Specificity	Pr($\hat{Y}$=0|Y=0)	87.62 %
Positive predictive value	Pr(Y=1|$\hat{Y}$=1)	67.90 %
Negative predictive value	Pr(Y=0|$\hat{Y}$=0)	81.78 %
Correctly classified		78.10 %

In addition to examining individual independent variables, predictive power of the model is studied. Table XV presents classification table and measures based on the actual and predicted values. One should keep in mind that the model estimation is based on only limited sample of observations, and also that testing a model with the same sample that was used in model estimation is likely to cause positive bias.

Using the estimated model to predict outcomes (Y equals to one if time value retained, equal to zero if time value lost) 78.10% of cases are correctly classified. The intrinsic value cases losing the time value are predicted correctly with significantly higher probability (around 88%) than option conversion cases where the time value is retained (around 57%). However, when looking at the proportion of cases in which it is predicted that time value is retained, in 68% of cases this actually is the case.

In sum, somewhat surprisingly I am able to find strong support for certain other characteristics than the method of payment affecting whether options lose or retain time value in mergers and acquisitions. Method of payment is highly related as options are significantly more likely to retain time value if acquirer uses stock in transaction. When a combination of stock and cash is used it also increases the probability of options being converted although the effect is less significant compared to stock only transactions. Consequently use of cash is negatively related to retaining time value as options tend to be paid intrinsic value in cash deals. In addition, options are more likely to be converted and hence retain the time value in large transactions. Finally, publicly listed and US acquirers are more likely to convert options and not sacrifice the time value of options.

6. Discussion of valuation implications

This chapter discusses the implications of the findings in the previous chapters on ESO valuation. Despite the fact that certain target, acquirer, and transaction characteristics increase the probability of retaining the time value of options in mergers and acquisitions, it does not change the fact that in almost 70% of observations options are only paid the intrinsic value. First, I will discuss the use and determinants of option valuation methods found in this study, and compare the findings to the results in the previous literature. Second, I show how the findings of this study can affect the value of ESOs in different situations, and consider how the acquisition premiums can affect the outcome. Third, I discuss what could be the preferred valuation method by the different related parties, meaning the ESO holders and the owners of the target as well as the acquirer.

6.1 Use and determinants of valuation methods

The results of this study clarify the previously ambiguous topic of how employee stock options are valued in mergers and acquisitions. Especially, it is shown that varying methods to value ESOs exists, and therefore it is not enough to simply consider the changes in the vesting status of option when merger or acquisition occurs as suggested by Maller et al. (2002). Also, the reduced form model of Szimayer (2004) does not seem to fit well with the empirical observations of this study as it omits the possibility of options being converted. In addition, the modeled fixed cash payments that depend on the vesting status do not echo the findings of this study. The assumption of ESOs simply vesting when a takeover takes place seems to be applied in some studies regarding the executive compensation in general, such as in Hartzell et al. (2004) who study the compensation of target CEO, and assume that all options of the CEO are paid the intrinsic value. Therefore, I believe the compensation literature in general will benefit from the increased understanding of ESOs in corporate transactions.

I find the results of the study to be somewhat different from Ferenczy (2008) who suggests the form of transaction, meaning whether a tender offer is made or not, to affect whether the options holders receive the intrinsic value or new options in the surviving corporation. Although conducting the tender offer as such seems to be related with the valuation method and increase the probability of option holders receiving the intrinsic value, I find evidence in support of tender offer only acting as a proxy for the method of payment. As previously discussed, these two are closely related as tender offers tend to be cash financed and mergers tend to be financed with stock. However, my results show that the method of payment better explains the method used. This is also supported by the 'general rule' outlined by the Court of Delaware. According to the opinion of the court, in cash deals ESOs can be paid the intrinsic value and as a consequence the out-of-the-money options can be forfeited with no consideration, whereas in stock deals option holders can expect to receive new options of the acquirer. However, as intrinsic value is not paid in all cash transactions and options are not converted in all stock deals, I also show that other variables affect the choice of valuation method not discussed in the previous literature.

However, this study only considers transactions with US listed target, and the results could vary between different countries. Only previous evidence comes from Finland, where Urtti (2009) studies the ESO valuation methods in Finnish transactions. In Finland ESOs can be

publicly listed after vested, and hence they become tradable securities instead of simple compensation contracts between the issuer and option holder. Urtti (2009) shows that in approximately half of the cases the intrinsic value is paid, but also cases in which value is determined using standard valuation model or market price of the traded options exist. Also, applying a minimum price for out-of-the-money options is far more common (approximately 16% of mergers and acquisitions) than reported in this study (approximately 1%). Finally, in stark contrast with the results in this study, Urtti (2009) identifies no cases in which options would have been converted to the new options of the acquirer or the surviving corporation.

I acknowledge that the results regarding the use of valuation methods can vary across the time because of the changes in the determining characteristics. Andrade et al. (2001) show that the method of payment can significantly fluctuate across the time. Authors demonstrate that during the merger wave in the late 1990s most of these deals were for stock, whereas during the 'hostile' takeover wave of the 1980s the method of payment was often cash.

6.2 Implications to option valuation and the effect of acquisition premiums

This section discusses the valuation implications of valuation methods used to price ESOs in mergers and acquisitions. I show that especially the takeover premiums that are paid over the pre-transaction share price make the analysis particularly complex. I first briefly discuss the valuation implications when options are converted, and then move on the intrinsic value method and its implications to the option value.

Probability of being acquired and therefore the number of companies being affected by the treatment of options in mergers and acquisitions is surprisingly high. Andrade (2001) shows that during the 1980s and 1990s the average percentage of firms acquired fluctuates from roughly two to almost six percentages annually.[29] In terms of market cap the annual values range from around point five to three percentages. Therefore, during the normal maturity of ten years or even during the expected life of around five years getting acquired is in no means a rare event.

[29] Andrade (2000) includes companies found from the database of the Center for Research in Security Prices (CRSP) to the analysis.

Implications of valuation methods are rather straightforward when no premium is paid for target stock. If the intrinsic value is paid, the option value equals to stock price over the applicable exercise price as the stock price is equal to the offer value. Resulting value is never above the B-S value due to the lost time value. If options are converted, option value remains the same assuming the volatility does not change and other features of the options remain constant.

However, when offer value includes a premium over the pre-transaction stock price of the target, implications become less clear. Again, loosely speaking the value of converted options generally remains the same or increases as the number of options and the exercise price are adjusted using the exchange ratio that incorporates the offer value and value of acquirer stock. Therefore, paying the premium increases the exchange rate and results to higher number of new options with lower exercise prices compared to the situation where no premium is paid.[30] Because of the conversion of the options, the value of options is unlikely to be below the B-S value calculated before the transaction, unless the volatility of the new underlying stock is below the volatility of target stock. Even if the volatility is lower, any acquisition premium paid compensates the effect.

Going forward, when intrinsic value method is paid for options things get more complicated as it is even less clear whether the pre-transaction B-S value calculated using the stock price without the takeover premium is above the intrinsic value calculated with the premium. To better illustrate the effects, Figure IV shows comparisons between hypothetical pre-transaction B-S value and the intrinsic value paid in transaction that takes the acquisition premium into account. For the sake of simplicity, ordinary B-S model is used to calculate the pre-transaction options values. When interpreting the results, one should keep in mind that the values produced by the ordinary B-S model are generally above the values produced by the

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[30] If cash is used, the exchange ratio is calculated as the ratio between the offer value and acquirer stock price. If stock is used, then only the exchange ratio is usually announced, and consequently the offer value and the premium are calculated using the acquirer share price prior the deal announcement. The number of shares subject to options is multiplied with the exchange ratio to get the new number, whereas the new exercise price is calculated by dividing the exercise price with the exchange ratio.

numerous ESO valuation models. The magnitude, however, can vary significantly among the models and the assumptions used.

In Figure IV the panels show the effect of change in one variable. Base case acquisitions premium (*P*) is equal to the median one-day premium in the sample (35%), and the value of option maturity (*T*) is equal to the mean remaining life in the sample (5.8 years) when the intrinsic value is paid. Exercise price (*X*), stock price prior the transaction (*S*), volatility (*V*), and risk-free rate (*R*) are all arbitrarily chosen but have plausible values. Each of the graphs has two lines. One shows the option value calculated using the ordinary B-S formula using the stock price without the premium, and the other shows the intrinsic value of options taking the acquisition premium into account. Therefore, the pre-transaction B-S value and the intrinsic value with the acquisition premium are equal at the intersection of the lines. Interpreting the graphs allows drawing conclusions on whether the takeover premium causes the intrinsic value method to result to option values higher or lower than the value without the transaction. In addition, comparison of the exercise price and the stock price when the two values are equal offers some insight on how the option moneyness affects the outcome. Compared to the intersection of the two values, at any lower (higher) stock price the intrinsic value with premium remains below (above) the B-S value.

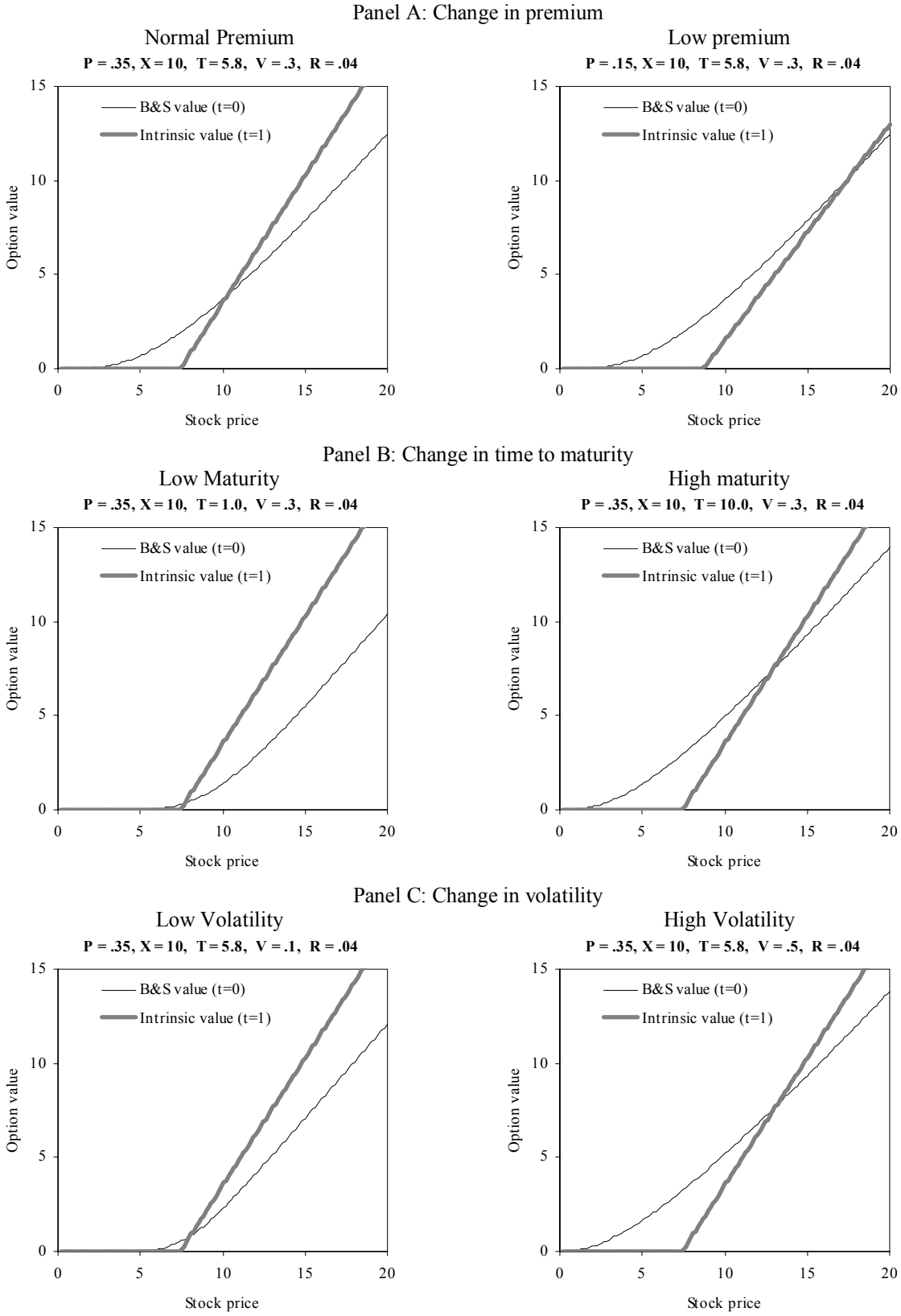

Figure IV: Intrinsic value method, takeover premium, and implications to option valuation

Figure presents option value as a function of pre-transaction stock price. B-S value (t=0) calculated using ordinary B-S formula (Black and Scholes, 1973) before the transaction. Intrinsic value (t=1) is the difference between Offer value and strike price (X) of option, where Offer value is calculated using the pre-transaction stock price and acquisition premium (P). T is option maturity in years, V is volatility, R is risk-free rate.

The top-left panel shows that under the prevailing assumptions, two lines cross approximately at the stock price equal to exercise price of the option. One should note that the intrinsic value is above zero already when the pre-transaction stock price is below the exercise price as a 35% premium is paid. In the top-right panel a premium of 15% is paid and naturally the crossing point moves more to the right, meaning that options can be well in-the-money and still the intrinsic value is below the B-S value. Simple conclusion is that lower the premium, higher the probability of intrinsic value being lower than the B-S value. Again assuming that B-S value is approximately equal to the accounting fair value, one can conclude that if acquisition premium is low, losing time value due to the use of intrinsic value method is likely to cause decrease in the option value.

Going forward, similar effects are illustrated with option maturity and stock return volatility. All other things equal, if the option maturity is very low intrinsic value is likely to exceed B-S value even when the options are slightly out-of-the-money prior to the transaction. Correspondingly, with high maturity such as ten years, option need to be well in-the-money for intrinsic value to exceed B-S value. In the panels in the bottom, volatility proves to have the same effect as a low volatility also decreases the B-S value. Therefore, despite paying an acquisition premium, intrinsic value is unlikely to exceed B-S value for highly volatile companies.

Finally, the combined effect of acquisition premium and the option moneyness is illustrated in Figure V. The absolute difference between the pre-transaction B-S value and the intrinsic value in transaction is shown in the vertical axis. Horizontal axes show the premium paid over the stock price and the option moneyness (moneyness of zero indicates option is at-the-money). Other underlying assumptions are equal to the base case in Figure IV. When a relatively low premium is paid, approximately 15% or less, the intrinsic value of option does not exceed the B-S value even though the stock price would be two fold compared to the strike price of the option. In contrast, with premium of approximately 40% or higher, the intrinsic value with premium exceeds the pre-transaction B-S value already when the option is at-the-money based on the pre-transaction share price.

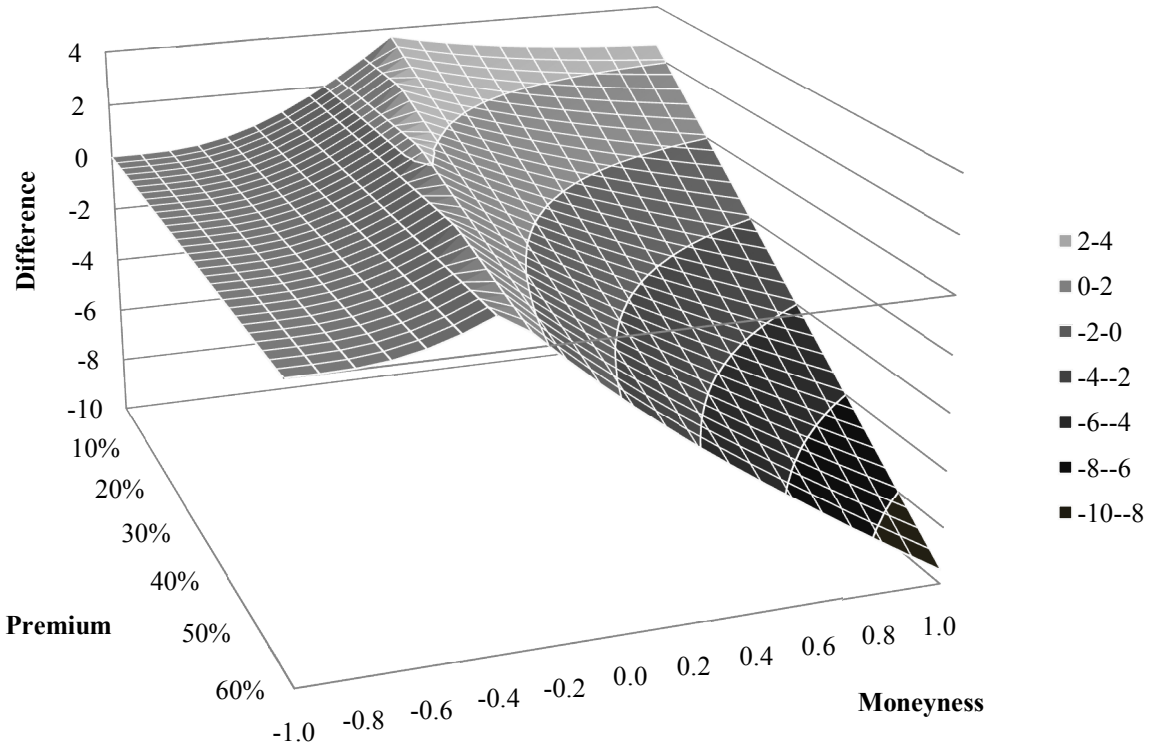

Figure V: Difference between pre-transaction B-S value and intrinsic value as a function of option moneyness and acquisition premium

Figure presents the difference between the pre-transaction B-S value (following Black and Scholes, 1973) and the intrinsic value paid in transaction. Therefore, on vertical axis a positive (negative) value indicates the B-S value to be higher (lower) than intrinsic value. Black & Scholes value refers to option value calculated using ordinary Black & Scholes formula before the transaction. Intrinsic value refers to the difference between Offer value and strike price of option, where Offer value is calculated using the stock price and acquisition premium. Exercise price is expected to be 10; time to maturity 5.8 years; volatility 30%; risk-free rate 4%. Stock price ranges from zero to 20. Moneyness equals to (stock price - strike price)/strike price.

In sum, this section shows using illustrative examples that premium paid for the target can have a significant effect on whether the intrinsic value method actually results in higher or lower option value compared to B-S value before the transaction. Option expenses are likely to exaggerate the true value of ESOs if target stock volatility and option maturity are high, options are not deep-in-the-money and if only a low premium is paid. In practice, the possible effects are best illustrated by looking at the group of cases in which the intrinsic value is paid and all the options are out-of-the-money even after taking the premium into account. In these extreme situations the payoff to all option holders is equal to zero because of losing the time

value of options. These cases represent a significant fraction of the observations in the sample, summing up to 14%.[31]

I acknowledge that models used to value ESOs usually produce values below the ordinary B-S model applied here, but this would only move the intersection of the pre-transaction value and the intrinsic value, and therefore would not change the conclusions. More thorough analysis would require a formal model incorporating all the aspects. Given that the multiple ESO pricing models are based on the assumption of some exogenous stopping rate such as employee leaving the company, inclusion of the possibility of acquisition could be feasible. However, in addition to modeling the probability of the acquisition, complete model would somehow need to estimate the option valuation method and the premium over pre-transaction stock price as well. Even though the value to the option holder is not explicitly addressed here, to large extent the same conclusions apply. In addition, the option value to the holder is likely to increase because of the relaxed vesting conditions, but the magnitude will vary from holder to the holder.

6.3 Implications and varying preferences over the valuation methods

This section discusses the preferences of option valuation method of the acquirer, the target employees, and the target shareholders. Although not empirically tested, I anticipate the preference for certain valuation method to be mainly affected by whether the acquirer is looking to retain the employees who have stock options, and the moneyness of the options.

I argue that the acquirer is more likely to convert the options if it wants to retain the employees who are holding the ESOs. In their study of accelerated vesting of employee stock options in anticipation of new accounting standards, Choudhary et al. (2008) note that the acceleration of unvested stock options removes the long-term incentive effects of option

[31] Univariate evidence on the option moneyness and the option valuation method is presented in Table VIII. Where information on option moneyness is available, the share of out-of-the-money observations is 14% when both intrinsic value and option conversion cases are considered, 21% when only the intrinsic value cases are considered, and finally 10% out of the intrinsic value and option conversion cases including also the observations where no information on option moneyness available.

contracts. Authors find that the average market reaction to the acceleration decision is about -1%, and explain the negative perception by the financial markets to result from vesting of in-the-money-options. This is argued to mean a wealth transfer from shareholders to the managers, but the authors seem to omit the fact that the vesting also decreases the cost to the firm as options are exercised early. Instead I would argue the reaction to also result from the fact that the owners know that new incentive instruments need to be issued to these ESO holders who are now able to immediately exercise their options.

To avoid the cost of issuing new options or other types of incentive instruments, acquirer can decide to convert the options if permitted. However, as discussed earlier, the acquirer can be forced to accelerate the vesting of options if so stated in the option agreements hence making the conversion of options less attractive. Also, if the options are deep out-of-the-money, the incentive effect is likely to be insignificant. In these situations, the acquirer will consider the cost of issuing new incentive instruments in its valuation of the target resulting to a lower offer value. Therefore, the shareholders of the target can also prefer converting options if this actually reduces the ultimate cost to the acquirer and leads to higher valuation of the firm.

In contrast, I anticipate the option holders to prefer receiving the intrinsic value, especially if they know that they will continue working for the company as they are very likely to receive new options or similar instruments in addition to cashing out their current options. In addition, Cai and Vijh (2006) document that acquisitions enable target CEOs to remove liquidity restrictions on stock and option holdings, and that CEOs with higher holdings are more likely to make acquisitions and accept a significantly lower acquisition premium. When the options are out-of-the-money, the intrinsic value is equal to zero and the option holders receive nothing in lieu of terminating the options. It naturally follows that the majority of option holders rather see their options being converted to retain even the time value of the options, unless they anticipate receiving additional compensation following the termination of their out-of-the-money options. However, the analysis is distorted by the fact that the target managers can receive other types of additional compensation when the transaction takes place therefore diluting the significance of the stock options. Hartzell et al. (2004) show that 12% of CEOs have their golden parachutes increased and that 28% receive variety of additional cash bonuses. These CEOs are also more likely to lose their jobs, implying that acquirers overtly pay certain CEOs to surrender managerial control over their firm.

Based on the above discussion, it is clear that competing preferences and incentives related to the treatment of options in transactions exists among different parties. Acquirer needs to balance between its incentives of managing the ESO related costs and satisfying the target executives to make the deal go through. Target shareholders are likely to be in the support of the method preferred by the acquirer to maximize the value they would receive from selling the company, unless they are option holders by themselves as well. However, most of the time these characteristics are likely to be play significant role only in the cross-section where the option valuation is not definitively stipulated in the option agreements. In addition, as discussed earlier in the case of lawsuit against AT&T, the acquirer and the target need to consider the threat of legal actions as well.

7. Conclusion

Previous studies identify numerous features of ESOs that prevent their valuation using standard option valuation models. In this study, I show that the possibility of company being acquired should be incorporated to the ESO valuation models since the valuation methods used in the transactions can produce option values significantly different from the theoretical value of options prior the transactions. I classify valuation methods based on whether the time value of options is lost or retained, and study what determines the outcome. I find that in 67% of the cases option holders only receive the intrinsic value of the options and hence the time value is sacrificed. On average, offering only the intrinsic value of options sacrifices 5.7 years of remaining option life, highlighting the fact of ESOs being long maturity options and the time value being a significant component of the option value. I further show that when the acquisition premium is taken into account, paying the intrinsic value can cause either upward or downward bias to the option values. The cases in which all options are out-of-the-money and the intrinsic value is paid are prime examples of situations where omitting the possibility of transaction causes upward bias to the option values. In these situations, the value of options is essentially destroyed since the options are forfeited and the payoff to the option holders is equal to zero.

In addition to paying the intrinsic value, other prevailing option valuation method is to convert options to the options of the acquirer or the surviving corporation, and therefore retain

also the time value of the options. This method is applied in 30% of the cases. From the valuation point of view, converting options generally retains or increases the option value.

I find strong support for certain target, acquirer, and transaction characteristics affecting whether options lose or retain the time value that are not identified in the previous literature. As suggested by the Court of Delaware, options are significantly more likely to retain time value if acquirer uses stock in a transaction. Consequently, the use of cash is negatively related to retaining the time value as options tend to be paid intrinsic value in cash deals. In addition, options are more likely to be converted and hence retain the time value when transaction becomes larger in terms of the transaction value, and the effect is strongest in the cross-section where the combination of stock and cash is used. Also, publicly listed and US acquirers are more likely to convert options and not sacrifice the time value of options. However, conducting a tender offer does not seem to affect the outcome as suggested by Ferenczy (2008), but it rather acts as a proxy for the method of payment.

Maller et al. (2002) and Szimayer (2004) discuss the effect of corporate transactions on the valuation of ESOs, but they fail to address the possibility of options being converted instead of simply terminating and cashing out the options. In contrast to the previous studies, my findings also show that the vesting status prior to the transaction has little effect on what happens to options in transaction, since in most of the cases the vesting of all options is accelerated. Maller et al. (2002) and Szimayer (2004) also both note that the value of ESOs tend to increase when a merger or acquisition takes place, but I show that depending on the valuation method both higher and lower option values exists. In addition, when assessing the ultimate cost of the options in transactions, it is important to note that the acquirer is likely to face additional costs if options are terminated and paid the intrinsic value, since new incentive instruments are likely to be issued.

Main contribution of the study is that it highlights the importance of the possibility of company being bought to the valuation of ESOs, and the investigation of the valuation method determinants lays out the foundation for the development of pricing models that predict how options are valued in these situations. Incorporating the findings of the study to the pricing models would produce more accurate estimates of ESO expenses to the companies, as well as more precise estimates of ESO values to the option holders. This may, however, require companies to adopt some more flexible valuation model than B-S. Simply

adjusting the expected life variable of the B-S model is insufficient, since the payoff profile when the transaction takes place deviates from the early exercise event. Furthermore, compensation literature and studies on corporate transactions in general are likely to benefit from the findings of the study. For instance, when investigating the incentives of executives in making transactions, Cai and Vijh (2006) show that the magnitude of CEO liquidity restrictions due to the stock and option holdings is associated with the probability of getting acquired and the level of acquisition premium accepted.

The topic could be expanded in several ways to further investigate the valuation of ESOs in corporate transactions. As discussed, current ESO pricing models could be developed to take the threat of being acquired and the valuation method into account. This would allow for more in depth analysis of valuation effects than presented in the context of this study. Also, estimating the option values for individual transactions before and after the transaction would provide better understanding the valuation effects. Other types of transactions could also be investigated, such as demergers and spin-offs, although they constitute a relatively small fraction of transactions compared to mergers and acquisitions. Replicating the study in another country could also prove to be interesting, although the disclosure environment is likely to set some limitations especially in countries with less developed reporting standards. Finally, simply considering additional explanatory variables could offer additional insight or simply further verify the results found in this study. However, these undoubtedly interesting issues are left for the future research.

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Appendices

Appendix A: M&A activity by number of transactions and transaction value

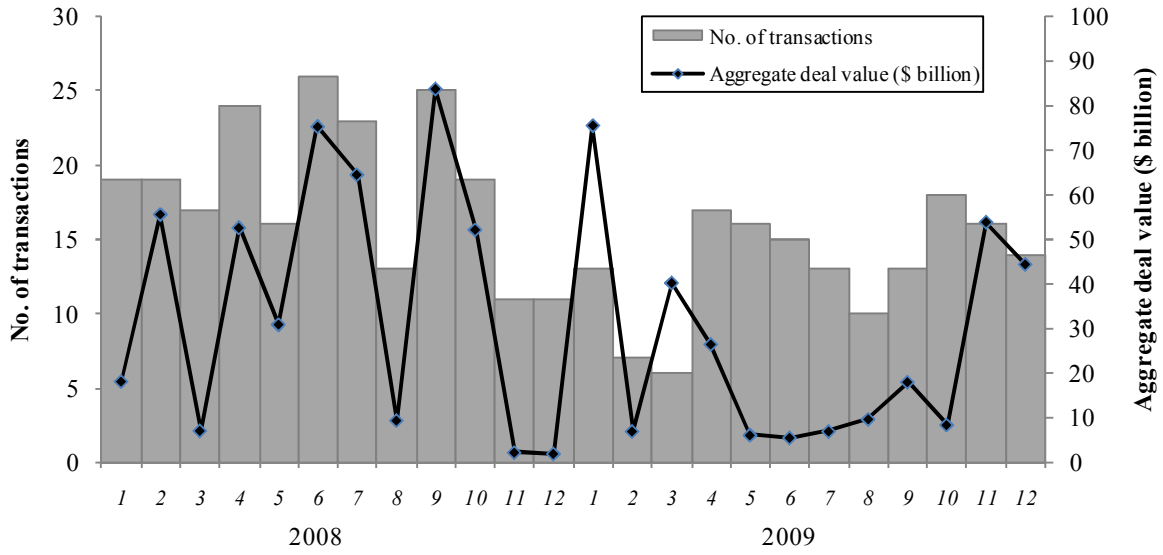

Figure VI: M&A activity by number of transactions and transaction value

Figure depicts the merger activity of the sample. The sample includes 381 transactions and consists of mergers and acquisitions during 2008 and 2009 in which target is listed on either Nasdaq or NYSE. Excluded are repurchases, self tenders, stake purchases, (debt) restructurings, intended transactions, and transactions with undisclosed dollar value, bankrupt target, no target options. Number of transactions and aggregate deal value based on the announcement dates and the transaction values from SDC Platinum database.

Appendix B: Alternative logistic regression specifications

Table XVI

Model specification of ESOs retaining time value in M&A using forward procedure

Table presents the results of logistic regressions of ESOs losing time value in mergers and acquisitions on various target, acquirer, and transaction variables. P-values are reported in parentheses. Model specifications based on the stepwise forward procedure approach using criteria based on Wald test and p-value of 0.2. Dependent variable *Time Value Retained* is a dummy that obtains value of one if options are categorized to retain time value in transaction and zero otherwise. Each column presents results for different model specification including the independent variables that have value in that column. *Stock* dummy is equal to one if stock is used as method of payment; *Cash* dummy is equal to one if cash is used as method of payment; *Log Value* is log of transaction value; *Public Acquirer* dummy is equal to one if acquirer is public; *US Acquirer* dummy is equal to one if acquirer nation is US. Sample consists of 306 option valuation observations in mergers and acquisitions during 2008 and 2009 in which target company is listed on either Nasdaq or NYSE. Excluded are repurchases, self tenders, stake purchases, (debt) restructurings, intended transactions, and transactions with undisclosed dollar value, bankrupt target, no target options, option valuation method not disclosed, and observations not classified to either lose or retain the time value of options. * denotes significance at the 10% level, ** at the 5% level, and *** at the 1% level.

Independent Variable = Time Value Retained (dummy equal to one if options converted and time value retained)						
Intercept	-4.67***	-3.27***	-3.97***	-2.98***	-1.77***	-0.78***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Stock	1.55***	1.62***	1.81***	1.78***	2.32***	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
Public Acquirer	1.6***	1.49***	1.63***	1.78***		
	(0.002)	(0.004)	(0.001)	(0.000)		
Log Value	0.61***	0.54***	0.43**			
	(0.001)	(0.003)	(0.012)			
Cash	-1.04***	-1.04***				
	(0.004)					
US Acquirer	1.3**					
	(0.024)					
Observations	306	306	306	306	306	306
Log likelihood	-134.01	-136.94	-141.20	-144.49	-152.52	-190.35
Likelihood-ratio χ^2	112.67***	106.82***	98.28***	91.71***	75.66***	
McFadden's adj. R^2	0.264	0.254	0.237	0.225	0.188	
BIC	-84.055	-83.921	-81.114	-80.263	-69.933	
AIC	0.915	0.928	0.949	0.964	1.010	

Table XVII

Alternative model specifications for ESO time value retention in M&A

Table presents the results of logistic regressions of ESOs losing time value in mergers and acquisitions on various target, acquirer, and transaction variables. P-values are reported in parentheses. Dependent variable *Time Value Retained* is a dummy that obtains value of one if options are categorized to retain time value in transaction and zero otherwise. Each column presents results for different model specification including the independent variables that have value in that column. *Year* dummy is equal to one if transaction announced in 2009 and zero if in 2008; *NYSE* dummy is equal to one if target is listed on NYSE, zero if on Nasdaq; *Stock* dummy is equal to one if stock is used as method of payment; *Cash* dummy is equal to one if cash is used as method of payment; *Tender Offer* dummy is equal to one if tender offer is being made; *Log Value* is log of transaction value; *Public Acquirer* dummy is equal to one if acquirer is public; *US Acquirer* dummy is equal to one if acquirer nation is US; *Remaining Life* is weighted average of remaining life of target options outstanding; *Completed* dummy is equal to one if transaction is (partially) completed. Sample consists of 306 option valuation observations in mergers and acquisitions during 2008 and 2009 in which target company is listed on either Nasdaq or NYSE. Excluded are repurchases, self tenders, stake purchases, (debt) restructurings, intended transactions, and transactions with undisclosed dollar value, bankrupt target, no target options, option valuation method not disclosed, and observations not classified to either lose or retain the time value of options. * denotes significance at the 10% level, ** at the 5% level, and *** at the 1% level.

Independent Variable = Time Value Retained (dummy equal to one if options converted and time value retained)						
Intercept	-4.67***	-4.69***	-4.98***	-4.78***	-4.63***	-4.72***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Stock	1.55***	1.44***	1.60***	1.60***	1.58***	1.46***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Cash	-1.04***	-0.99***	-1.04***	-1.08***	-1.04***	-1.09***
	(0.004)	(0.007)	(0.004)	(0.003)	(0.004)	(0.003)
Log Value	0.61***	0.61***	0.62***	0.69***	0.61***	0.61***
	(0.001)	(0.001)	(0.001)	(0.004)	(0.001)	(0.001)
Public Acquirer	1.60***	1.68***	1.59***	1.58***	1.61***	1.79***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
US Acquirer	1.30**	1.33**	1.36**	1.30**	1.32**	1.25**
	(0.024)	(0.021)	(0.020)	(0.024)	(0.022)	(0.030)
Tender Offer		-0.34				
		(0.415)				
Completed			0.29			
			(0.416)			
NYSE				-0.23		
				(0.615)		
Year					-0.18	
					(0.558)	
Remaining Life						-0.01
						(0.906)
Observations	306	306	306	306	306	295
Log likelihood	-134.01	-133.67	-133.68	-133.88	-133.84	-127.95
Likelihood-ratio χ^2	112.67***	113.35***	113.34***	112.93***	113.02***	105.36***
McFadden's adj. R^2	0.264	0.261	0.261	0.260	0.260	0.253
BIC	-84.055	-79.005	-79.001	-78.586	-78.676	-71.235
AIC	0.915	0.919	0.919	0.921	0.921	0.915