Joint Ventures and M&As – An Asymmetric Information Perspective

A Master Thesis on Joint Ventures and Conducting Higher Performing Acquisitions, With a Special Focus on Asymmetric Information.

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Executive Summary

Asymmetric information may explain why many mergers & acquisitions (M&A) fail to create shareholder value. Asymmetric information exists when a firm holds private information that other firms do not know of. This thesis argues there is an alternative way to the traditional direct M&A approach, which eliminates asymmetric information, before the final purchasing decision is taken. The alternative way is to set up a joint venture (JV) with a buyout option to the potential acquirer. In this way, the potential acquirer can use the JV with the potential target to eliminate asymmetric information, and in case the potential target should turn out to be a peach, that is a positive NPV investment, the potential acquirer could thus exercise his buyout option. In case the potential target turns out to be a lemon, that is a negative NPV investment, the potential acquirer will not exercise his buyout option, avoiding the great lost he would have incurred, in case he had engaged in direct M&A.

In financial markets, "there is nothing such as a free lunch", which is also the case, when we depart from the direct M&A and turn to the JV with buyout option approach. Nevertheless, this thesis presents a game theoretical model that outlines the implied game between the potential acquirer and the potential target firm, with the possibilities of engaging in a direct M&A or a JV with a buyout option to the potential acquirer. In the model, we solve for relevant equilibria, which forms the underlying understanding of the mechanisms between the potential acquirer and potential target firm.

This thesis takes a further step by presenting empirical evidences, by use of an event study. In the study two samples are selected: A JV Sample where a potential acquirer has engaged in a JV with a buyout option, and a M&A Sample characterized by direct M&A. Each sample consists of 98 firms where industry and time period exposure are alike for the two samples. All observations take place in the period 01.01.1996-01.01.2003. The event study presents evidence of JV with a buyout option performing better than direct M&A. It furthermore presents results on the industry level as well as cross- and intra country differences, in order to gain a more profound understanding of the relative advantage in JV with buyout option compared to direct M&A. The empirical result in this thesis has not previously been seen in the academic literature, and adds to the existing ongoing discussion within corporate finance and M&A.

Based on the findings in the game theoretical model and the empirical evidence we allow ourselves to set policy implications for managers, who wish to undertake M&As.

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1. Introduction

Previous studies have shown that many mergers & acquisitions (M&A) fail to succeed from the acquirer's perspective. The studies have shown that culture clashes, lack of focus on the integration of the two firms, wrong strategic decisions and overpricing are among the most common reasons for the lack of success (e.g. Rau & Vermalen (1998), Bain and Co. (2003)). We believe that these factors to a large extent can be ascribed to asymmetric information. It can be argued asymmetric information is the reason why the management in the acquirer firm undervalues the cultural distance between acquirer and target firm and thereby the integration costs. Likewise, it could be asymmetric information, which causes wrong strategic decisions, since resources are inadequately valued and placed by acquirer firm's management in the target firm. Asymmetric information is therefore closely related to any M&A, which is why dealing with this issue is of importance. A number of cases¹ have described how JVs have been used as a mean of eliminating asymmetric information in the context of M&As. In the late 1980s Philips, the large Dutch electronics firm, decided to divest its appliances division, whose revenues had been running at \$1.55 billion. The division had a history of poor performance caused by a number of problems. Philips had for some time tried to sell the division but was not happy with the valuation they could get from potential buyers. At the same time Whirlpool was seeking to expand its US base and saw a potential for developing the appliance business of Philips into a global, coordinated production and sales activity. But there were many uncertainties about the investment required, the future relationships with dealers, and the ability to turn around the operations. In 1989 Philips proposed a joint venture in which Whirlpool would own 53% of the appliance operation for \$381 million and have an option to buy the remaining 47% within three years. For Whirlpool, the joint venture enabled it to gain knowledge about the appliance division before committing further funds. Whirlpool also benefited from Philips' continued participation in a number of ways. For a period of time, the products were branded as Philips-Whirlpool appliances. The incentive for Philips to help was that it would receive more for the remaining 47%, which it sold to Whirlpool in 1991 for \$610 million. It was estimated by the use of the temporary joint venture, Philips received about \$270 million more than if it had tried to complete the transaction before the start of the joint venture two years earlier. This example illustrates how the buyer can use the JV experience to better determine the value of brands, distribution systems, and personnel. Through direct involvement with the business, the risk of

¹ Nanda & Williamson (1995). They refer to the cases of Corning and Ciba-Geigy, Honeywell and Bull & NEC, IBM and Siemens, Dresser and Lamatsu.

making mistakes is reduced. Risk, in this sense, is highly related to the asymmetric information between the potential acquirer and target firm.

1.1 Thesis Problem Statement

The overall objective of this thesis is to analyze whether JV with buyout option creates more longterm shareholder value than traditional direct M&A for the acquirer. We have chosen the acquirer's perspective, as research on the field has increasingly focused the attention towards the acquirer not creating value for its shareholders (Mitchell & Stafford (2000), McKinsey (2003)). Another reason, for choosing the acquirer's point of view, is the focus on the acquirer in a M&A transaction, as he makes the final decision on the mean of acquisition.

The underlying belief in this thesis is that a JV setup can help a potential acquirer to eliminate asymmetric information. That is, establishing a JV with buyout option gives the potential acquirer a period of time before the potential acquisition, with access to evaluate all aspects of the firm as an insider, which includes internal accounting reports, quality of management, business processes etc. In a direct M&A, the acquirer normally does not have the possibility to co-operate closely with the target in the period before the acquisition. It can therefore be assumed that there is less asymmetric information, when the potential acquirer must make his acquisition decision in a JV with buyout option, than in a direct M&A. To what extent the lower degree of asymmetric information leads to higher performance is a key issue for this master thesis.

To analyze this, we test the following hypothesis:

Hypothesis 1: For the acquirer, a **JV with buyout option**, with the purpose of a following acquisition of the target firm, creates higher **long-term shareholder value** than **direct M&A**, as **asymmetric information** is eliminated

JV with buyout option is defined as JV with an option for the potential acquirer in the JV to buyout the remaining shares from the potential target, so that the acquirer will gain full control of the JV firm. We use the expression, potential, as although in JV with buyout option, acquisition is the purpose, it is however only an option for the potential acquirer. If it turns out that the potential target is not as profitable as the potential acquirer had expected, he will not exercise the buyout option and there will be no acquisition deal. A direct M&A is the traditional approach to acquisition, in which the acquirer buys the majority of the shares of the target, so the acquirer gains full control of the target firm.

The long-term shareholder value is the cumulative average abnormal return on the stock, [-8;+36] months. A long-term view on the shareholder value has been chosen, as we believe it is more appropriate to undertake in relation to measuring the shareholder value. This is in line with both Langetieg (1978) and Schwert (1996), which have contributed with important work to the existing literature on performance of acquisitions.

Asymmetric information is defined as private information held by target firms, which is neither public nor known to other firms. The private information is assumed to play a critical role for assessing the value of the potential target firm. The existence of asymmetric information, ceteris paribus, makes it more difficult for the acquirer to make a valuation of the integration costs, investment costs, etc.

Hypothesis 1 is the main research hypothesis and deals with the overall subject of the thesis. However, we also believe that differences can be found on the industry level, i.e. some industries are more exposed to asymmetric information, so that long-term shareholder value creation due to choosing JV with buyout option instead of the direct M&A, is dependent on industry. This is formulated in Hypothesis 2:

Hypothesis 2: For the acquirer, the long-term shareholder value creation in choosing JV with buyout option instead of direct M&A, is different from industry to industry

In acquisitions, in which the potential acquirer firm is not from the same country as the potential target firm, it can be assumed there is more asymmetric information than if they had been from the same country. Thus, we believe there will be greater difference in the long-term shareholder value creation within direct M&A than within JV with buyout option. This is formulated in hypothesis 3 as:

Hypothesis 3: For the acquirer in JV with buyout option, the long-term shareholder value differential between **IJV** and **DJV** is lower than in direct M&A long-term shareholder value differential between **IM&A** and **DM&A**.

IJV (I denotes *I*nternational) is defined as JV between firms from different countries, whereas DJV (D denotes *D*omestic) is between firms from the same country.

IM&A is defined as direct M&A between firms from different countries, whereas DM&A is between firms from the same country.

For all the hypotheses it is important to note, that the assumption of whether JVs with buyout option actually eliminate asymmetric information will not directly be tested. The assumption is set from the intuitive arguments, mentioned in the beginning of this thesis problem statement, as well as previous findings by other researchers².

As the underlying assumption in the thesis is that setting up a JV can eliminate asymmetric information, we will as a starting point for the analysis, build a theoretical framework model. The theoretical framework serves the purpose of illustrating the problem of acquisition, in the presence of asymmetric information. Its objective is to introduce the reader to the implied game between the potential acquirer and potential target firm. The game will show what factors that are important for the potential acquirer in deciding whether to undertake JV with buyout option or direct M&A. It is not a purpose to test the theoretical framework model, but to use the underlying structure in the theoretical framework model when undertaking the empirical study that will test Hypothesis 1, Hypothesis 2 and Hypothesis 3.

Theoretical Framework Model: A theoretical framework that enables us to understand the implied game between the potential acquirer and potential target firm.

² See section 1.2 Literature

Based on the theoretical framework model and the tests of the 3 hypotheses, we will derive policy implications for managers with intentions of engaging in M&A activity. The final purpose of the thesis is thus:

Policy Implications: Based on the theoretical framework model and the tests of Hypothesis 1, Hypothesis 2 and Hypothesis 3, we derive policy implications for managers with intentions of engaging in M&A activity.

We consider policy implications, as the practical suggestions for managers who intent to engage in M&A activity, while maximizing long-term shareholder value.

1.2 Literature

This section is divided into 2 parts. The first part, section 1.2.1, presents various theoretical perspectives on how JVs potentially can improve M&As. The theoretical discussion serves the purpose of presenting the results of the most important work in this field. An overview of the existing literature will lead to a discussion of the theoretical perspective chosen for this thesis. This forms the starting point for the theoretical framework model that we will be presented in chapter 2. In the second part, section 1.2.2, results from empirical studies on JV performance will be presented. These studies do not evidence that JVs can improve M&As, but are instead related to general JV performance. As will be shown later, these findings are however of high interest to this thesis.

1.2.1 Theoretical Perspectives

Hennart (1988) was among the first researchers to place theories on the usefulness of JVs as a mean of acquisition. On the basis of transaction cost theory, Hennart hypothesize that a JV is useful whenever a firm faces potential large integration costs when merging its assets with the target. He argues that the post-acquisition integration problem is expected to be important in the context where target firms are large and have a non-divisionalized organizational structure. Hennart refers to this problem as the "Indigestibility Problem". The indigestibility problem is hypothesized to be less critical in acquisitions where the target firms are small and/or targeted assets are transparent, e.g. in an autonomous division. On the other hand, JVs are potentially effective in an indigestible context, since JVs enables the acquirer to "get a closer look" on the target's assets.

Kogut (1991) presents another perspective on the motives for JVs as a mean of acquisition. Kogut views JVs as a real option to expand and acquire. Kogut posits that JVs are designed organizational forms, which gives firms a better platform for managing uncertainty. Kogut argues that because of uncertainty in firms' business environment, it makes sense for firms to invest in the option to respond to these uncertainties. JVs, as an organizational form, can be viewed as investments providing firms with the opportunity to expand in favourable environments, with a limited downside risk.

To test his hypothesis, Kogut makes an empirical study using JVs from *Mergers & Acquisition* for the years 1975-83 along with questionnaires. The final sample consisted of 92 firms with at least

one US JV firm. Kogut finds that after a 2 year lifetime of the JVs, 29.3% were terminated by dissolution, 40.2% were acquired and 30.4% were still in effect. Based on these results, Kogut finds that in concentrated industries³, JVs appear to be used as a step towards a complete acquisition. One interpretation of this result – according to Kogut – is that JVs are often part of the restructuring of mature industries, either due to new or/and foreign competition, or efforts to stabilize the degree of rivalry. By acquiring the assets, a shifting of ownership occurs without an increase in industry capacity.

Balakrishnan & Koza (1993) views JVs as intermediate organizational forms, which are "...superior to markets and hierarchies when the costs of valuing complementary assets are nontrivial" (p.99). Balakrishnan & Koza argue that when the value of potential targets is not common knowledge, asymmetric information exists and acquirers are faced with an adverse selection problem. The lack of complete information about the value of the target's assets thus potentially leads to a contractual solution as e.g. leasing. Bounded rationality and the potential misuse of the leased assets by the acquirer, however results in transaction costs. The general problem is, as Balakrishnan & Koza indirectly puts it, related to Williamson (1975)⁴. Balakrishnan & Koza however find theoretical justification in JV as an intermediate superior organizational form, since reduction in transaction costs due to the share of ownership, and elimination of asymmetric information potentially exist.

To test their hypothesis, Balakrishnan & Koza evaluates investor reactions to the announcement of JVs. Based on a sample of 64 entirely based US JVs (85 parent firms) published in *Mergers and Acquisitions* in the period 1974-1977, the authors find that firms obtained an abnormal return of 1.19% during the month of the announcement of the joint-venture. In addition, they find that acquirers and targets in direct M&As realized smaller abnormal returns in dissimilar industries compared to direct M&As in similar industries. However, Balakrishnan & Koza do not test for differences in the JV and the M&A sample.

The indigestibility perspective (or post integration cost problem) by Hennart (1988) and the asymmetric information perspective by Balakrishnan & Koza (1993) are discussed by Reuer &

³ As opposed to fragmented industries

Koza (2000). At a strict theoretical level, Reuer & Koza argue that the two perspectives are complementary and partly congruent, since ex post indigestibility will be a contributing factor to the asymmetric information. Their conceptual conclusion is that asymmetric information exists when indigestibility problems are present, but the opposite is not true.

In addition to their theoretical discussion Reuer & Koza also have an empirical study. Using JVs characterised by buyout among partners, buyout to third party or liquidation, from the period 1985 to 1995, their sample consisted of 297 US domestic and international JVs. The mean CAR is 0,44 (p<0.05), which indicates that the market views JV announcements positively. Dividing the sample into various sub-samples shows evidence that CARs are positively related to differences in industry among the JV partner firms. This finding supports the asymmetric information perspective.

We generally support the view of Reuer (2000, 2001) and Balakrishnan & Koza (1993), that is, JV can potentially be used as a mean of eliminating asymmetric information. This captures our attention since uncertainty in a M&A transaction is closely related to the existence of asymmetric information between the acquirer firm and the target firm. The target firm obviously has better information about the true value of its assets and capabilities because of prior ownership and use. It may, however, choose to withhold information about quality or organizational problems and inflate output and other positive aspects. As Ravenscarft and Scherer (1987) put it, "Would –be sellers naturally present their best face". The target firm cannot credibly assure the acquirer that it will disclose all the information that it has and negotiate the sale in good faith, even if it were inclined to do so. The transfer of ownership of the complementary assets is thus impacted by "adverse selection".

The just presented overview of what has previously been found by researchers in the field of JVs as a mean of improving M&As, shows none of the studies have taken a game theoretical view. Within the theoretical framework, we have found it interesting to take the asymmetric information perspective for JVs and put it into traditional game theory. In the paragraphs below, we will shortly present important theoretical work within game theory, which have had direct influence for our theoretical approach to JVs and M&As in this thesis.

⁴ Williamson (1975) presents two compared alternatives in which firms can access complementary assets: i) market mediated contract and ii) hierarchy/acquisition

Akerlof's article from 1970 on the market for lemons is a path breaking study about the core of the asymmetric information problem. In the article, the used car market is illustrated as an example of how asymmetric information can lead to the total breakdown of a market. Individuals in the used car market do not know whether an acquisition of a used car is either good or a so-called lemon. Only after a given acquisition the individual can judge whether his purchase was a good or a bad one. However, the investment should be made before acquiring the private information the seller has. Thereby, an asymmetry in available information has developed and therefore individuals will demand a discount, discouraging good car sellers to stay in the market while attracting lemons. In the extreme case, the problem of asymmetric information will lead to market break down.

In Spence's (1974) model of job market signaling, the labor market is seen as a game in which employer and potential workers determine the actual recruitment relation. Nature starts to pick the characteristics, which can either be good or bad⁵, of the worker. Then, the worker sends a message to the employer based on what kind of education he chooses. The employer receives this information and determines what wage he will pay to the worker, depending on his perception of conditional probability distribution over productivity in the market. In his model, Spence assumes the wage schedules are determined before the workers decide on their education and the employer constantly revises his conditional probability distribution over productivity, i.e. repeated games. A critical assumption for the model is the costs of signaling are negatively correlated with productive capability⁶. This critical assumption has later been labeled *the single cross property* by Krebs (1990). The single cross property is an assumption we will also make use of in our theoretical framework. The theoretical work of Spence is the first complete model to highlight the importance of signaling for the final outcome of the game.

Myers and Majluf (1984) claim capital structure is highly influenced by asymmetric information between shareholders and firm managers. They argue managers will rely on internal funds and debt before equity. Their model operates with firm managers sending a message to potential investors by offering an equity stake in return for financing. The asymmetric information problem lies within potential investors not possessing the private information that firm managers have. Thereby, a

⁵ To what extent the worker is productive.

⁶ Low ability workers find signaling more costly than do high ability workers.

correct valuation of the firm and assessing firm investment projects is made more difficult. Potential investors uncertainty about whether the firm is good or a lemon will rise, making them discount their belief of the profitability of the firm's existing assets. The higher the firm managers' stake in the firm and the firms' investment projects, the lower will be the investors' assessment of the firm being a lemon. The game ends with potential investors final decision about whether to invest. The "putting the money were his mouth is" way of acting is of great importance for the outcome of a signaling game, which is why, it will be an essential part of the model we present in chapter 2.

Mølgaard & Baltzer (1999) takes its starting point with an investor looking for a partner in a transition economy, in which the partner can be either a lemon or a peach. Due to the differences in capital costs, the investor and the domestic firm are better off, by leaving the required investments necessary for the partnership, to the investor. By extensive modelling and refinement, as suggested by Cho & Krebs (1987), they find all pooling equilibrium to be destabilized, i.e. no pooling equilibrium will survive the equilibrium domination test. Mølgaard & Baltzer's work is important since they highlight there can be inefficiencies implied in domestic firms signaling. As with Spence (1974) and Myer & Majluf (1984) we have also benefited a great deal from Mølgaard & Baltzer (1999), in particular in setting up the game and deriving equilibria. However, differences can be made to Møllgard & Baltzer's approach compared to ours, as they assess a different context and make different assumptions.

1.2.2 Empirical Findings

Until date, there has not been made any empirical studies similar to the one we will conduct in chapter 3. The studies below are among the most cited studies on general JV performance.

Before 1981, JV performance studies focused on single industries, e.g. Fusfeld (1958) for a study of the iron steel industry, Boyle (1960) on the rubber industry and Backman (1965) on the chemical industry.

One of the first empirical studies on JV performance in multi-industries, was made by Berg & Friedman (1981). In their multi-industry study, Berg & Friedman (1981) used a pooled time seriescross section model in order to determine the impact of JVs on industrial rates of return. Using data form the Bureau of Economic Analysis (source data: The Federal Trade Commission Data Entry Sheets), their sample consisted of 300+ JVs in nineteen industry groups from the period 1964-1975. The results showed that JV participation is positively correlated to firm size, capital expenditures and profitability. Also, technologically oriented and non-horizontal JVs had strong positive effects on R&D intensity, thus indicating that JVs and R&D are somehow complements.

Perhaps the most cited study on JVs, was made by McConnell & Nantell (1985). McConnell & Nantell used a sample of 210 US firms, which had entered into 136 domestic JVs over the period 1972-79. The sample covered all JVs announced in the "*Joint Venture Roster*" published in *Mergers and Acquisitions* 1972-1979. The 2-day announcement period abnormal return was 0.73%. This result was significant at the 0.01 level. The CAR over the 62-day period ending on the announcement day was 2.15%. This result was also significant at the 0.01 level. The CAR however remained at 2.15% after 60 days subsequent to the JV announcement day, indicating no further valuation effect following the initial announcement. In addition, McConnell & Nantell also studied the market size effect. This was done by grouping the JVs into 3 categories: "Small", "Large" and "Others". The small firms had the largest gain of 1.10%, while large firms gained 0.63% - both statistically significant.

Scaling these gains to the amount invested in the JV, the average premium in JVs is approximately 23%, which is much similar to the premiums paid in M&As (see e.g. Jensen & Ruback (1983), Bradley, Desai and Kim (1988))⁷.

While Berg & Friedman's (1981) and McConnell & Nantell's (1985) samples only include U.S. firms entering into JVs with other U.S. firms, that is domestic JVs, Lee & Wyatt (1990) use a sample of US firms engaging in international JVs (IJVs). In their study of IJVs, Lee & Wyatt find that the CAR over the 30-day pre-announcement period is -1.45%, whereas the CAR over the 30 day post-announcement period is -1.93%. Using a sample of 109 firms in the period 1974-1986, Lee & Waytt thus concludes that IJVs decrease shareholder wealth in the event period. Similar results on IJVs are found by Chung, Koford & Lee (1993). They use a large data set (+20 years), consisting of 230 US IJV announcements in the period 1969-89. In addition to the study of Lee &

⁷ McConnell & Nantell interpret their results as supportive of the synergy hypothesis. Their argument goes as follows. M&As gains have two sources: 1) displacement of less effective management, or 2) synergy. Since JVs (with dual management) gives an opportunity to isolate the management displacement hypothesis from the synergy hypothesis,

Wyatt (1990), Chung, Koford and Lee (1993) examined whether gains/losses are related: i)status of host country, ii) industry. The results from the sample showed that the value of U.S. firms establishing IJV, fell by 2.79% during the test period (t=-60 to t= 30). The t-test on CAR underlines that these losses were statistically significant at the 10% level. In addition, the negative wealth effects was unaffected by the host country as well as the industries involved. However, in case IJVs were formed with at least 3 or more involved firms from different industries, CAR was found to be positive and significant.

Finally we would like to point out one interesting result found by Weston, Siu and Johnson (2001). They find that mergers and JVs display very similar timing characteristics. The correlation between announced completed mergers and JV startups, is more than 0.95. In other words, both mergers and JVs seem to be motivated by factors, which have an effect on investment activity. We believe the findings by Weston, Siu and Johnson potentially supports our approach that JVs are used as a mean of acquisition.

Summary of previous empirical findings:

Based on the results found in the above section and in section 1.2.1 there is no consensus of whether JVs in general increase or decrease value for shareholders. As mentioned, Berg & Friedman (1981), McConnell & Nantell (1985), Balakrishnan & Koza (1993) and Reuer & Koza (2000) all find that JV announcements create shareholder wealth in their respective event periods, whereas Lee & Wyatt (1990) and Chung, Koford & Lee (1993) find the opposite results.

Additionally, it can be concluded that all the studies use US firms when measuring JV performance in the sample and no event period had a length of more than 90 days. In summary, we therefore find it in its right place to make an empirical study including both non-US firms and a large event period, where the latter will serve the purpose of analyzing whether JVs as a mean of acquisition destroy or create long term shareholder wealth.

McConnell & Nantell support the synergy hypothesis within JVs. We however disagree with McConnell and Nantell since they ignore Roll's hybris argument (1986) as a source of gain.

1.3 Theoretical and Empirical Delimitations

This section will present the theoretical and empirical delimitations. The theoretical delimitations are pointed towards the theoretical framework, which will be presented in chapter 2, whereas the empirical delimitations are directed towards the empirical study undertaken in chapter 3.

Delimitations are caused by the conscious choice of theory. Conscious choices make consistent deselecting of the alternative approaches, which is why choice of theory will be presented when argued for the delimitations in the following section.

1.3.1 Theoretical Delimitations

The theory used in this thesis is based on traditional game theory. We believe the game theoretical setting is the most appropriate, as it views the problem under uncertainty from the perspective of the decision maker. The problem of asymmetric information is at the core in game theory, as this makes the decision maker unable to make decisions under full information. This characteristic of game theory hits an important point in the previously presented problem statement for the thesis. Asymmetric information between the potential acquirer and potential target forces the former to be critical and precautions, which affects efficiency. A great advantage of game theory is its ability to generate understanding of why decisions are taken based on a rational view of the implied participants in the game. It also highlights and outlines the options of the participant at any given stage. A clear downside by using game theory is the assumptions for the game setting are often very specific and strict. As it relies on the ability of the author to outline the outcome of any given contingency, it is very vulnerable to contingencies that are very complex, unless assumptions are used to cover up for this. The latter is clearly widely used in game theory, although it does not draws a better picture of the real world, but more a clearer picture of the settings in the game that the author describes. This questions the validity of the constructed game with its equilibria, especially in cases, in which the author is forced to make extensive assumptions that departs the game of the author, from the real world, that he intends to describe. Nevertheless, although being aware of the critics of game theory, we believe any theory that intends to outline and explain a certain behavior will be based on rationality and a reduction of the real world complexity through assumptions.

If the game theoretical perspective was not taken as the main theory in this thesis, we could alternatively suggest the real option approach, which has strongly grown in recognition during the last couple of years. The real option approach as outlined by Copeland & Antikarov (2001) and Schwartz and Trigeorgis (2001) among others, adds an interesting perspective on the choice between decisions that all contains different options. It sees a value in any option to management as a factor to be considered over time. The above-mentioned authors prove the superior power of the real options approach over the traditional discounted cash flows, which lack the incorporation of flexibility. In case the real options approach was chosen as the theoretical fundament for the analysis, the theory would more be in the direction of valuation based on option theory. The real option approach is considered very useful in a theoretical setting. However, the practical application is problematic, especially when having to calculate the volatility of the investment projects of the firm. In addition to this, use of the real option approach would not cover the aspect on asymmetric information between the potential acquirer and potential target. It would suffer from difficulties in explaining why both JV with buyout option and direct M&A occur in the market from a microeconomics level. We have considered the real option approach, but have rejected its use in this thesis as the main theory. However, in some settings during the thesis inspiration is directly drawn from the real option approach.

Further, we could have used transaction cost theory to analyze how JVs can improve M&As by eliminating asymmetric information. As mentioned previously, this view was taken by Hennart (1988), who hypothesize that JV is useful whenever a firm faces potential large integration costs when merging its assets with the target. It is our impression that transaction cost theory has been a widely researched area and as a consequence of this, it is difficult to add new dimensions within this theoretical framework.

1.3.2 Empirical Delimitations

For the empirical study, the event study approach, as outlined by Cambell *et al.* (1997), has been chosen. It is an appropriate method, as it measures the effect of a given event. In this case, the event is forming the JV with buyout option or a direct M&A. The event study measures the performance prior and after the event, as empirical studies have found market reaction prior to the event announcement, evidencing insider trading or the market being able to anticipate the event prior to its announcement. The event study is an econometric methodology, based on a large sample. This is

also one of the great advantages by using the event study. A large sample enables to conclude on the entire population, given that the data in the sample are reliable.

A case study approach could have been used instead of the broader event study. The advantage by using such an approach would enable us to work more with the details in the case study, making the learning contain more details than the event study approach. In the introduction, the Philips-Whirlpool case was presented. Applying the Philip-Whirlpool case to a single case study could certainly have resulted in many interesting aspects of a case. Another case representing the direct M&A transaction could have been chosen, and a direct comparison could be made between this case and the Philips-Whirlpool case. Policy implications could then be drawn from these case studies. However, we do not consider it reliable to generalize on a few case studies, since this would be statistically incorrect. The latter is the main reason for not choosing the case study approach.

1.4 Methodology & Structure

The purpose of this section is twofolded. Initially, we start out by explaining the scientific methodology used in the thesis. The scientific methodology is a discussion of how the knowledge production process is generated in the thesis. In the second part of the section, the structure in the thesis will be presented. An introduction to the thesis structure should give the reader a quick overview of the content in the thesis.

1.4.1 Scientific Methodology

In a scientific paper or study - at least in the thesis form - it is often of great help to the reader to include a description of the methodology used. The methodology description is important, since it explains why and how a subject has been researched. In light of this, it should be noted that different methodologies can lead to different results despite research topics remain unchanged. In addition, the methodology in our case explains the form⁸ of the thesis.

To illustrate the scientific methodology used in this thesis, we use a model by Andersen (1998). The model is illustrated in Figure A.

⁸ The form of the thesis includes the structure, the theory, the empirical work, the line of argumentation, the layout etc.





Source: Andersen (1998)

As illustrated by Andersen (1998), the choice of methodical approach influences the study and the form of the thesis. In this thesis, there are basically two types of factors influencing the process for the production of knowledge and the form of the thesis: The Framework Conditions and The Process Control Factors.

The Framework Conditions are important because they influence the process for the production of knowledge. The Framework Conditions consist of: Law & Rules, Stakeholders, Purpose and Resources.

Law & Rules in this thesis are basically given in the "Guidelines for The Master Thesis" at CBS. The only restrictive implications imposed in the thesis in respect of these guidelines are in terms of page number content and focus of research area. In terms of page numbers, the thesis must for two

persons (which is the actual case here) be in the range of 120-180 pages. In terms of research area, the thesis must deal with a financial related issue, since both of the authors of the thesis are finance students. The primary *stakeholders* in the thesis are the authors. It is our desires to undertake a theoretical and empirical study, in order to potentially identify improved ways for firms to engage in M&As - hence the *purpose* of the thesis. The theoretical dimension in the thesis thus serves our needs and academic ambitions to find a theoretical model, which illustrates the basic problem underlying the purpose of the thesis. Our ambitions and desire in our empirical study has been to make a study, which have not been carried out by any other researchers till date⁹. Serving the needs of our selves as stakeholders has a direct implication for the process for the production of knowledge and the form of the thesis. It should however be noticed that we have from the point of departure of the thesis, had secondary stakeholders in mind. The secondary stakeholders in the project are business managers in general and our supervisor Caspar Rose. Due to the fact that studies for some time have shown that M&As are reducing value from an acquirer's perspective¹⁰, our intentions have additionally been trying to find potential solutions to this problem.

Resources have basically not had any implications for the process of production of knowledge, even though it can be argued that time is as mostly a constraint factor. However, due to no deadline put up by secondary stakeholders, time is not considered a constraint factor.

It can thus be stated that within the Framework Conditions, the key influence on The Process for the Production of Knowledge lies in the thesis's stakeholders. This will have further implications on the Process Control Factors. Depending on e.g. the thesis's stakeholders, the Process Control Factors can either be given factors, chosen factors and/or partially inferred factors. A hypothetical example is a firm imposing a research question to academics, thus setting given factors for The Process for the Production of Knowledge. Since we are the thesis's stakeholders, basically none of the Process Control Factors, that is: The Research question (problem statement), Theoretical Embeddedness, Empirical Delimitation, Project Organization, Access to Data, Study Design, Data Retrieval Methods, Analysis and Interpretation Techniques, Report and Dissemination Form.

⁹ To the best of our knowledge

¹⁰ See e.g. Weston, Siu, Johnson (2001) for an extensive outline on studies of M&A performance

Some Process Control Factors' influence on The Process for the Production of Knowledge are subject for more discussion than others. With the Research Question and The Theoretical Embeddedness already chosen (in the first part of the thesis), we will briefly in the section below explain how the study design was chosen.

In general, empirical studies can take many forms such as e.g. *Single Case Studies, Multi Case Studies, Random Sampling, Quasi Experiments, etc.* (Andersen (1998)). Each empirical study form has its weaknesses and strengths. The strength of e.g. Single Case Studies is that it enables the researcher to go much into depth with e.g. a firm. On the other hand, no general conclusion can normally be drawn from Single Case Studies (Flyvbjerg (1991)).

Our empirical study takes the form of a Simple Random Sampling. The sample observations are randomly chosen, so that each sample contains the same number of observations, thereby assuming that the size of the entire population is the same. Simple Random Sampling enables us to use *inference*, that is, to draw a general conclusion of an entire population on the basis of a random sampling of the population (Balnaves & Caputi (2001)), compared to the Single Case Study. The downside of the Simple Random Sampling is the advantage by using the Single Case Study, namely being able to go into depth with the empirical results. In the Simple Random Sampling¹¹ we will furthermore, make use of *Univariat Analysis* (Andersen (1998)), meaning that our final conclusions will only be drawn from one variable, which is return over time. This will be explained in further detail in chapter 3.

It is worth highlighting Access to Data as an important Process Control Factor highly influencing The Process for the Production of Knowledge. Most of the sources from which data was obtained are high cost databases and information sources e.g. Bloomberg, Factiva, Lexis Nexis and Datastream. Fortunately, access to some of these data was granted through the CBS library, while access to the rest of the data was granted through personal contacts and the job in a major bank of one of the authors. Although, access to data was provided, the process of collecting the data was

¹¹ Actually, we also take use of an extended form of the Simple Random Sampling, called Stratified Sampling when conducting our empirical study. Stratified Sampling is used to create a benchmark sample. An explanation of the benchmark sample is given in detail in chapter 3.

slow, as JV data was difficult to collect¹². Perhaps, this is one of the major reasons for why a similar study has not been conducted before.

The main aspects of the thesis are the Theory and the Empiricism. The interaction between these two elements conforms the core in the process for the production of knowledge. First, the theory is created, which forms the fundament for designing and working with the Empiricism. Without a solid theoretical understanding of how to solve the problem statement, the thesis would lack to present our view on how we see the context in which the problem statement should be solved. On the other hand, if the Theory was created on a stand-alone basis, it would clearly lack a touch of the real world. This is where the Empiricism comes into play. It tries to draw on conclusions based on what is observable and actual data. The design of an empirical study should take its starting point from the problem statement, followed by the Theory. The core of the Empiricism in this thesis is based on the selection of data, as well as tests on predetermined relations. The method that enables to make these tests and determine relations is found in the statistical theory. The final determination of whether a certain relation is found or not is based on the level of significance. The level of significance means, at what level we are willing to commit a type 1 error of rejecting a null hypothesis that should not have been rejected, thereby making a wrong conclusion. Normally the 5% level of significance is used as the magic distinction between right and wrong. It means there is 5% chance of committing a type 1 error. In contrast to some statisticians, we believe there should be room for flexibility, when a conclusion is drawn based on the level of significance. One should not only conclude, "either it is true or it is not" based on the 5% level of significance, as many statisticians do. In cases, in which data shows many significant result just above the 5% level of significance¹³, e.g. 7% or 9%, this is also very valuable and worth considering. The point is to have a sense of the data and not only concluding with blindfolded eyes.

We believe the Empiricism should be related back to the theory, which enables us to generate a clearer understanding of the Empiricism and the Theory. This will help to form a wider picture of the answer to the problem statement. While the theory from a starting point outlines possible contingencies under certain assumptions, it will, based on the Empiricism, be possible to point out how firms do in practice. This information is very valuable and useable when considering the policy

¹² Many firms do not inform the financial market of its JV agreements. In addition, we have not been able to find new JV observations reported in an easy accessible format.

implications for future players in the market, thereby considering the interest of the secondary stakeholders.

The theoretical defined terms and the formation of the terms to the Empiricism is important so that there is consistency in the way Empiricism is conducted based on the Theory. The first step is to ensure that there is a clear focus on the key terms as well as clear definitions in the Theory. The second step is to make sure the term definitions are transmitted without lost of meaning to the Empiricism. The third step is to verify that the obtained data are reliable and corresponding to the terms in the Empiricism. All the mentioned steps will ensure the Theory is in according with the Empiricism and that the conclusions drawn from here is reliable and valid, thereby making sure the Theory and the Empiricism works to answer the predetermined Problem Statement. Figure B illustrates the relationship between reliability and validity.

Figure B, The Relationship between Reliability and Validity



Source: Andersen (1998); originally by Hellevik (1994)

In this thesis, the theoretically terms will be well defined, as they will be presented in a game theoretical context, in which equilibria will be found based on quantifying the size of the theoretically terms. When applying these terms to the operational empirical setting, some of the theoretically defined terms will be amplified, e.g. θ , so that it will be more applicable to an operational setting. However, while doing this we will be very conscious of not decreasing the validity of the Theory and Empiricism.

¹³ A lower critical test value

Finally, much time have been spent in selecting the data, so that they are consistent with the operational defined variables. This has ensured a high degree of reliability in the Empiricism.

1.4.2. Thesis Structure

This section will give the reader an overview of the structure in the thesis. As illustrated in Figure C the thesis consists of 5 main parts.





Source: Own construction

In the up coming chapter 2, a model called The JV-M&A Asymmetric Information Model will be presented. The purpose of the model is to outline the game between a potential acquirer and potential target firm. The model, which builds on traditional game theory, will illustrate how different equilibria outcomes are reached based on different settings. The equilibria will show whether JV with buyout option or direct M&A is the optimal mean of acquisition. Based on the findings in the model, relative advantages and disadvantages of JV with buyout option as a mean of acquisition compared to direct M&A are illustrated. At the end of Chapter 2 a discussion of

potential policy implications for managers in acquirer firms is made, based on the finding in the JV-M&A Asymmetric Information Model.

To answer how policy implications potentially should be made for managers in acquirer firms, an empirical study in chapter 3 is be made. This is possible, now that the basic setting between the potential acquirer and potential target is understood, based on the JV-M&A Asymmetric Information Model.

Chapter 3 will present the Empirical JV-M&A Design and Results. It will explain how the empirical tests are based on an event study approach and how the samples are designed. At the end of Chapter 3, we will take a critical review of the empirical analysis. The final section in the chapter will include both a discussion of how the empirical results from our study relates to other findings in the academic literature and whether the hypotheses stated in the problem statement should be accepted or rejected.

Chapter 4 will bridge the gap between the JV-M&A Asymmetric Information Model and the empirical results. Based on this, policy implications for managers in acquirer firms are suggested.

Chapter 5 will present the overall conclusions and answers the problem statement.

2. The JV-M&A Asymmetric Information Model

In this chapter we develop our theoretical framework model. The chapter starts with a brief introduction to the settings of the game between a potential acquirer firm (PA) and a potential target firm (PT). Next, the notations will be presented so that the reader will be familiar will the abbreviations and symbols used in the model. Important assumptions are then presented, followed by the actual model and the equilibria. The model consists of a full information benchmark and finding the separating and pooling equilibria. In developing the model, we have had different sources of inspiration in terms of related topic contents as well as modeling techniques. Among some of the sources are Mølgaard & Baltzer (1999), Spence (1974), Myers and Majluf (1984), Kogut (1991), Laffont & Tirole (2000) and Gibbons (1992).

2.1 The Basic Game Theory Approach

In the terms of traditional game theory, we are dealing with a dynamic game of incomplete information¹⁴. In order to deal with the problem of incomplete information we use the *Harsanyi transformation*. The advantage of the Harsanyi transformation is to transform a game with incomplete information to a game with complete but imperfect information. With the Harsanyi transformation we can treat the players as distinct types with different payoff functions (Bierman & Fernandez (1998)). Using the Harsanyi transformation, the game can be structured the following way. In this game the Receiver (*R*) does not know the payoff of the Sender (*S*), due to the existence of asymmetric information. This type of game is called a Signaling Game, in which the Perfect Bayesian Equilibrium is found. The game implies two players, which are *S* and *R*. Nature draws a type n_i for *S* from a set of feasible types $N=\{n_1, ..., n_I\}$ according to a probability distribution $p(n_i)$, where $p(n_i)>0$ for every *i* and $p(n_i) + ..., +p(n_I)=1$. *S* observes n_i and then chooses a message m_j from a set of feasible actions $A=\{a_1, ..., a_K\}^{15}$. The dashed line in Figure M1¹⁶ shows the asymmetric information between *S* and *R*.

¹⁴ Gibbons (1992): "Games with complete information are games, in which the player's payoff functions are common knowledge". In a game of incomplete information at least one player is uncertain about another player's payoff function.

¹⁵ Gibbons (1992): For details on definitions and how to find the Perfect Bayesian Equilibrium

¹⁶ All figures and equations in this chapter are labelled with a "M" denoting that they correspond to the *M*odel used in the thesis. As will be shown, all equations in the empirical section of the thesis are labelled with an "E" denoting the *E*mpirical focus. The purpose of this is to keep the figure and equation numbers at a minimum, and thereby making it easier for the reader.

Traditional game theory distinguishes between so called pooling and separating strategies, where the first strategy refers to each type sending the same message, whereas each type sends a different message in the separating strategy¹⁷.





Source: Gibbons (1992)

2.2 Notations

In this section the notations for the following model be presented.

N = Nature of firm, $N \in (P,L)$

PT = Potential Target, $PT \in (P,L)$

PA = Potential Acquirer

P = Peach

¹⁷ Pooling Strategy: Play m_1 if nature draws n_1 and play m_1 if nature draws n_2 or Play m_2 if nature draws n_1 and play m_2 if nature draws n_2 . Separating Strategy: Play m_1 if nature draws n_1 and play m_2 if nature draws n_2 or Play m_2 if nature draws n_1 and play m_2 if nature draws n_1 and play m_2 if nature draws n_2 or Play m_2 if nature draws n_2 or Play m_1 if nature draws n_2 or Play m_2 if nature draws m_2 or Play $m_$

L = Lemon

JV = Joint Venture

 φ = Asset Transfer Costs

 $t_N^i = PT$'s share of the integration costs, where the PT is of nature N, $t_N^i > 0$ (t refers to target)

a = PA's share of integration costs (a refers to acquirer)

 $l + \psi = PT$'s cost per unit of integration (As will be illustrated later in the model, ψ is strictly related to inefficiency. Since inefficiency has a negative impact a symbol similar to the devil's fork is used)

 $t^{upper,L} =$ Upper integration-cost bound for L

 $t^{upper,P} =$ Upper integration-cost bound for P

 $t_{N\min 0}^{\prime}$ = The minimum positive value that converges to 0, $N \in (P,L)$

 π_N^A = Per period expected profits generated by *PT* of nature *N*, as a stand-alone firm ("*A*" in π_N^A denotes *alone*). Also called PT's reservation value.

 π_N^C = Per period expected profits generated by *PA* and *PT* of nature *N*, in a combined activity ("*C*" in π_N^C denotes *combined*)

 $e_N^{bid} = PA$'s offered exercise price for a given time period, where the underlying asset is the value of JV formed with *PT* of nature *N*

 $E_N^{bid} = PA$'s discounted exercise prices on an option, where the underlying asset is the value of JV formed with *PT* of nature *N*

 $E_N^{ask} = PT$'s ask price on an option where the underlying asset is the JV formed with *PA*, and where the potential target is of nature *N*

 E_N^f = The exercise price based on full information, where the underlying asset is the value of JV formed with *PT* of nature *N*

 $E'_N = PA$'s proposed exercise price to PT, where the underlying asset is the value of JV formed with *PT* of nature *N*

 $\omega = PA$'s share of the gains from the JV

 S_N = Added Welfare to Society, where *PT* is of nature *N* (*S* refers to Society)

E[S] = Expected Added Welfare to Society

Net profit = Profit minus costs related to establishing JV

t = Time period

 $\Delta = \frac{1}{(1+r)}$, the discount factor

 $\theta = PA$'s probability assessment that PT is of Nature P

 $\theta_{directM\&A}$ = Pooling equilibria where direct M&A will take place

 $\theta_{directM\&A}^{Undo\min ated}$ = Pooling equilibria where *PA* will prefer playing a pooling strategy with a direct M&A, given the requirement of separating equilibria is fulfilled

 $\theta_{JV+buyout}$ = Pooling equilibria where PA will prefer the establishment of a JV with buyout option

 $\theta_{JV+buyout}^{Undo \min ated}$ = Pooling equilibria where *PA* will prefer playing a pooling strategy by establishing JV with a buyout option, given the requirement of separating equilibria is fulfilled

2.3 The Model

In our model, the Sender, *S*, is *PT* who knows it is target for acquisition. Having this in mind, *PT* maximizes its payoff by sending the message that it believes will maximize its payoff. The Receiver, *R*, is *PA* who maximizes his payoff by preferring *P* for L^{18} . Both *P* and *L* will prefer sending the message of being *P*, as they know *PA* prefers *P*. Thereby, *PA* is faced with an adverse selection problem as outlined by Akerlof (1970). Nature is *PT*'s ability to generate future profit, which can either be *P* or *L*. *L* knows it is *L*, but not who is *P* in the market, and vice versa. By definition, nature is predetermined before the game starts, as in Spence (1974), who defines the indices as the predetermined observable, unalterable attributes, e.g. race, sex, criminal and service records. The nature characteristics cannot be changed at the beginning of the game, but can be manipulated through the message sent to *PA*. The message is the signal of how profitable the firm is, which it sends through t'^{19} . t' is *PT*'s stake of the integration costs in a JV with *PA*. The message can separate *P* from *L*.

Notice, our model implicitly assume the alternative to a direct M&A is engaging in a JV with buyout option to PA. The buyout option is a call option that gives PA the right to buy out PT in the JV. The call option is in the money, when the value of the underlying asset is higher than the exercise price. The market value of the JV is the underlying asset, thereby depending on the nature of PT. For simplicity, an option price with payment ex ante on the buyout option has been left out. Instead, the option price is assumed to be incorporated in the exercise price ex post. The exercise

¹⁸ Akerlof (1970) introduced the "lemon" term about a bad car. Our analogue is using the "lemon" term as the label for a firm with low future profits and with NPV less than zero, compared to a firm with high future profits, a Peach, P, a firm with NPV higher than zero.

¹⁹ We assume there are no transaction costs implied in sending the message.

price will in this case be higher than if an option price is paid ex ante, reflecting the value of the buyout option²⁰.

The exercise price is not a credible signal, as it cannot help PA to credible sort P from L. For PA the problem lies in how to interpret a high verses low exercise price. Both P and L can send a high exercise price signal without any costs, which means there is no signaling value in a high exercise price. On the other hand, a low exercise price is not either a credible signal, as PA knows that L can signal a lower exercise price and still gain from the transaction. L can rationally signal an exercise price, which is lower than the market value of P, which makes a rational P not willing to signal the same exercise price. This means, a rational P cannot send a message that L cannot mimick, but L can send a message that a rational P will not mimick. For PA, it means he will not consider the exercise price, as a credible signal.

PA's stake of the integration costs equals $(1-t^{i})$. The underlying assumption is that a higher t^{i} signals a P firm, while a low t' signals a L. Both firms are interested in signaling a P firm status as this will lead to a bigger incentive for PA to engage in a JV. The line of argument is directly drawn from the work of Myers and Majluf (1984) who argue, firm managers stake in the firm and the firm's investment project will decrease investor's probability of the firm being L. Another explicit assumption is that t' should be equal to 0, in an optimal solution for both firms, if there was full information in the market, as PA has lower cost of capital than PT. The reason behind PA's lower cost of capital – and thereby its lower unit cost of integration – is related to the assumption that PAhas a competitive business advantage and the ability to earn economic rents (Brealey & Myers (2000)). In addition, this implies *PA* is expected to be better at driving profits from *PT*'s assets than *PT. PA*'s investors, whether being on equity or debt, will recognize this, which will reflect a lower cost of capital for PA than for PT. The assumption of PA's lower cost of capital than PT, and thereby a lower unit cost of integration, is one of the central differences in this model compared to Mølgaard & Baltzer (1999). Mølgaard & Baltzer assume that differences in cost of capital are caused by capital market imperfections, since targets in their model are firms in emerging markets whereas acquirers are firms in developed countries.

 $^{^{20}}$ If this was not the case, *PA* would clearly prefer an option price ex ante for an increase in the exercise price value. When the increase in the exercise price is higher than the ex ante option price, an equilibrium will be reached, in which the increased exercise price value will lead to indifference.
Figure M2 shows the set up for our model²¹. It shows, how *PT* is either *P* or *L*. The prior probability of a firm being *P* is labeled θ , whereas 1- θ labels the probability of a firm being *L*. The prior probability assessment of *PA* is given at the beginning of the game based on previous experience of *PA*. θ is assumed to be common knowledge, as in other signaling models. In the model the initial prior probability assessment will not be updated, as it is not a repeated game. A high θ indicates *PA* being optimistic, whereas a low θ indicates him being pessimistic.



Figure M2, PT VS. PA Game

Source: Own construction

In time period 1, t=1, depending upon its nature, *PT* will choose its message, consisting of t^{t} . The players are sequential rational²², which implies *PT* will choose his message based on *PA*'s subsequent strategies and prior assessment, θ . Thus, depending on the nature of *PT* and θ , *PT* will

²¹ Notice, Figure M2 displays the general set up of our game. We have not yet solved for equilibria, which is why all possible contingencies are outlined. The figure does not seek to answer whether all values of θ will result in the illustrated options. We will later show that some values of θ will result e.g. in direct M&A as outcome.

²² We use Gibbons (1992) definition of sequential rational: "That is, at each information set the action taken by the player with the move (and the player's subsequent strategy) must be optimal given the player's belief that information set and the other players' subsequent strategies (where a "subsequent strategy" is a complete plan of action covering every contingency that might arise after the given information set has been reached)."

either play $t_{P1}(\theta_A), t_{P2}(\theta_B), \dots, t_{L1}(\theta_F)$ as illustrated in Figure M2. In *t*=2, *PA* will next decide on its action, based on the received message from *PT*. Its action will be in the form of deciding whether to engage in a JV with buyout option, direct M&A or no action. If *PA* decides on JV and buyout option, he will offer E', which is the exercise price to *PT*. For each t' played, there is a uniquely determined E'. Also, by deciding upon JV with buyout option, *PA* postpones the acquisition decision until private information of *PT* is revealed. If, however *PA* in *t*=2 decides to make a direct M&A, the game ends. This choice implies *PA* to be sufficient optimistic, which will be examined more in detail when the actual model is presented. The last choice at *t*=2 for *PA* is to take no action.

In t=3, PA has gained all private information from PT, in case a JV with buyout option is established. Assuming PA initially chooses JV with buyout option, two choices exist at this specific moment; i) PA is confirmed in his initial positive beliefs about PT and exercises his buyout option, if PT turns out to be P, or ii) He decides not to continue with his initial acquisition intentions and exits if PT turns out to be L. In the latter case it is assumed that PA's initial investment²³ in the JV is lost.

As shown in Figure M2, we have constructed a 3-period model. In order to compare flows of profits and costs between different time periods, a discount factor is introduced, which is labeled Δ^{24} . Notice, the flows of profits and costs in *t*=3 are discounted to *t*=2, where *PA* makes his choice of which equilibrium strategy to choose. The flows are not discounted to *t*=1, since "no money changes hands" in this period. The first period, *t*=1, is also different from *t*=2 and *t*=3 as explained in section 2.1, since the first period is a signaling period, whereas the other periods are consequences of the action taken by *PA*, incurring flows of profits and costs.

At this stage, we have that setting up a JV with buyout option before engaging in the big M&A investment, provides PA with flexibility and the option to expand into an acquisition in case PT is P. A further discussion of the flexibility within the JV with buyout option setup, will be given at a later stage in this chapter.

²³ PA's initial investment is, as will be later shown, Asset Transfer Costs and Integration Costs.

²⁴ The discount factor reflects the time value of money. Money received at the beginning of a period is worth more than the same amount of money received in future periods, as the received money can be placed in the bank and earn interest. $\Delta = 1/(1+r)$, where *r* is the discount rate.

An important aspect of the model is distinguishing between P and L. Both PTs wants to maximize their net profit, given their messages. According to Krebs (1990) an important assumption is the socalled single cross property, which implies L demanding a higher increase in E' for a given increase in t'. Both PT firms would like to minimize t' as this incur costs and therefore will impact negatively on the net profit. Nevertheless, they both know that with asymmetric information they have to signal to PA. In order to compensate for the loss in t', the PT firms will demand an increase in E'. However, P will demand a relatively lower increase in E' than L.





Source: Krebs (1990)

Figure M3 shows the indifference curves of *L* and *P*. *L*'s curve is steeper than that of *P*, illustrating that for any given increase in t^i , *L* will demand a higher increase in E^i than *P*. The single cross property is an important underlying assumption for the model.

2.4 The Assumptions

In this section, the underlying assumptions for the model will be presented. The first three assumptions (A-C) are basic assumptions in a signaling game in Perfect Bayesian Equilibrium and less model specific in terms of The JV-M&A Asymmetric Information Model. The two assumptions, following next (D-E), deals with the differences between *PA* and *PT*. Third, two

assumptions (F-G) on what differentiates P from L and finally two general model assumptions (H-I).

2.4.1 Assumption A: Signaling Requirement 1

After observing any messages t', *PA* must have a belief about whether *P* or *L* could have sent t'. Thereby, it is assumed that *PA* knows the critical value of *L*, t', which is the upper integration cost bound for *L*. This will be explained more in detail, when the condition for t' is derived.

2.4.2 Assumption B: Signaling Requirement 2

For each t^{t} , *PA*'s action must maximize his expected Utility²⁵ given the belief about which types could have sent t^{t} .

2.4.3 Assumption C: Signaling Requirement 3

PT's message must maximize its Utility²⁶. *PT* has complete information and moves only at the beginning of the game, so Requirement 3 is simply that *PT*'s strategy is optimal given *PA*'s strategy.

2.4.4 Assumption D: Associated JV Costs

In order for *PA* to generate any profits from *PT*, *PA* has to make two kinds of investments. These investments are considered as costs, which we call: i) *Asset Transfer Costs*, and ii) *Integration Costs*.

Asset Transfer Costs

We label the asset transfer cost, φ . It is important to note that when referred to the asset transfer costs, assets should be understood as intangible assets. In other words, the transfer is related to know-how within strategy, technology, organization etc. In addition to being an intangible asset, we also see φ as being a complementary asset to the existing assets of *PT*. φ is strictly imposed on *PA* and never *PT*. By assumption we have

 $^{^{25}}$ Von Neuman-Morgenstern's expected utility. We implicitly assume *PA* and *PT* are risk neutral. They both accept a fair gamble, i.e. the expected payoff is a weighted average of the outcome probabilities.

$\varphi \ge 0$

In addition, φ is a per period cost.

Integration Costs

Integration costs are costs associated with integrating the two firms. These do not only include e.g. investments in fixed assets, but also the indirect costs involved with having two different management teams instead of just one²⁷. Whereas *PA* solely holds the asset transfer costs, *PA* and *PT* can share the integration costs. Defining *a* as *PA*'s share of the integration costs, and *t*' as *PT*'s share of the integration costs, we have

 $t' + a \equiv 1 \Leftrightarrow t' = 1 - a$

If a JV with buyout option is established, it is assumed that t' > 0, i.e. both parties have to contribute to the integration costs. However, if a M&A takes place we implicitly have t'=0. Also, we allow t' to be greater than 1 (implying that *a* is negative). In that case, *PA* receives a transfer of wealth from *PT*.

We thus formally require

If direct M&A, t' = 0If JV with buyout option, t' > 0

2.4.5 Assumption E: The Integration Cost Differential

Having defined the shares of the integration costs in Assumption D, we now turn to an assumption, which we call *The Integration Cost Differential*. It is defined as:

PT's unit cost of integration > PA's unit cost of integration.

²⁶ Ibid

²⁷ We use the term "indirect" as it can be argued that it is less efficient to have two management teams as opposed to one.

By assumption the following is set:

PT's cost of integration = $1 + \psi$ where $\psi > 0$. *PA*'s cost of integration = 1

This implies, if JV with buyout option is formed and *PT* shares t^i of the integration costs, *PT* holds the following costs: $t^i(1+\psi)$. The above assumptions imply that *PA* is more efficient than *PT*. The reason behind *PA*'s lower unit costs of integration is related to its competitive business advantage and thereby the ability to earn economic rents.

2.4.6 Assumption F: The Profit Differential

By construction we have

$$\pi_P^A > \pi_L^A$$

where π_P^A and π_L^A denote the expected stand-alone profit²⁸ for *P* and *L*, respectively. We use the term stand-alone, when *L* or *P* is not engaged in combined activities with *PA*, that is JV with buyout option or direct M&A.

In order to make the model as simple as possible, we set: $\pi_L^A = 0$. We thus have

$$\pi_P^A > \pi_L^A \equiv 0$$

Following the line of simplicity, we also assume that PA's stand-alone profits are zero by construction.

Combining assumption E and F thus form the underlying assumption for the single cross property mentioned in the introduction to the model. The assumption is in line with Spence (1974) who assumes applicants in the job market possess different skills, which impact their productivity.

2.4.7 Assumption G: Net Profits

The following assumptions (G1 + G2) will illustrate *PA*'s choice of interest in *PT* if no asymmetric information exists *or* t'=0.

If *PT* is of Nature *P*, we set the following assumption:

G1)
$$1 + \varphi < \pi_P^C - \pi_P^A$$

 π_P^C is the expected profits from combined activities by *P* and *PA*.

If *PT* is of Nature *L*, we set the following assumption:

$$G2) 1+\varphi > \pi_L^C > 0$$

Assumption G thus tells us there are positive net-profits (net of JV-costs) associated with a combined activity between PA and PT, if PT is of Nature P and negative net-profits with a combined activity if PT is of Nature L.

2.4.8 Assumption H: The JV Period

The JV Period assumption states that *P* would be better off as a stand-alone firm compared to one period of combined activity with *PT*. The one period of combined activity is only associated with the JV period, and not any subsequent periods. We thus have

 $\pi_P^C \leq (1+\Delta)\pi_P^A$

2.4.9 Assumption I: Profit Sharing Rule

For the simplicity of the model, we assume *PT* extracts all net profits in the first JV period, i.e. t=2, between *PA* and *PT*. In t=3 it is the other way around and *PA* extracts all net profits²⁹. ω is *PA*'s share of the Added Welfare to Society, S_N , $N \in (L,P)$. S_N can also be understood as gains from combined activities, that is, synergies. Thus, ω equals 0 in t=2 and 1 in t=3. It will later be shown

²⁸ Also called the reservation value

²⁹ Given PT is P, since no combined activity would rationally exist if PT were L, given Assumption G.

that ω cannot exactly equal 1, but rather converges to 1, i.e. $\omega \in [0,1)$. Thereby, ω is a constant that is predetermined before the start of the game. *PA* and *PT* can therefore not change ω and *PT* cannot use it as a message³⁰.

It is not important for the final equilibrium of the model, how the actual sharing is done, but important that an assumption about the sharing is made, so that *PA*'s net profit from the JV with buyout option can be determined.

2.5 The Case of Full Information

With the initial model assumptions at hand, we will start presenting the full information benchmark³¹. This will provide us with the scenario in which there exists no asymmetric information and *PA* can therefore pick the optimal outcome of the game. In other words, the transparency of the market makes the outcome most efficient.

An efficient outcome will lead to *PA* only picking *P* as described in the assumptions in section 2.4. S_P can therefore be written as

Discounting
of net profit
$$S_{p} = (1 + \Delta)(\pi_{p}^{C} - \pi_{p}^{A} - \varphi - (1 - t^{t}) - t^{t}(1 + \psi))$$

Net revenue from Asset transfer costs and

combined activity

inefficient integration costs

By rearranging S_P we have

 $S_P = (1 + \Delta)(\pi_P^C - \pi_P^A - 1 - \varphi - t'\psi)$

³⁰ If ω was not exogenous determined, *PT* would use ω as a message and he would signal higher ω to show *PA* that he is *P*. This would imply t' not being a credible message.

³¹ The inspiration of making a full information benchmark at the very beginning of a signaling model is drawn from Laffont & Tirole (2000).

 $t^{i}\psi$, in the above equation, is the inefficiency term given in S_{P} . In order to maximize S_{P} , $t^{i}\psi$ should be minimized, i.e. when $t^{i} = 0$. An important finding in the full information benchmark implies the efficient outcome when $t^{i}=0$.

Recall, JV with buyout option is used as a mean of eliminating asymmetric information. Further, since a direct M&A strategy will liberate *PA* from the inefficiency term related to the JV with buyout option strategy, an implication of the full information is that direct M&A will be the optimal strategy. In the section below, we will take a more thorough look at the exercise price related to direct M&A in the full information benchmark.

2.5.1 Exercise Price under Full Information

As already found, t'=0, under full information. In the following, we will try to determine the corresponding E'_P , which is the exercise price for *P*. In this section, E'_P should, however, be interpreted as the sales price for *P* rather than the exercise price since M&A occurs.

Under full information, it easily follows that PA will become an actual acquirer if

$$\pi_P^C - (1 + \varphi) \ge E_P^{bid} \qquad ; \ E_N^{bid} \equiv (1 + \Delta) e_N^{bid}$$

 E_P^{bid} is the exercise price, *PA* would offer *P*, which is the sum of the discounted exercise prices, e_N^{bid} , in the different game periods. e_N^{bid} should be interpreted as the price *PA* would pay for the net profits of *PT* in a given period. It follows from the latter equation that direct M&A will only be the case, if the offered price is lower or equal to the gains by making the acquisition.

Looking at the acquisition from P's point of view, we thus have that P would only engage in a direct M&A if

$$E_P^{ask} \ge \pi_P^A \ge 0$$

 E_P^{ask} is the sales price P would require.

For direct M&A to be realized, the following criteria must be met

$$E_P^{bid} \ge E_P^{ask}$$

Figure M4 below illustrates when the condition, $E_p^{bid} \ge E_p^{ask}$, is met.

Figure M4, M&A under Full Information

Nature	Bid price	Ask price	Result
Р	$\pi_P^C - (1 + \varphi) \ge E_P^{bid}$	$E_P^{ask} \ge \pi_P^A$	Deal will take place, due to Assumption G1*

* Assumption G1) $1 + \varphi < \pi_P^C - \pi_P^A$

Source: Own construction

The condition for a M&A, will thus lie in the following range:

$$E_P^{\iota} \in [\pi_P^A; \pi_P^C - (1+\varphi)]$$

Where π_p^A is the lower bound, that is, the lowest price *P* would be willing to sell at, and $\pi_p^C - (1 + \varphi)$ is the upper bound for *PA*, that is, the maximum price *PA* would be willing to pay for *P*.





Source: Own construction

2.6 Separating Equilibria

As mentioned in the beginning of this chapter, separating equilibria implies *PA* being able to distinguish between *P* and *L*. We thus formally require: $t_P^i \neq t_L^i$.

A direct implication of separating equilibria, is that it will only lead to a JV with buyout option outcome. The underlying assumption is that when PT sends a message, he also has to "put his money where his mouth is", meaning that the credible message is only credible when it can be carried out, given rationality. In case PT is not forced to "put his money where his mouth is", it would be easy for L to mimick the credible separating message of P, thereby resulting in a non-credible message. Direct M&A will not appear in a separating equilibrium, since the message for PT in case of direct M&A can be mimicked by L. If P sends a message that L can mimick without transaction costs, which is the case if PA chooses a direct M&A strategy, the outcome is not a separating equilibrium.

In the following, we will take a more thorough look at what it takes to create a credible message. For a message to be credible, conditions 1S-4S (*S* denotes *S*eparating), must to be fulfilled:

2.6.1 The Conditions

Condition 1S: P's Message Condition

The first condition requires that *P* must prefer sending the message, t_P^t , to the stand-alone scenario. This can be expressed in the following way:

$$\Delta E_P^{\prime} + \pi_P^C - t_P^{\prime}(1+\psi) \ge (1+\Delta)\pi_P^A$$

Net profit from sending the message (JV with buyout option)

By isolating ΔE_P^i we have

 $\Delta E_P^i \ge (1+\Delta)\pi_P^A - \pi_P^C + t_P^i(1+\psi)$

Now, referring to Assumption H where $(1 + \Delta)\pi_p^A \ge \pi_p^C$, we can easily see that the exercise price for *PT*, in case of *P*, must be: $\Delta E_p^i \ge 0$.

Condition 2S: Exercise Price Condition

The aim of this condition is to ensure buyout will actually take place at the ex post stage, that is, when *PT* is *P*.

In order for PA to exercise its buyout option, the value of PT must be in the money, that is, the exercise price must be less or equal to the actual market value of PT at the expost stage. We thus have the following condition:

$$\Delta E_P^f \ge \Delta E_P^i$$

where ΔE_P^f is the exercise price based on full information. ΔE_P^f is therefore the true value of *P* ex post. ΔE_P^f is defined as

$$\Delta E_P^f \equiv \Delta (1-\omega)(\pi_P^C - \pi_P^A - \varphi - 1) + \Delta \pi_P^A$$
Equation M1

where ω is *PA*'s share of the gains.

If it turns out that $\Delta E_P' \ge \Delta E_P^f$ then *PA* will not exercise its option, because this would incur a loss. As a consequence of this, *PA* will propose a renegotiating of the exercise price at the end of *t*=2. Due to the fact that *PT* can foresee the problems involved with an exercise price that is higher than the actual value of the firm, the endgame resulting from the bargaining at the ex ante level, will thus be an exercise price, which will not be renegotiated ex post.

Condition 3S: L's Stand-alone Condition

Opposite to condition 1S, we must have, *L* would prefer stand-alone than sending the message, t_P^i . This is simply due to the fact that the message should be too costly for *L*, if *L* undertook, t_P^i . The stand-alone preference for *L* can be expressed as:

$$(1+\Delta)\pi_L^A \ge \pi_L^C - t_P^i(1+\psi) + \min\{\Delta\pi_L^A, \Delta E_P^i\}$$

The reason why min $\{\Delta \pi_L^A, \Delta E_P^i\}$ is written in the above equation, is due to the fact that by the end of the JV, *PA* knows whether *PT* is *P* or *L*. In case *PT* shows up to be *L*, *PA* will never exercise the buyout option, which leaves *PT* with $\Delta \pi_L^A$. However, since $\Delta E_P^i \ge 0$ (cf. condition 1S), and $\pi_L^A \equiv 0$ (see Assumption F), $(1 + \Delta)\pi_L^A \ge \pi_L^C - t_P^i(1 + \psi) + \min\{\Delta \pi_L^A, \Delta E_P^i\}$ can also be written as³²:

³² The reader should at this point note that we have established grey boxes as an integrated part of illustrating the JV-M&A Asymmetric Information Model. The grey boxes only contain mathematical derivations. The reader, who is not interested in the underlying mathematics, can choose not to examine the grey boxes in depth without loss of the intuitive comprehension of the model.

 $\pi_L^C - t_P^i (1 + \psi) \le 0$

Isolating t_P^i gives us

 $t_P^{\prime} \geq \pi_L^C / (1 + \psi)$

where $\pi_L^C / (1 + \psi)$ is the per period profit resulting from the JV with buyout option, relative to the cost involved with integration from *L*'s perspective. Since this will play an important role in the remaining of the model, we standardize this expression the following way

$$t_P^i \ge \pi_L^C / (1 + \psi) \equiv t$$
 Equation M2

where $t^{upper,L}$ is the upper integration cost bound for *L*, that is, *L*'s maximum "pain-limit". The upper integration cost bound for *L*, should be understood as the maximum costs a sequential rational *L* would undertake, when sending the message. If *L* undertook a t', which was higher than t', *L*'s costs resulting from his involvement in the JV with buyout option would be higher than his profit from participation, making a negative net profit. *L* would in this case prefer the stand-alone scenario, which according to Assumption F would result in profit being equal to 0.

Condition 4S: PA's preference condition

The first 3 conditions have focused on *PT*. We now turn our focus to *PA* and determine his preferences. According to Assumption F, *PA*'s stand-alone profit is zero. *PA* will always prefer JV with buyout option, than the stand-alone scenario, when *PT* is *P*, that is

$$-\Delta E_{P}^{'} + \Delta (\pi_{P}^{C} - \varphi - 1) - (\varphi - (1 - t_{P}^{'})) \ge 0$$

where $-\varphi - (1 - t_P^t)$ is *PA*'s cost during the JV period.

2.6.2 Finding the Equilibria

Based on the 4 conditions described in the previous section, we can derive the actual separating equilibria.

If PT is P, the Added Welfare to Society, S, if JV with buyout option is formed, is thus

$$S_{p} = (\pi_{p}^{C} - \varphi - a - t_{p}^{t}(1 + \psi) - \pi_{p}^{A}) + (\Delta \pi_{p}^{C} - \Delta \varphi - \Delta 1 - \Delta \pi_{p}^{A})$$

Added Welfare to Society for t=2 (=the JV period)

Added Welfare to Society for t=3 (=after exercising the option)

Based on the expression for S_P , we can write the upper integration cost bound for P, as

Substituting for *a* where $a = 1 - t_P^i$, S_P can thus be written as $S_P = (\pi_P^C - \varphi - (1 - t_P^i) - t_P^i - t_P^i \psi - \pi_P^A) + (\Delta \pi_P^C - \Delta \varphi - \Delta 1 - \Delta \pi_P^A)$ $S_P = (\pi_P^C - \varphi - 1 + t_P^i - t_P^i - t_P^i \psi - \pi_P^A) + (\Delta \pi_P^C - \Delta \varphi - \Delta 1 - \Delta \pi_P^A) \Leftrightarrow$ $S_P = (\pi_P^C - \varphi - 1 - t_P^i \psi - \pi_P^A) + (\Delta \pi_P^C - \Delta \varphi - \Delta 1 - \Delta \pi_P^A)$

Moving t_P^{t} to the left hand side, the upper integration cost bound for P can be written as

$$t_p^{\iota} \le (\pi_p^C - \varphi - 1 - \pi_p^A + \Delta \pi_p^C - \Delta \varphi - \Delta 1 - \Delta \pi_p^A) / \psi$$

Putting $(1 + \Delta)$ outside a bracket on the right hand side gives us

$$t_P^i \leq (1+\Delta)(\pi_P^C - \varphi - 1 - \pi_P^A)/\psi$$

We standardize this the following way

$$t_P^{\prime} \le (1+\Delta)(\pi_P^C - \varphi - 1 - \pi_P^A)/\psi \equiv t$$
Equation M3

The upper integration cost bound for P should be understood as the maximum costs a sequential rational P can incur, that is, his "pain-limit". A value higher than the limit, means that P's costs resulting from his involvement in the JV with buyout option, is larger than his profit from participation, making a negative net profit.

In order to ease the derivation of forthcoming equations in the model the following expression for S_P is made:

From Equation M3 we have

$$(\pi_P^C - \varphi - 1 - \pi_P^A + \Delta \pi_P^C - \Delta \varphi - \Delta 1 - \Delta \pi_P^A)/\psi \equiv t$$

 ψ is moved to the right hand side

$$(\pi_P^C - \varphi - 1 - \pi_P^A + \Delta \pi_P^C - \Delta \varphi - \Delta 1 - \Delta \pi_P^A) \equiv \psi t$$

 $-\psi t$ is inserted on both the left and right hand side

$$(\pi_P^C - \varphi - 1 - \pi_P^A + \Delta \pi_P^C - \Delta \varphi - \Delta 1 - \Delta \pi_P^A) - \psi t_P^t \equiv \psi t - \psi t_P^t$$

The left hand side is equal to S_p , we thus have

$$S_{P} = \psi \overset{upper,P}{t} - \psi t_{P}^{i}$$

$$S_{P} = \psi (\overset{upper,P}{t} - t_{P}^{i})$$

Equation M4

Hence, in order for sequential separating equilibria to exist, we must have

$$t \ge t$$
Equation M5

Figure M6, Separating Equilibria



Source: Own construction

Separating equilibria requires the message of P to be credible. Equation M5 shows this will lead to multiple separating equilibria, as many outcomes satisfy the equation condition. Figure M6 shows how the net profit is a decreasing function of t'. Notice that L is steeper than P, due to the assumption about the single cross property presented in the introduction. P demands relatively less than L for an increase in t'. In order to optimize its net profit, P will send a credible message to PA. Given the mentioned behavior, P will choose the lowest possible t'_P while still being able to send a

credible message. The unique undominated separating equilibrium³³ will therefore be $t_P^i = t^{ipper,L}$, given sequential rational behavior. The unique undominated separating equilibrium will maximize the payoff of the JV between *P* and *PA*, given *P* chooses a differentiation strategy.

The Added Welfare to Society for the undominated separating equilibrium can thus intuitively from Equation M4, be given as

$$S_{P}\begin{bmatrix} upper,L\\t\end{bmatrix} = \psi(t - t)$$

Equation M6



Figure M7, Unique Undominated Separating Equilibrium

Source: Own construction

³³ Cho & Kreps (1987)

At first sight, the unique undominated equilibrium of $t_p^t = t^{upper,L}$ does not seem to make sense, as it contradicts with the definition of separating equilibrium as mentioned earlier in this paper³⁴. If $t_L^t = t^{uppper,L}$, *L* is indifferent between stand-alone (status quo) and engaging in JV with buyout option. To solve this problem, we refer to the tie breaking rule, which *we* define as:

Tie Breaking rule

"Given a player being indifferent between 2 choices, the player will not make the choice that departs him from status quo."

Applying the tie breaking rule in our model, means that L prefers the stand-alone scenario for choosing the separating equilibrium. The tie breaking rule assumes that a given player in a given game will choose stand-alone than anything else, if ceteris paribus, the gains are equal in playing the two strategies.

Figure M8, End result of the Tie Breaking rule



Source: Own construction

Thus fare we have found the requirement for sequential separating equilibria to exist, c.f. Equation M5. In the following, we will examine how the input values for t and t will affect the separating equilibria.

Substitution Equation M3 for
$$t^{upper,P}$$
 and Equation M2 for $t^{upper,L}$, Equation M5 can thus be written as
 $\pi_L^C / (1+\psi) \le (\pi_P^C - \varphi - 1 - \pi_P^A + \Delta \pi_P^C - \Delta \varphi - \Delta 1 - \Delta \pi_P^A) / \psi$
Rearranging the right hand side by putting (1+ Δ) outside the brackets, gives us

 $\pi_L^C / (1+\psi) \le (1+\Delta)(\pi_P^C - 1 - \varphi - \pi_L^A) / \psi$ Multiplying with $(1+\psi)$ on both sides of gives us $\pi_L^C \le ((1+\Delta)(\pi_P^C - 1 - \varphi - \pi_L^A) / \psi)(1+\psi)$ Dividing with $(\pi_P^C - 1 - \varphi - \pi_L^A)$ on both sides, gives us $\pi_L^C / (\pi_P^C - 1 - \varphi - \pi_L^A) \le ((1+\Delta)(1/\psi))(1+\psi)$ Finally, rearranging the right hand side, gives us

$$\pi_L^C / (\pi_P^C - 1 - \varphi - \pi_L^A) \le (1 + \Delta)((1 + \psi) / \psi)$$
 Equation M7

Equation M7 gives us a solid platform for a discussion of the factors involved with separating equilibria. The larger the difference between the left and right hand side of Equation M7, the more separating equilibria exist, which corresponds to the difference between $t^{upper,L}$ and $t^{upper,P}$ in Figure M6. This requires the values of π_L^C , φ and π_L^A to be as low as possible, while the values of π_P^C and Δ should be as high possible.

2.6.3 Exercise Price in Separating Equilibria

Thus fare, we have been looking at what conditions *P* have to meet in order to separate itself, in terms of t_p^i . In the following we will examine what is required for E_p^i in separating equilibria.

PA's share of the Added Welfare to Society from the JV with buyout option with *P*, can be written as

$$\omega S_P = \Delta (\pi_P^C - \varphi - 1) - 1 - \varphi + t_P^i - \Delta E_P^i$$

Substituting for $S_p = \psi \begin{pmatrix} upper, P \\ t & -t_p^{t} \end{pmatrix}$ from Equation M4 and moving ΔE_p^{t} to the left hand side, gives us

$$\Delta E_P^{i} = -\omega \psi (t - t_P^{i}) - 1 - \varphi + t_P^{i} + \Delta (\pi_P^C - \varphi - 1)$$
 Equation M8

³⁴ In a separating equilibrium the potential target candidates send different messages

2.6.4 Summary of Separating Equilibria

In section 2.6.2-2.6.3 we have shown the existence of separating equilibria when Equation M5 holds. Further more, a unique undominated separating equilibrium exists when $t^{t} = t^{upper,L}$. The Added Welfare to Society for the undominated separating equilibrium is given in Equation M6. Finally we found there is a uniquely determined E_{p}^{t} for each equilibria. This exercise price is given in Equation M8.

2.7 Sequential Pooling Equilibria

In this section we will look at the model in a different setting. More specifically, we will assume *PT*'s message does not allow *PA* to separate *P* from *L*. Using the terms developed in the previous sections, we thus have: $t_P^i = t_L^i$

In the setting of sequential pooling equilibria, we will look at two different scenarios: i) Pooling equilibria with direct M&A, ii) Pooling equilibria with JV with buyout option to *PA*. In both scenarios, we will start out by deriving the requirements for pooling equilibria. As will be shown, the pooling equilibria in both scenarios will depend on θ , that is, *PA*'s probability assessment that *PT* is of Nature *P*. In general we have, the higher θ , the more likely would *PA* be to buy *PT* from a pool of *P*s and *L*s. θ should therefore also be interpreted as *PA*'s level of optimism³⁵.

Refinement, as suggested by Cho & Krebs (1987), will be made in section 2.7.2 and 2.7.4. The refinement illustrates the existence of pooling equilibria, even if a separating strategy could have been chosen by *P*. *P* will choose to send a pooling for a separating message, when E[S] is higher than S_P .

 $^{^{35}}$ The fact that we are trying to find an expression for *PA*'s optimism has a clear parallel to Roll's (1986) hubris argument. Roll states one driving force behind M&As is when managers in acquiring fims suffer from severe optimism.

2.7.1 Pooling Equilibria with Direct M&A

This section will deal with the scenario, in which *PA* chooses a direct M&A instead of engaging himself in JV with buyout option. For direct M&A to take place, we must have *PA* being sufficiently optimistic, since he is buying *PT* from a pool of *P*s and *L*s.

In the following, we will develop an expression for *PA*'s optimism in a direct M&A setting. Since *PA*'s optimism is related to his probability assessment of *PT* being of Nature *P*, the primary purpose of section 2.7.1 is to develop a requirement for θ .

2.7.1.1 Exercise Price in Pooling Equilibria with Direct M&A

First, in the setting of direct M&A, we have $t'_N = 0$, since no integration costs are required from *PT*. This gives the message the following form: $t'_N = 0$.

Now, in order for both P and L to give up ownership in a direct M&A, we must have:

$$e^{i}(1+\Delta) \ge \pi_{N}^{A}(1+\Delta), \quad N \in P,L$$
 Equation M9

The above equation thus simply states, that the direct M&A price has to be greater or equal to the stand-alone profit for *PT*, in order for *PT* to be willing to sell out directly. Equation M9 thus implies that $e^{t} > 0$ due to Assumption F. In addition the equation also states that if *P* and *L* both are offered the same exercise price, and *P* is willing to participate in a direct M&A, then (given individual rationality) *L* would also participate.

The ex ante expected Added Welfare to Society, E[S], from a direct M&A, can be given as a weighted average of θ

$$E[S] = \theta(1+\Delta)(\pi_{P}^{C} - \pi_{P}^{A} - \varphi - 1) + (1-\theta)(\pi_{L}^{C} - \pi_{L}^{A} - \varphi - 1)$$

As π_L^A equals 0, according to Assumption F, it follows that

$$E[S] = \theta(1+\Delta)(\pi_{P}^{C} - \pi_{P}^{A} - \varphi - 1) + (1-\theta)(\pi_{L}^{C} - \varphi - 1)$$
 Equation M10

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Based on Equation M10, PA's share of the expected Added Welfare to Society, is thus

$$\omega E[S] = \theta (1+\Delta)(\pi_P^C - \varphi - 1) + (1-\theta)(\pi_L^C - \varphi - 1) - e^t(1+\Delta)$$
 Equation M11

Based on Equation M11, an expression for the direct M&A price, can be written as

Isolating e^{t} in Equation M11 gives us

$$e^{l}(1+\Delta) = \theta(1+\Delta)(\pi_{P}^{C} - \varphi - 1) + (1-\theta)(\pi_{L}^{C} - \varphi - 1) - \omega E[S]$$

also, the first term on the right hand side can also be written as $\theta(1+\Delta)(\pi_P^C - \pi_P^A - \varphi - 1) + \theta(1+\Delta)\pi_P^A$. We thus have

$$e^{l}(1+\Delta) = \theta(1+\Delta)(\pi_{P}^{C} - \pi_{P}^{A} - \varphi - 1) + \theta(1+\Delta)\pi_{P}^{A} + (1-\theta)(\pi_{L}^{C} - \varphi - 1) - \omega E[S]$$

Substituting the expression for E[S] by using Equation M10, gives us

 $e^{l}(1+\Delta) = \theta(1+\Delta)(\pi_{P}^{C} - \pi_{P}^{A} - \varphi - 1) + \theta(1+\Delta)\pi_{P}^{A} + (1-\theta)(\pi_{L}^{C} - \varphi - 1) - \omega(\theta(1+\Delta)(\pi_{P}^{C} - \pi_{P}^{A} - \varphi - 1) + (1-\theta)(\pi_{L}^{C} - \varphi - 1))$ this can be reduced to $e^{l}(1+\Delta) = E[S] + \theta(1+\Delta)\pi_{P}^{A} - \omega E[S]$ which further can be written as

$$e^{l}(1+\Delta) = (1-\omega)E[S] + \theta(1+\Delta)\pi_{P}^{A}$$
 Equation M12

Equation E12 thus states, that in all sequential pooling equilibria with direct M&A, the direct M&A price is $e^{t}(1 + \Delta) = (1 - \omega)E[S] + \theta(1 + \Delta)\pi_{P}^{A}$.

In addition, we must have that the direct M&A price is greater or equal to the stand-alone profits for P, in order for both P and L to participate in a direct M&A, cf. Equation M9. The requirement to the direct M&A price can thus be written as

$$e^{t}(1+\Delta) = (1-\omega)E[S] + \theta(1+\Delta)\pi_{P}^{A} \ge \pi_{P}^{A}(1+\Delta)$$

The requirement given in the above equation is of great importance, as the inequality

$$(1-\omega)E[S] + \theta(1+\Delta)\pi_P^A \ge \pi_P^A(1+\Delta)$$

Equation M13

will be our platform for deriving an expression for θ , cf. the purpose of this section.

2.7.1.2 Requirement for θ in Pooling Equilibria with Direct M&A

The first step to derive θ from Equation M13, is to substitute the expression for E[S] in Equation M13. The definition of E[S] was defined in Equation M10. The term $(1+\Delta)(\pi_p^C - \pi_p^A - \varphi - 1)$ in Equation M10 is equal to $\psi^{upper,P}$ cf. Equation M3. In other words, the expected Added Welfare to Society can also be written as

$$E[S] = \theta \psi^{upper,P} t + (1-\theta)(\pi_L^C - \varphi - 1)$$

Substituting the above expression for E[S] into Equation M13, gives us

$$(1-\omega)\left[\theta\psi^{upper,P}_{t}+(1-\theta)(\pi_{L}^{C}-\varphi-1)\right]+\theta(1+\Delta)\pi_{P}^{A}\geq(1+\Delta)\pi_{P}^{A}$$

Dividing $(1 - \omega)$ on both sides of the equation (assuming $\omega \neq 1$) and removing the brackets on left hand side, gives us

$$\theta \psi \overset{upper,P}{t} + \pi_L^C - \varphi - 1 - \theta \pi_L^C + \theta \varphi + \theta + \frac{\theta(1+\Delta)}{(1-\omega)} \pi_P^A \ge \frac{(1+\Delta)}{(1-\omega)} \pi_P^A$$

Rearranging by isolating all terms containing θ on the left hand side, gives us

$$\theta \psi \stackrel{upper,P}{t} - \theta \pi_L^C + \theta \varphi + \theta + \frac{\theta (1+\Delta) \pi_P^A}{(1-\omega)} \ge \frac{(1+\Delta)}{(1-\omega)} \pi_P^A - \pi_L^C + \varphi + 1$$

Putting θ outside a bracket on the left hand side, gives us

$$\theta \left[\psi^{upper,P}_{t} - \pi_{L}^{C} + \varphi + 1 + \frac{(1+\Delta)}{(1-\omega)} \pi_{P}^{A} \right] \ge \frac{(1+\Delta)}{(1-\omega)} \pi_{P}^{A} - \pi_{L}^{C} + \varphi + 1$$

Isolating θ on the left hand side, gives us

$$\theta \geq \frac{\frac{(1+\Delta)}{(1-\omega)}\pi_{P}^{A} - \pi_{L}^{C} + \varphi + 1}{\psi t - \pi_{L}^{C} + \varphi + 1 + \frac{(1+\Delta)}{(1-\omega)}\pi_{P}^{A}}$$

We have thus fare found an expression for θ . Below we will rewrite this to a more simple expression, which can be comparable to other equilibria expressions we will derive in upcoming sections. This is important so direct comparison between equilibria can be made

Adding the synthetic term, $\psi t - \psi t$ in the numerator, gives us

$$\theta \geq \frac{\psi t^{pper,P} - \psi t^{pper,P} + \frac{(1+\Delta)}{(1-\omega)} \pi_P^A - \pi_L^C + \varphi + 1}{\psi t^{pper,P} + \frac{(1+\Delta)}{(1-\omega)} \pi_P^A - \pi_L^C + \varphi + 1}$$

the expression for θ can thus finally be written as

$$\theta \ge 1 - \frac{\psi t}{\psi t} = \theta_{directM\&A}$$
$$\theta \ge 1 - \frac{\psi t}{\psi t} + \frac{(1+\Delta)}{(1-\omega)} \pi_P^A - \pi_L^C + \varphi + 1$$

Equation M14

As $\theta_{directM\&A}$ is]0;1[according to Equation M14, we thus have a level of θ , where sequential pooling equilibria with direct M&A can exist³⁶.

To sum up, sequential pooling equilibria with direct M&A can be stated by the result found in Equation M14, and the direct M&A price in sequential pooling equilibria is given by Equation E12. If $\theta \ge \theta_{directM\&A}$, we have a *PA* who is sufficiently optimistic in his ex ante view of *P* and *L*, and sequential pooling equilibria with direct M&A exists. If however, $\theta < \theta_{directM\&A}$ *PA* is too pessimistic in his prior beliefs and no sequential pooling equilibria with direct M&A exists.

2.7.2 Refined Separating Equilibria, Pooling Equilibria With Direct M&A

The focus of this section is to take a more thorough look at the requirement for *PA* preferring to play a pooling equilibria with direct M&A, for a separating equilibria³⁷. In other words, our purpose is thus to derive an expression for θ which results in a higher net profit for *PA*, than he would achieve by playing a separating strategy. Hence, *PA* could potentially play a separating strategy, assuming *P* sends a message, $t' \ge t^{upper,L}$, but chooses pooling, as the net profit is higher.

³⁶ $\theta_{directM\&A} \in]0;1[$ for the following reason: Looking at Equation M14, it is seen $\psi t^{upper,P}$ appears in both the numerator and denominator. If $\psi t^{upper,P}$ only appeared in the fraction, this would result in $\theta_{directM\&A} = 0$. However, since $\frac{(1+\Delta)}{(1+\omega)}\pi_{P}^{A} - \pi_{L}^{C} - \varphi + 1$ appears in the denominator and $\pi_{L}^{C} - \varphi + 1 > 0$ due to assumption G2, the fraction in Equation

From a basic modeling point of view, we thus have to ensure that both P and L are better off in a pooling equilibrium than the unique undominated separating equilibrium found in section 2.6.2.

We know from Equation M9, that if P is willing to participate in a direct M&A, so too would L, due to individual rationality. In addition, we know that P would be willing to participate in pooling equilibrium with direct M&A if the net-profit of this strategy out weights the net-profit in playing the separating equilibrium. This can be written as

$$(1-\omega)E[S] + \theta(1+\Delta)\pi_{P}^{A} \ge (1-\omega)S_{P}\begin{bmatrix}upper,L\\t\end{bmatrix} + (1+\Delta)\pi_{P}^{A}$$

Net-profit to *P* from pooling with direct M&A, based on Equation M12 Net-profit to *P* from separating equilibrium, based on Equation M6

From the above equation, an expression for θ , can be given as

Isolating for
$$E[S]$$
, gives us

$$E[S] \ge S_{p} \begin{bmatrix} upper,L \\ t \end{bmatrix} + \frac{(1+\Delta)}{(1-\omega)} \pi_{p}^{A} - \frac{\theta(1+\Delta)\pi_{p}^{A}}{(1-\omega)}$$
Substituting for $E_{l}S_{l}$ using Equation M10 and $S_{p} \begin{bmatrix} upper,L \\ t \end{bmatrix}$ using Equation M6, gives us
 $\theta(1+\Delta)(\pi_{p}^{C}-1-\varphi-\pi_{p}^{A})+(1-\theta)(\pi_{L}^{C}-1-\varphi) \ge \psi(\overset{upper,P}{t}-\overset{upper,L}{t})+(1-\theta)\frac{(1+\Delta)}{(1-\omega)}\pi_{p}^{A}$
Removing the brackets, gives us
 $\theta\pi_{p}^{C}-\theta-\theta\varphi-\theta\pi_{p}^{A}+\theta\Delta\pi_{p}^{C}-\theta\Delta-\theta\Delta\varphi-\theta\Delta\pi_{p}^{A}+\pi_{p}^{C}-1-\varphi-\theta\pi_{L}^{C}+\theta+\theta\varphi) \ge \psi(\overset{upper,P}{t}-\overset{upper,L}{t})+\frac{(1+\Delta)}{(1-\omega)}\pi_{p}^{A}-\frac{(1+\Delta)}{(1-\omega)}\pi_{p}^{A}\theta$
Eliminating the duplicating terms, $\theta-\theta+\theta\varphi-\theta\varphi$, gives us
 $\theta\pi_{p}^{C}-\theta\pi_{p}^{A}+\theta\Delta\pi_{p}^{C}-\theta\Delta-\theta\Delta\varphi-\theta\Delta\pi_{p}^{A}+\pi_{p}^{C}-1-\varphi-\theta\pi_{L}^{C}\ge \psi(\overset{upper,L}{t}-\overset{upper,L}{t})+\frac{(1+\Delta)}{(1-\omega)}\pi_{p}^{A}\theta$

Rearranging by putting terms containing θ on the right hand side, gives us

³⁷ Cho & Krebs (1987)

$$\theta \pi_{P}^{C} - \theta \pi_{P}^{A} + \theta \Delta \pi_{P}^{C} - \theta \Delta - \theta \Delta \varphi - \theta \Delta \pi_{P}^{A} - \theta \pi_{L}^{C} + \frac{(1+\Delta)}{(1-\omega)} \pi_{P}^{A} \theta \geq \psi \begin{pmatrix} upper, P & upper, L \\ t & -t \end{pmatrix} + \frac{(1+\Delta)}{(1-\omega)} \pi_{P}^{A} - \pi_{L}^{C} + 1 + \varphi = 0$$

Setting θ outside a bracket gives us

$$\theta \left[\begin{array}{c} \pi_P^C - \pi_P^A + \Delta \pi_P^C - \Delta - \Delta \varphi - \Delta \pi_P^A - \pi_L^C + \frac{(1+\Delta)}{(1-\omega)} \pi_P^A \end{array} \right] \geq \psi \left(\begin{array}{c} {}^{upper,P} & {}^{upper,L} \\ t \end{array} \right) + \frac{(1+\Delta)}{(1-\omega)} \pi_P^A - \pi_L^C + 1 + \varphi \left(\begin{array}{c} \pi_P^C + \pi_P^C + \pi_P^C \end{array} \right) + \frac{(1+\Delta)}{(1-\omega)} \pi_P^A - \pi_L^C + 1 + \varphi \left(\begin{array}{c} \pi_P^C + \pi_P^C + \pi_P^C \end{array} \right) + \frac{(1+\Delta)}{(1-\omega)} \pi_P^A - \pi_L^C + \frac{(1+\Delta)}{(1-\omega)} \pi_P^A \right]$$

Isolating θ on the left hand side, gives us

$$\theta \geq \frac{\psi\begin{pmatrix}upper,P\\t&-t\end{pmatrix} + \frac{(1+\Delta)}{(1-\omega)}\pi_P^A - \pi_L^C + 1 + \varphi}{\pi_P^C - \pi_P^A + \Delta\pi_P^C - \Delta - \Delta\varphi - \Delta\pi_P^A - \pi_L^C + \frac{(1+\Delta)}{(1-\omega)}\pi_P^A}$$

Setting Δ outside a bracket in the denominator, gives us

$$\theta \ge \frac{\psi({t - - t - t - t}) + \frac{(1 + \Delta)}{(1 - \omega)}\pi_p^A - \pi_L^C + 1 + \varphi}{\Delta(\pi_p^C - 1 - \varphi - \pi_p^A) + \pi_p^C - \pi_p^A - \pi_L^C + \frac{(1 + \Delta)}{(1 - \omega)}\pi_p^A}$$

Substituting for $t^{upper,P} \equiv ((1+\Delta)(\pi_P^C - 1 - \varphi - \pi_P^A))/\psi$ ($\Leftrightarrow \psi t^{upper,P} = (1+\Delta)(\pi_P^C - 1 - \varphi - \pi_P^A)$) cf. Equation M3 in the denominator, gives us³⁸

$$\theta \geq \underbrace{\frac{\psi(t-t)^{pper,P} - upper,L}{(t-\omega)} + \frac{(1+\Delta)}{(1-\omega)} \pi_P^A - \pi_L^C + 1 + \varphi}_{\psi t} + \underbrace{\psi(t-t)^{P} - \pi_P^C + 1 + \varphi + \pi_P^A + \pi_P^C - \pi_P^A - \pi_L^C + \frac{(1+\Delta)}{(1-\omega)} \pi_P^A}_{\psi t}$$

Synthetic neutralizing terms

Eliminating the following duplicating terms, $\pi_P^C - \pi_P^C + \pi_P^A - \pi_P^A$, in the denominator, gives us

$$\theta \ge \frac{\psi(t - t) + \frac{(1 + \Delta)}{(1 - \omega)} \pi_P^A - \pi_L^C + 1 + \varphi}{\psi t + \frac{(1 + \Delta)}{(1 - \omega)} \pi_P^A - \pi_L^C + 1 + \varphi} \iff$$

$$\theta \ge 1 - \frac{\psi \quad t}{\psi \quad t} \equiv \theta^{Undo \min ated}_{directM \& A} = \theta^{Undo \min ated}_{directM \& A}$$

Equation M15

If the equality in Equation M15 is satisfied we have undominated pooling equilibria with direct M&A and if the inequality is not satisfied, no undominated pooling equilibria with direct M&A exists. Further, the undominated pooling equilibria with direct M&A in Equation M15 is only stronger than the sequential pooling equilibria with direct M&A found in Equation M14, when we

³⁸ Notice that the synthetic neutralising terms are added as a consequence of the just mentioned substitution

do not have the following conditions: t = t and $\omega = 0$. This is seen by simply comparing Equation M14 and Equation M15.

2.7.3 Pooling Equilibria with JV with Buyout Option

As mentioned in the beginning of the chapter, the other scenario in which pooling equilibria can be found, is in the establishment of JV with buyout option to PA. Before deriving the JV and buyout option pooling equilibria 3 conditions, 1P-3P, must be satisfied (P denotes Pooling).

Condition 1P: Renegotiation-proof

The renegotiation-proof is the same as the one explained in condition 2S under separating equilibrium (section 2.6.1). It simply states that $\Delta E_P^{\prime} \leq \Delta E_P^{f}$. The reader who does not recall the renegotiation-proof should turn to section 2.6.1, condition 2S, to refresh the idea behind the renegotiation-proof. In accordance with the renegotiation proof, the buyout price should satisfy the following condition (seen from the *PT*'s perspective).

$$\Delta e^{t} \leq \pi_{P}^{C} - t^{t}(\psi + 1) - (1 + \Delta)\pi_{P}^{A}$$

Condition 2P: For L to participate

In order for L to participate, he must be better off as a participant in the JV than as a stand-alone firm. The requirement is therefore

$$\pi_L^C - t^{\iota}(\psi + 1) \ge 0$$

which is just a rewriting of $t' \leq t'$ (c.f. Equation M2). Condition 2P simply states that it is not too costly for L to participate.

Condition 3P: For P to participate

In order for P to participate, he must be better off as a participant in JV with buyout option than as a stand-alone firm. Hence,

$$\pi_P^C - t^i(\psi + 1) + \Delta e^i \ge (1 + \Delta)\pi_P^A$$

The above equation is just a rewriting of condition 1P. Condition 1P and 3P can thus be represented by condition 3P alone.

2.7.3.1 Exercise Price in Pooling Equilibria with JV With Buyout Option

With the 3 conditions at hand, we can now turn our focus to derive an expression for θ in which we can find the existence of pooling equilibria with JV and buyout option. Before doing so, e^{t} must be found.

In order to derive an expression for e^t , the expected Added Welfare to Society and *PA*'s share must be defined. Intuitively, the Added Welfare to Society in the setting of pooling equilibria with JV and buyout option, can be written as

$$E\left[S\left[t^{i}\right]\right] = \theta((1+\Delta)(\pi_{P}^{C}-\varphi-1-\pi_{P}^{A})-\psi t^{i}) + (1-\theta)((\pi_{L}^{C}-\varphi-1)-\psi t^{i}) = E\left[S\right]-\psi t^{i} \quad \text{Equation M16}$$

Expected Added Welfare to Society, if *PT* is *P*

Expected Added Welfare to Society, if *PT* is *L*

The term $\psi t'$ captures the inefficiency associated with the investments of PT during the JV-period.

PA's share of the Added Welfare to Society is

$$\omega E\left[S\left[t^{t}\right]\right] = \theta \Delta(\pi_{P}^{C} - \varphi - 1 - e^{t}) + t^{t} - \varphi - 1$$
Equation M17

where $t' - \varphi - 1$ is *PA*'s first period investment outlay. Recall, that *PA* extract no profits in the first period of the JV. The term $\theta \Delta(\pi_P^C - \varphi - 1 - e')$ is the present value of the net-profit if *PT* proves to be a *P* with probability θ .

Based on Equation M17, we can write an expression for the exercise price for a given t^{t} as

Eliminating the brackets in Equation M17, gives us

$$\omega E \left[S\left[t^{\prime}\right] \right] = \Delta \theta \pi_{P}^{C} - \Delta \theta \varphi - \Delta \theta - \Delta \theta e^{\prime} + t^{\prime} - \varphi -$$

Moving $\Delta \theta e^{i}$ to the left hand side, gives us

$$\Delta \theta e^{t} = \Delta \theta \pi_{P}^{C} - \Delta \theta \varphi - \Delta \theta + t^{t} - \varphi - 1 - \omega E \left[S \left[t^{t} \right] \right]$$

Dividing with θ and rearranging the right hand side, gives us

$$\Delta e^{t} = \Delta (\pi_{P}^{C} - \varphi - 1) - \frac{(1 + \varphi - t^{t})}{\theta} - \frac{\omega E \left[S[t^{t}] \right]}{\theta}$$
Equation M18

Equation M18 is the exercise price in pooling equilibria with JV and buyout option.

2.7.3.2 Requirement for θ in Pooling Equilibria with JV With Buyout Option

With Equation M18 at hand we can now, in conjunction with condition 3P, write the necessary condition for *P* to participate in the pool. The derivation will be made only for *P*, as *L* will participate in the pool as long as *P* will, and $t^{t} \leq t^{upper,L}$. The requirement for θ in pooling equilibria with JV and buyout option, can thus be written as

Substituting the expression for Δe^t Equation M18 into condition 3P, gives us

$$\pi_{P}^{C} - t^{\prime}(\psi + 1) + \Delta(\pi_{P}^{C} - \varphi - 1) - \frac{(1 + \varphi - t^{\prime})}{\theta} - \frac{\omega E \left[S \left[t^{\prime} \right] \right]}{\theta} \ge (1 + \Delta) \pi_{P}^{A}$$

Substituting the expression for $E \left[S \left[t^{\prime} \right] \right]$ cf. Equation M16, gives us
$$\pi_{P}^{C} - t^{\prime}(\psi + 1) + \Delta(\pi_{P}^{C} - \varphi - 1) - \frac{(1 + \varphi - t^{\prime})}{\theta} - \frac{\omega}{\theta} \left[\theta (1 + \Delta) (\pi_{P}^{C} - 1 - \varphi - \pi_{P}^{A}) + (1 - \theta) (\pi_{L}^{C} - 1 - \varphi) - \psi t^{\prime} \right] \ge (1 + \Delta) \pi_{P}^{A}$$

Eliminating the brackets, gives us

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 $\pi_{p}^{c} - t^{\prime} - \psi t^{\prime} + \Delta \pi_{p}^{c} - \Delta \varphi - \Delta - \frac{(1+\varphi - t^{\prime})}{\theta} - \frac{\omega}{\theta} \Big[\theta \pi_{p}^{c} - \theta - \theta \varphi - \theta \pi_{p}^{s} + \theta \Delta \pi_{p}^{c} - \theta \Delta - \theta \Delta \varphi - \theta \Delta \pi_{p}^{s} + \pi_{L}^{c} - 1 - \varphi - \theta \pi_{L}^{c} + \theta + \theta \varphi - \psi t^{\prime} \Big] \ge (1+\Delta)\pi_{p}^{s}$ Eliminating the last bracket on the left hand side, gives us $\pi_{p}^{c} - t^{\prime} - \psi t^{\prime} + \Delta \pi_{p}^{c} - \Delta \varphi - \Delta - \frac{(1+\varphi - t^{\prime})}{\theta} - \omega \pi_{p}^{c} + \omega + \varphi + \omega \varphi + \omega \pi_{p}^{s} - \omega \Delta \pi_{p}^{c} + \omega \Delta \varphi + \omega \Delta \pi_{p}^{s} + \omega \Delta \varphi + \omega \Delta \pi_{p}^{s} - \frac{\omega \pi_{L}^{c}}{\theta} + \frac{\omega \varphi}{\theta} + \omega \pi_{L}^{c} - \omega - \omega \varphi + \frac{\omega \psi t^{\prime}}{\theta} \ge (1+\Delta)\pi_{p}^{s}$ Eliminating the duplicating terms $\omega - \omega + \omega \varphi - \omega \varphi$, gives us $\pi_{p}^{c} - t^{\prime} - \psi t^{\prime} + \Delta \pi_{p}^{c} - \Delta \varphi - \Delta - \frac{(1+\varphi - t^{\prime})}{\theta} - \omega \pi_{p}^{c} + \omega \pi_{p}^{s} - \omega \Delta \pi_{p}^{c} + \omega \Delta \varphi + \omega \Delta \pi_{p}^{s} - \frac{\omega \pi_{L}^{s}}{\theta} + \frac{\omega \varphi}{\theta} + \omega \pi_{L}^{c} - \omega - \omega \varphi + \frac{\omega \psi t^{\prime}}{\theta} \ge (1+\Delta)\pi_{p}^{s}$ Isolating terms containing θ on the right hand side, gives us $\pi_{p}^{c} - t^{\prime} - \psi t^{\prime} + \Delta \pi_{p}^{c} - \Delta \varphi - \Delta - \omega \pi_{p}^{c} + \omega \pi_{p}^{s} - \omega \Delta \pi_{p}^{c} + \omega + \omega \Delta \varphi + \omega \Delta \pi_{p}^{s} + \omega \pi_{L}^{c} - (1+\Delta)\pi_{p}^{s} \ge \frac{(1+\varphi - t^{\prime})}{\theta} + \frac{\omega \pi_{L}^{c}}{\theta} - \frac{\omega}{\theta} - \frac{\omega \psi t^{\prime}}{\theta} = \frac{\omega \psi t^{\prime}$

Substituting $-\omega \psi t^{\mu\nu\rho er,P} = -\omega(1+\Delta)(\pi_P^C - 1 - \varphi - \pi_P^A)$ cf. Equation M3 in the denominator, gives us

$$\theta \geq \frac{1 + \varphi - t^{t} + \omega \pi_{L}^{C} - \omega - \omega \varphi - \omega \psi t^{t}}{\psi t - \omega \psi t}$$

Synthetic neutralising terms

Adding a synthetic term in the numerator (corresponding to non-similar terms in the denominator): $(\psi t^{upper,P} - \omega \psi t^{r} - \psi t^{r}) - (\psi t^{upper,P} - \omega \psi t^{r} - \psi t^{r})$, gives us

$$\theta \geq \frac{1 + \varphi - t^{'} + \omega \pi_{L}^{C} - \omega - \omega \varphi - \omega \psi t^{'} + (\psi t^{upper,P} - \omega \psi t^{-} - \psi t^{'}) - (\psi t^{upper,P} - \omega \psi t^{-} - \psi t^{'})}{\psi t^{-} - \omega \psi t^{-} - \omega \psi t^{-} - \omega - \omega \varphi + 1 + \varphi - t^{'} - \psi t^{'} + \omega \pi_{L}^{C}}$$

Dividing the numerator with the denominator, gives us

$$\theta \ge 1 + \frac{-\psi t + \omega \psi t + \psi t' - \omega \psi t'}{\frac{-\psi t}{t} - \omega \psi t}$$

Multiplying the fraction with -1, gives us

$$\theta \ge 1 - \frac{\psi t - \omega \psi t - \psi t - \psi t + \omega \psi t^{t}}{\psi t - \omega \psi t - \omega \psi t - \psi t^{t} + \omega \psi t^{t}}$$

Rewriting the numerator to $\psi(1-\omega)(t-t')$ gives us

$$\theta \ge 1 - \frac{\psi(1-\omega)(t-t')}{\psi(t-\omega)\psi(t-\omega)(t-t')}$$

Rewriting the first two terms in the denominator with $\psi_{t}^{upper,P}(1-\omega)$ and substituting the terms $-\omega - \omega \varphi + 1 + \varphi + \omega \pi_{L}^{c}$ with $(1-\omega)(-\pi_{L}^{c}+1+\varphi) + \pi_{L}^{c}$ in the denominator, gives us

$$\theta \ge 1 - \frac{\psi(1-\omega)(t-t')}{\psi(t-\omega)(t-t')}$$

Removing $(1-\omega)$ in both numerator and denominator, gives us

$$\theta \ge 1 - \frac{\psi(t - t')}{\psi(t - t')}$$

$$\theta \ge 1 - \frac{\psi(t - t')}{\psi(t - t')} + \frac{-t' - \psi t'}{(1 - \omega)} + (-\pi_L^C + 1 + \varphi) + \frac{\pi_L^C}{(1 - \omega)}$$
Setting $\pi_L^C = t(1 + \psi)$, cf. $t = \frac{\pi_L^C}{(1 + \psi)}$, and rewriting the denominator gives us
$$\theta \ge 1 - \frac{\psi(t - t')}{\psi(t - t)} \Leftrightarrow$$

 $(1-\omega)$

$$\theta \ge 1 - \frac{\psi(t - t')}{\psi(t - t)} \equiv \theta_{JV+buyout} = \theta_{JV+buyout}$$
Equation M19

As $\theta_{JV+buyout}$ is]0;1[we thus have a range of sequential pooling equilibria in which JV with buyout option can exist. The exercise price for any given t', in the sequential pooling equilibria with JV and buyout option, can be derived from Equation M18.

2.7.4. Refined Separating Equilibria, Pooling Equilibria with JV with Buyout Option

For pooling equilibria with JV with buyout option to exist despite the requirement for separating are fulfilled, we must have both types of *PT* to do at least as well as in the unique undominated separating equilibrium. The left hand side of condition 3P captures the pooling equilibrium payoffs to *P*. Substituting for Δe^{t} in condition 3P using Equation M18, we thus have

$$\pi_{P}^{C} - t'(\psi + 1) + \Delta(\pi_{P}^{C} - \varphi - 1 -) - \frac{(1 + \varphi - t')}{\theta} - \frac{\omega}{\theta} E\left[S\left[t'\right]\right] \ge (1 - \omega)S\left[t] + (1 + \Delta)\pi_{P}^{A}$$
Equation M20

$$PT^{*}s \text{ payoffs in pooling}$$
PT's payoffs in unique
equilibria undominated separating

Equation M20 will be used for deriving an expression for θ in the setting of a pooling equilibria with JV and buyout option. In order to ease the derivation, we rewrite the pooling equilibrium payoffs. The left hand side of the Equation M20 can thus also be written as³⁹

$$\frac{1-\omega}{\theta} E\left[S\left[t^{t}\right]\right] - \frac{1-\theta}{\theta}(1+\psi)\binom{upper,L}{t} - t^{t} + (1+\Delta)\pi_{P}^{A}$$

Equation M20 can thus be written as

$$\frac{1-\omega}{\theta} E\left[S\left[t^{t}\right]\right] - \frac{1-\theta}{\theta} (1+\psi) (t^{upper,L} - t^{t}) + (1+\Delta)\pi_{P}^{A} \ge (1-\omega)S\left[t^{upper,L}\right] + (1+\Delta)\pi_{P}^{A}$$
Equation M21

Based on Equation M21, an expression for θ in the setting of a pooling equilibria with JV and buyout option can be written as

Substituting for
$$E\left[S\left[t^{\prime}\right]\right]$$
 using Equation M16 and $S\begin{bmatrix}upper,L\\t\end{bmatrix}$ using Equation M6, Equation M21, can thus be written as

$$\frac{1-\omega}{\theta}\left[\theta\left[(1+\Delta)(\pi_{p}^{C}-1-\varphi-\pi_{p}^{A})-\psi t^{\prime}\right]+(1-\theta)(\pi_{L}^{C}-1-\varphi-\psi t^{\prime})\right]-\frac{1-\theta}{\theta}(1+\psi)(upper,L-t^{\prime})+(1+\Delta)\pi_{p}^{A} \ge (1-\omega)\psi(upper,L-t^{\prime})+(1+\Delta)\pi_{p}^{A}$$
Removing the brackets, gives us

$$\pi_{p}^{C}-1-\varphi-\pi_{p}^{A}+\Delta\pi_{p}^{C}-\Delta-\Delta\varphi-\Delta\pi_{p}^{A}-\psi t^{\prime}+\frac{\pi_{L}^{C}-1-\varphi-\psi t^{\prime}}{\theta}-\pi_{L}^{C}+1+\varphi+\psi t^{\prime}-\omega\pi_{p}^{C}+\omega+\omega\varphi+\omega\pi_{p}^{A}-\omega\Delta\pi_{p}^{C}+\omega\Delta+\omega\pi_{p}^{A}+\omega\Delta\pi_{p}^{A}+\omega\psi t^{\prime}+\frac{-\omega\pi_{L}^{C}+\omega+\omega\varphi+\omega\psi t^{\prime}}{\theta}+\omega\pi_{L}^{C}-\omega-\omega\varphi-\omega\psi t^{\prime}+\frac{-upper,L}{\theta}+t^{\prime}-\psi t^{\prime}+\psi t^{\prime}+$$

³⁹ See Appendix 1 for explanation.

Eliminating the following duplicating terms

$$-1+1-\varphi+\varphi-\pi_{p}^{A}+\pi_{p}^{A}+\frac{-\psi t^{\prime}}{\theta}-\frac{-\psi t^{\prime}}{\theta}+\psi t^{\prime}-\psi t^{\prime}+\omega-\omega+\omega\varphi-\omega\varphi+\omega\psi t^{\prime}-\omega\psi t^{\prime}+\Delta\pi_{p}^{A}-\Delta\pi_{p}^{A}, \text{ gives us}$$

$$\pi_{p}^{C}+\Delta\pi_{p}^{C}-\Delta-\Delta\varphi+\frac{\pi_{L}^{C}-1-\varphi}{\theta}-\pi_{L}^{C}-\omega\pi_{p}^{C}+\omega\pi_{p}^{A}-\omega\Delta\pi_{p}^{C}+\omega\Delta+\omega\Delta\varphi+\omega\Delta\pi_{p}^{A}+\frac{-\omega\pi_{L}^{C}+\omega+\omega\varphi+\omega\psi t^{\prime}}{\theta}+\omega\pi_{L}^{C}+\omega\pi_{L}^{C}+\omega+\omega\varphi+\omega\psi t^{\prime}+\omega\psi t^{\prime}+\omega\pi_{L}^{C}+\omega\psi t^{\prime}+\omega\psi t^$$

Putting all terms containing θ on the right hand side, gives us

$$\pi_{P}^{C} + \Delta \pi_{P}^{C} - \Delta - \Delta \varphi - \Delta \pi_{P}^{A} - \psi t^{i} - \pi_{L}^{C} - \omega \pi_{P}^{C} + \omega \Delta \pi_{P}^{A} - \omega \Delta \pi_{P}^{C} + \omega \Delta + \omega \Delta \varphi + \omega \Delta \pi_{P}^{A} + \omega \pi_{L}^{C} + \frac{upper,L}{t} - t^{i} + \psi \frac{upper,L}{t} - \psi \frac{upper,L}{t} + \psi \frac{$$

Rewrite part of the left hand side by substituting with $(1 - \omega)\psi^{upper,P} = (1 - \omega)(1 + \Delta)(\pi_P^C - 1 - \varphi - \pi_P^A)$, gives us $(1 - \omega)\psi^{upper,P} = t + \varphi - \omega - \omega \varphi - \psi t^i - \pi_L^C + \omega \pi_L^C + t^i + \psi^{upper,L} - t^i + \psi^{upper,L} + \psi^{upper,P} + \psi^{upper,L} + \omega \psi^{upper,P} - \omega \psi^{upper,L} \ge \frac{-\pi_L^C + 1 + \varphi + \omega \pi_L^C - \omega - \omega \varphi - \omega \psi t^i + t^i - t^i + \psi^{upper,L}}{\theta}$

Eliminating the following duplicating terms $(1-\omega)\psi^{upper,P} t - \psi^{upper,P} t + \omega\psi^{upper,P} t$, gives us

$$1 + \varphi - \omega - \omega\varphi - \psi t' - \pi_L^C + \omega\pi_L^C + \frac{upper,L}{t} - t' + \psi \frac{upper,L}{t} + \psi \frac{upper,L}{t} - \omega\psi \frac{upper,L}{t} \ge \frac{-\pi_L^C + 1 + \varphi + \omega\pi_L^C - \omega - \omega\varphi - \omega\psi t' + \frac{upper,L}{t} - t' + \psi \frac{upper,L}{t} + \frac{upper,L}{t} = \frac{-\pi_L^C + 1 + \varphi + \omega\pi_L^C - \omega - \omega\varphi - \omega\psi t' + \frac{upper,L}{t} - t' + \psi \frac{upper,L}{t} + \frac{upper,L}{t} = \frac{-\pi_L^C + 1 + \varphi + \omega\pi_L^C - \omega - \omega\varphi - \omega\psi t' + \frac{upper,L}{t} - t' + \psi \frac{upper,L}{t} = \frac{-\pi_L^C + 1 + \varphi + \omega\pi_L^C - \omega - \omega\varphi - \omega\psi t' + \frac{upper,L}{t} - t' + \psi \frac{upper,L}{t} = \frac{-\pi_L^C + 1 + \varphi + \omega\pi_L^C - \omega - \omega\varphi - \omega\psi t' + \frac{upper,L}{t} - \frac{upper,L}{t} = \frac{-\pi_L^C + 1 + \varphi + \omega\pi_L^C - \omega - \omega\varphi - \omega\psi t' + \frac{upper,L}{t} - \frac{upper,L}{t} = \frac{-\pi_L^C + 1 + \varphi + \omega\pi_L^C - \omega - \omega\varphi - \omega\psi t' + \frac{upper,L}{t} - \frac{upper,L}{t} = \frac{-\pi_L^C + 1 + \varphi + \omega\pi_L^C - \omega - \omega\varphi - \omega\psi t' + \frac{upper,L}{t} - \frac{upper,L}{t} = \frac{-\pi_L^C + 1 + \varphi + \omega\pi_L^C - \omega - \omega\varphi - \omega\psi t' + \frac{upper,L}{t} - \frac{upper,L}{t} = \frac{-\pi_L^C + 1 + \varphi + \omega\pi_L^C - \omega - \omega\varphi - \omega\psi t' + \frac{upper,L}{t} - \frac{upper,L}{t} = \frac{-\pi_L^C + 1 + \varphi + \omega\pi_L^C - \omega - \omega\varphi - \omega\psi t' + \frac{upper,L}{t} = \frac{-\pi_L^C + 1 + \varphi + \omega\pi_L^C - \omega - \omega\varphi - \omega\psi t' + \frac{upper,L}{t} = \frac{-\pi_L^C + 1 + \varphi + \omega\pi_L^C - \omega - \omega\varphi - \omega\psi t' + \frac{upper,L}{t} = \frac{-\pi_L^C + \omega\pi_L^C - \omega - \omega\varphi - \omega\psi t' + \frac{upper,L}{t} = \frac{-\pi_L^C + 1 + \omega\pi_L^C - \omega - \omega\varphi - \omega\psi t' + \frac{upper,L}{t} = \frac{-\pi_L^C + 1 + \omega\pi_L^C - \omega - \omega\varphi - \omega\psi t' + \frac{upper,L}{t} = \frac{-\pi_L^C + 1 + \omega\pi_L^C - \omega - \omega\varphi - \omega\psi t' + \frac{upper,L}{t} = \frac{-\pi_L^C + 1 + \omega\pi_L^C - \omega - \omega\varphi - \omega\psi t' + \frac{upper,L}{t} = \frac{-\pi_L^C + 1 + \omega\pi_L^C - \omega - \omega\varphi - \omega\psi t' + \frac{upper,L}{t} = \frac{-\pi_L^C + 1 + \omega\pi_L^C - \omega - \omega\varphi - \omega\psi t' + \frac{upper,L}{t} = \frac{-\pi_L^C + 1 + \omega\pi_L^C - \omega - \omega\psi t' + \frac{upper,L}{t} = \frac{-\pi_L^C + \omega\pi_L^C - \omega - \omega\psi t' + \frac{upper,L}{t} = \frac{-\pi_L^C + \omega\pi_L^C - \omega\psi t' + \frac{upper,L}{t} = \frac{-\pi_L^C + \omega\pi_L^C - \omega\psi t' + \frac{upper,L}{t} = \frac{-\pi_L^C + \omega\pi_L^C - \omega\psi t' + \frac{upper,L}{t} = \frac{-\pi_L^C + \omega\pi_L^C - \omega\psi t' + \frac{upper,L}{t} = \frac{-\pi_L^C + \omega\pi_L^C - \omega\psi t' + \frac{upper,L}{t} = \frac{-\pi_L^C + \omega\psi t' + \omega\psi t' + \frac{upper,L}{t} = \frac{-\pi_L^C + \omega\psi t' + \omega\psi t' + \frac{upper,L}{t} = \frac{-\pi_L^C + \omega\psi t' + \omega\psi t' + \frac{upper,L}{t} = \frac{-\pi_L^C + \omega\psi t' + \omega\psi t' + \omega\psi t' + \frac{upper,L}{t} = \frac{-\pi_L^C + \omega\psi t' +$$

Isolating θ on the left hand side, gives us

$$\theta \geq \frac{-\pi_{L}^{C} + 1 + \varphi + \omega \pi_{L}^{C} - \omega - \omega \varphi - \omega \psi t^{i} + \frac{upper,L}{t} - \frac{upper,L}{t}}{1 + \varphi - \omega - \omega \varphi - \psi t^{i} - \pi_{L}^{C} + \omega \pi_{L}^{C} + \frac{upper,L}{t} - t^{i} + \psi} \frac{upper,L}{t} + \frac{upper,L}{t} - \frac{upper,L}{t} + \frac{upper,L}{t}$$

Adding a synthetic term in the numerator corresponding to non-duplicating terms in the denominator; that is adding the

following terms
$$\psi t' - \psi t' + \psi t' - \psi t' + \psi \psi t' - \omega \psi t', w^{upper,L} = \psi \psi t', w^{upper,L} = \psi \psi t', gives us$$

$$\theta \ge \frac{-\pi_L^C + 1 + \varphi + \omega \pi_L^C - \omega - \omega \varphi - \omega \psi t' + \psi t' - t' + \psi t' - \psi t' + \psi t' - \psi t' + \psi t' - \psi t' + \omega \psi t' - \omega \psi t'}{1 + \varphi - \omega - \omega \varphi - \psi t' - \pi_L^C + \omega \pi_L^C + \psi t' - t' + \psi t' + \psi t' - \psi t' + \psi t' - \omega \psi t'}$$

Dividing the numerator with the denominator, gives us

$$\theta \ge 1 + \frac{-\omega\psi t^{i} + \psi t^{i} - \psi}{1 + \varphi - \omega - \omega\varphi - \psi t^{i} - \pi_{L}^{C} + \omega\pi_{L}^{C} + t} + \frac{\psi}{t} + \frac{$$

Multiplying the fraction with -1 in the numerator and the denominator, gives us

$$\theta \ge 1 - \frac{\omega \psi t^{i} - \psi t^{i} + \psi}{1 + \varphi - \omega - \omega \varphi - \psi t^{i} - \pi_{L}^{C} + \omega \pi_{L}^{C} + \frac{\psi pper, L}{t} - \frac{\psi pper, L}{t} + \psi}{1 + \psi t - \psi} \frac{\psi pper, L}{t - t^{i} + \psi} \frac{\psi pper, L}{t - \psi} \frac{\psi pper, L}{t}$$

Rewriting the numerator with $(1-\omega)\psi(t^{upper,L}-t^{i})$ and the denominator with

 $(1-\omega)\psi^{upper,P}_{t} - (1-\omega)(\pi_{L}^{C} - 1 - \varphi) + (1+\psi)(t - t') - (1-\omega)\psi(t - t') \quad \text{(in order to give us a result comparable to Equation M19), gives us}$

$$\theta \ge 1 - \frac{(1-\omega)\psi(t-t')}{(1-\omega)\psi(t-t-t')} \frac{(1-\omega)(\pi_L^C - 1 - \varphi) + (1+\psi)(t-t') - (1-\omega)\psi(t-t-t')}{(1-\omega)\psi(t-t-t')}$$

Dividing with $(1 - \omega)$ in the numerator and denominator, gives us

$$\theta \ge 1 - \frac{\psi(t - t^{t})}{\psi(t - t)} = \theta_{JV+buyout}^{Upper,L} = \theta_{JV+buyout}^{Undo \min ated}$$
Equation M22

By simply comparing Equation M22 to Equation M19, we can easily conclude that $\theta_{JV+buyout}^{Undomin\,ated} > \theta_{JV+buyout}$, since the fraction in Equation M22 yields a smaller result than the fraction in Equation M19, thus implying a larger θ in Equation M22 than in Equation M19. This, as mentioned previously, do however not hold when $\omega = 0$ and $t = t^{upper,P}$.

To sum up, we can conclude, if $\theta_{JV+buyout}^{Undo \min ated} > \theta_{JV+buyout}$, there exists undominated pooling equilibria characterised by JV with buyout option. The exercise price in the undominated pooling equilibria, is given in Equation M18.

2.8 Separating Equilibria VS Pooling Equilibria

In the previous section, we have found the important values of θ and t' that are central in the decision making of *PA* and *PT*. Remember, E' is uniquely determined for any given t'. In this section we intend to "play" with these values and relate them to one another, putting them in a context, in which we will show, whether the outcome will be a pooling equilibria with direct M&A, pooling equilibria with JV and buyout option or separating equilibria with JV and buyout option, given the assumptions for separating equilibria are fulfilled. The end goal, of doing so, should be a more profound understanding of the game between *PT* and *PA* as outlined in Figure M2. This is important, so that the mechanisms in the decision-making and the choice of direct M&A vs. JV with buyout option, can be understood.

All the illustrated figures, in this section, are made for an illustrative purpose. Different input values of π_N^A , φ , ψ , Δ , ω and t_P^i will result in different figures than those depicted. Nevertheless, the basic understanding of the figures is similar, regardless of the size of the input values.

2.8.1 The Initial Game Setup

Before we interpret and analyze the game between *PA* and *PT*, it is worthwhile remembering the initial game setup in Figure M2. *PT* chooses his message given sequential rationality. *PA* receives the message and decides on playing a separating, given *PT* has chosen $t_P^t \ge t$.

To find the outcome of the game between *PA* and *PT*, two variables are important: θ and t^i . The combination of θ and t^i determines how the game will find its outcome, or more specifically, how θ is placed in relation to $\theta_{JV+buyout}$, $\theta_{JV+buyout}^{Undo\min ated}$, $\theta_{directM\&A}^{Undo\min ated}$ and how t^i is placed in relation to t^i . Figure M9 shows the possible combination of θ and t^i for *L* and *P*.



Figure M9, Possible Combinations of θ and t' for *PT*

Source: Own construction

In the left graph of the figure, in which t t t t t t, the white box is off the equilibrium path⁴⁰ for *L*. The possible outcomes are strictly determined by the degree of optimism, θ , and the level of t', where t t t t t. The higher the level of θ , the more confident *PA* will be in *PT*, turning out to be *P*. The combination of $\theta_{JV+buyout} > \theta$ and t t t t t t t is off the equilibrium path, as *PA* lacks confidence in *PT* being *P*. *PA*'s lack of confidence, in the existence of *P*s in the market, makes him not willing to invest. From this, it can derived that when the market is less transparent and *PT*s cannot separate themselves, for M&A to occur, there is a need for optimistic *PA*s. The grey boxes are partly on the equilibrium path. Solving for the equilibria on the equilibrium path is shown in Figure M10.

On the graph, on the right hand side of Figure M9, $t' \ge t$ and separation is possible. Again, the white boxes are off the equilibrium path and the outcomes for *P* depends on both θ and t'. The two white boxes⁴¹, in the right hand side graph, are off the equilibrium path, since the two grey boxes to the left provide society with a higher added welfare. The white box in the left side⁴² of the right graph is off the equilibrium path, as *P* will choose separating, when *PA* is pessimistic meaning a low θ .

Figure M10 shows the equilibria on the equilibria paths, just described in the previous figure, and how this relates to the Added Welfare to Society, when *PT* being *P*, *S*_{*P*} and the expected Added Welfare to Society, *E*[*S*]. The exact equilibrium outcome will depend on θ and the following choice of t'_{N} by *PT*. This will be examined more in detail in the following section.

⁴¹
$$\theta \ge \theta_{JV+buyout}^{Undo\min ated}$$
, $t_P^i \ge t$ and $\theta \ge \theta_{directM \& A}^{Undo\min ated}$, $t_P^i \ge t$
⁴² $\theta_{JV+buyout}^{Undo\min ated} > \theta$, $t > t^i$

⁴⁰ According to Gibbons (1992) the definition of equilibrium path is: "For a given equilibrium in a given extensive form game, an information set is on the equilibrium path if it will be reached with positive probability if the game is played according to the equilibrium strategies, and is off the equilibrium path if it is certain not to be reached if the game is played according to the equilibrium strategies (where "equilibrium" can mean Nash, subgame perfect, Bayesian, or perfect Bayersian equilibrium.)"
Figure M10, On the Equilibrium Path



Source: Own construction

The 2 graphs in the figure are declining with increasing t'. When $t' \ge t'$ the curve is less steep than when $t' \ge t'$. This is due to the single cross property presented in the introduction. Only *P* can send a message when $t' \ge t'$ and he requires relatively less than *L* for an increase in t'. When t' = 0, *E*[*S*] is at its maximum, due to no inefficiently.

2.8.2 P and L's Messages

The four important requirements for θ in different separating and pooling equilibria found in the previous sections, give five value ranges that θ can undertake. These are shown in Figure M11. In the center of the figure, *P* and *L*'s messages to the different values of θ are shown. However, a refinement leads to *PT*'s dominated message. We define *PT*'s dominated message as the message that will survive sequential rationality. This will be explained more in detail in the following.

Figure M11, P and L's Messages



Source: Own construction

If *PT* is *L* and $\theta_{JV+buyout} > \theta$, *L* will not send any message given sequential rationality. *L* knows *P* would send a separating message and therefore it would be irrational for *L* to send a message. In this case, *PA* would not have any interest in *L*, given $\theta_{JV+buyout} > \theta$ and equilibria in this range would be off the equilibrium path. Again, we make use of the tie breaking rule outlined in section 2.6.2. For *L*, $\theta_{JV+buyout} > \theta$ implies *E[S]* =0, since there are no transaction costs in sending a message. Thus, the tie-breaking rule implies, *L* choosing the option that does not depart him from status quo, i.e. choosing not to send a message. For *L*, if $\theta_{JV+buyout} \le \theta < \theta_{directM\&A}$, sequential rationality would imply *L* choosing *t'* minimum⁴³ larger than *t'*=0. This message is denoted t'_{Lmin0} . Recall, according to Assumption D, *t'* can be any positive number, and thereby not 0 in order to have JV outcome. *L* knows that its message is equal to or below t as a separating criteria, when t' = 0 since t' as a separating criteria, when $t' = t_{N-1} t' t' t'_{N-1}$, which is why *L* chooses t'_{Lmin0} . If $\theta \ge \theta_{directM\&A}$, the message would be $t'_{L} = 0$ since *L* expects *PA* to be sufficient optimistic to make a direct M&A, which is why this would be the most rational message.

When *PT* is a *P* and we have $\theta_{JV+buyout}^{Undo \min ated} > \theta$, sequential rationality would make *P* choose t. Given $\theta_{JV+buyout}^{Undo \min ated} > \theta$, *P* would not choose $t > t_p^{upper,L} > t_p^t$, as he knows *L* could easily mimick this message and *PA* is not expected to be willing to play a pooling strategy, as *PA* is not sufficient optimistic. If however, $\theta_{JV+buyout}^{Undo \min ated} \le \theta < \theta_{directM \& A}^{Undo \min ated}$, $t_p^t_{P\min 0}$ would be the message, as $t > t_p^{upper,L} > t_p^t$ would be too costly a signal. Given $\theta_{JV+buyout}^{Undo \min ated} \le \theta < \theta_{directM \& A}^{Undo \min ated}$, The Added Welfare to Society would be higher playing $t_{P\min 0}^t$ than $t > t_p^t$. The last possible t^t message is $t_p^t = 0$ if $\theta \ge \theta_{directM \& A}^{Undo \min ated}$, following the same line of argument as above. $\theta \ge \theta_{directM \& A}^{Undo \min ated}$ gives the highest Added Welfare to Society, but also requires the highest value of θ and thereby the highest level of optimism.

2.8.3 PA's Choice of Equilibrium given PT's message

Based on PT's message, PA makes his choice of pooling or separating equilibrium. illustrates, how PA makes his choice of equilibrium as a consequence of PT's dominated message.

 $^{^{43}}$ Minimum refers to the smallest number higher than 0 and it leads to a theoretical solution, in which the positive number converges to 0

Figure M12, PA's Choice of Equilibrium



Source: Own construction

Figure M13 shows the final outcome of the game between *PA* and *PT* and its impact on the added welfare to society.

PA will choose a pooling equilibrium with direct M&A, if the dominated message from *PT* contains $t^{t} = 0$ and the Added Welfare to Society will be highest, due to *PT* not having to incur costs that are inefficient. If *PT* is less optimistic, and the message is t^{t}_{Lmim0} , *PA* would play a pooling equilibrium with JV and buyout option, so that his initial financial commitment is less than in the case of direct M&A. Prior asymmetric information between *PA* and *PT* can be decreased, by engaging in JV. *PA* will accept or reject his initial believe about *PT* during the acquisition of information through JV.

The dominated separating equilibrium is found when the dominated *PT* message is $t^{upper,L}$. In this case a JV with buyout option will be the outcome.



Figure M13, Pooling vs. Separating Equilibrium and Added Welfare to Society

Source: Own construction

2.9 Model Summary

In this chapter, we have presented a model for how to understand the game between *PA* and *PT*. Under full information $\theta = 1$, since *PA* knows exactly whether *PT* is *P* or *L*. Thus, *PT* will not undertake an inefficient part of the integration costs, t'=0, and the highest Added Welfare to Society can be extracted. The full information benchmark provides us with the desired outcome for society. Pooling equilibria with direct M&A is the outcome in the full information benchmark and most efficient for society.

Under asymmetric information, both separating and pooling equilibria can occur, depending on whether Equation M5 holds. If separation is possible, PA faces the problem of whether to prefer separating equilibria that ensures him of the nature of PT, but having to accept PT's inefficient share of the integration cost, or pooling equilibria that gives higher E[S], but with the risk of picking L for P.

In separating equilibria it was essential to find $t^{upper,L}$ and $t^{upper,P}$, so that a credible message could be created. A credible message implies, according to Equation M5, $t^{upper,P} \ge t^{upper,L}$, where the tiebreaking rule makes L not depart from stand-alone, when $t_L^i = t^{upper,L}$. Separating equilibria, however, forces P to accept an inefficient share of the integration costs, i.e. $t_P^i \ge t^{upper,L}$. The unique undominated separating equilibrium is $t_P^i = t^{upper,L}$, thus maximizing S_P under separating equilibria.

When Equation M5 does not hold, the value of θ determines what kind of pooling equilibria will be the outcome as well as the messages being send. The important θ values are

$$\theta \ge 1 - \frac{\psi t}{\psi t} = \theta_{directM\&A}$$
Equation M14

$$\theta \ge 1 - \frac{\psi(t - t')}{\psi(t - t)} \equiv \theta_{JV+buyout}$$
 Equation M19

If $\theta \ge \theta_{directM\&A}$, we have a *PA* who is sufficiently optimistic in his ex ante view of *P* and *L*, and sequential pooling equilibria with direct M&A exists. If $\theta < \theta_{directM\&A}$, *PA* is too pessimistic in his prior beliefs and no sequential pooling equilibria with direct M&A exists. In case $\theta_{JV+buyout} \le \theta < \theta_{directM\&A}$ pooling with JV with buyout option are found. Hence, high θ value encourages direct M&A equilibria and low θ value encourages JV with buyout option equilibria. Figure M10 showed how *E[S]* is higher for direct M&A than JV with buyout option equilibria.

Refinement leads to pooling equilibria with a higher E[S] than separating equilibria. Thus, to find the undominated pooling equilibria Equation M5 must hold, but P will choose the pooling equilibria for the separating equilibria. The important θ values are

$$\theta \ge 1 - \frac{\psi \quad t}{\psi \quad t} \equiv \theta^{Undo \min ated}_{directM \& A}$$
$$\psi \quad t + \frac{(1+\Delta)}{(1-\omega)} \pi_P^A - \pi_L^C + 1 + \varphi$$

$$\theta \ge 1 - \frac{\psi(t - t^{t})}{\psi(t - t)} = \theta_{JV+buyout}^{Upper,L} = \theta_{JV+buyout}^{Undo \min ated}$$
Equation M22

If $\theta \ge \theta_{directM\&A}^{Undo\min ated}$, we have an undominated pooling equilibria with direct M&A and if $\theta < \theta_{directM\&A}^{Undo\min ated}$, no undominated pooling equilibria with direct M&A exists. Further, the undominated pooling equilibria with direct M&A in Equation M15 is only stronger than the sequential pooling equilibria with direct M&A found in Equation M14, unless t = t and $\omega = 0$. This is simply shown by comparing Equation M14 and Equation M15.

If $\theta_{JV+buyout}^{Undo\min ated} > \theta$ separating equilibria will occur with $t^{t} = t^{upper,L}$, as the unique undominated separating equilibrium. If $\theta_{JV+buyout}^{Undo\min ated} \le \theta < \theta_{directM \& A}^{Undo\min ated}$ the equilibria are pooling equilibria with JV and buyout option.

For each t' played, there is a uniquely determined exercise price, *E*, depending on the equilibrium strategy played. The exercise price under Full Information, Separating Equilibria, Pooling Equilibria with Direct M&A and Pooling Equilibria with JV with Buyout Option was found in Equation M1, Equation M8, Equation E12 and Equation M18, respectively.

Finally PT's dominated message was examined in section 2.8.2.

In general, the model thus shows that θ plays an important role in whether no action, direct M&A or JV with buyout option are formed. If θ is sufficiently high, direct M&A will be carried out, whereas being less optimistic leads to JV with a buyout option or no action. An inefficient part of the integration costs are undertaken depending on θ .

2.10 Bridging the JV-M&A Asymmetric Information Model to an Empirical Study

Based on the JV-M&A Asymmetric Information Model, the purpose of this chapter is to discuss an implication of the difference between the JV with buyout option and the direct M&A. Understanding this difference enables us to take the step further and set potential policy implications, based on the theoretical reasoning. This is the first step towards a more pragmatic view on the JV-M&A Asymmetric Information Model. However, the actual policy implications will not be suggested, until the empirical study in the next chapter is conducted.

The JV-M&A Asymmetric Information Model just presented assumed advantages and disadvantages of making a JV with buyout option as a mean of acquisition compared to the advantages and disadvantages of making a direct M&A. The advantages and disadvantages of the two will be explained more in depth in the following.

In the JV-M&A Asymmetric Information Model, in case *PA* chooses the JV, he receives a buyout option. Setting up a JV thus gives *PA* a real option, which he would not have, if he pursued a direct M&A. This option is, according to Copeland *et al.* (2000), *an option to expand*. It clearly has value in case *PT* should turn out to be a peach⁴⁴. In this case, *PT* can pursue his original intended acquisition plans, by buying out *PT*. In case *PT* should turn out to be a lemon, *PA* can stop committing further funds. There are however no free lunches, meaning that there are also disadvantages of establishing a JV with buyout option. These disadvantages come in the form of inefficiency costs, which are related to *PT*'s share of the integration costs. As a consequence of this, capitalization on synergies is assumed to be less efficient in a JV compared to a direct M&A, where *PT* in the latter case holds no integration costs.

The less efficient capitalization on synergies in a JV setup can also be viewed as the costs involved with the tedious process of running a JV. It can be argued that capitalization on synergies in JVs are slower than in direct M&A. This is also found by other researchers. Balakrishnan (1991) e.g. finds that a potential disadvantage in JVs lies in the fact that there are often 2 management teams in a JV. This can incur conflicts and inefficiency. As Balakrishnan (1991) puts it:

⁴⁴ The perspective of viewing the buyout option as an option to expand basically makes the buyout option an American call option with time to maturity = duration of elimination of asymmetric information.

"By most definitions, joint-ventures imply equity and profit sharing. The essential characteristic of a JV is that unlike a hierarchy, there is no ultimate "unity of command" and property rights and control are shared by the parent firms".

The relative advantages and disadvantages in JVs with buyout options vs. direct M&As as means of acquisition in the JV-M&A Asymmetric Information Model are given in Figure M14.

Figure M14, Relative Advantages and Disadvantages of JV With Buyout Option vs. Direct M&A in The JV-M&A Asymmetric Information Model

	JV with buyout option	Direct M&A
Relative advantage	Real option	More efficient capitalization on synergies
Relative disadvantage	Less efficient capitalization on	Higher risk of acquiring a lemon
	synergies	

Source: Own construction

In the direct M&A, a relative advantage lies in being able to capitalize more efficient on synergies, as *PT* does not incur any integration costs. The faster capitalization in a direct M&A, which is a part of the more efficient capitalization on synergies, is often a relative advantage as speed can be an important factor in M&A transactions. The relative disadvantage in the direct M&A is the higher risk of acquiring a lemon, as it does not have the real option that the JV with buyout option have.

2.10.1 Policy Implications for Potential Acquirers

Referring to the Philips-Whirlpool case in the beginning of this thesis, we saw there were advantages for both Philips and Whirlpool in making the JV, thus creating a "win-win-scenario". However, this does not have to be the case since there are also potential disadvantages in making a JV as illustrated in the section above. If however, the value of the real option less the loss caused by less efficient capitalization on synergies out weights the gains from the more efficient capitalization on synergies less the probability of acquiring a lemon, we find reasons to believe that acquirers should take JVs with buyout options into consideration as a potential more effective mean to undertake an acquisition.

In order to further explore if JVs with buyout options are potentially more effective means for acquirers when undertaking an acquisition, we will in the up coming chapter make an empirical study. The empirical study will test whether a sample of JVs with buyout options outperforms a M&A Sample. If the JV Sample with buyout options outperforms the M&A Sample, policy implications for acquirers should thus be that JVs with buyout options should be seen as a potential more effective way for making an acquisition.

A further discussion of the policy implications for potential acquirers will be made when our empirical study is conducted in the up coming chapter.

3. Empirical JV-M&A Design and Results

In the previous chapter, we have examined the theoretical mechanisms in the game between a potential acquirer and a potential target. The chapter has helped us to understand the game between the two players. This chapter will present an empirical study of the performance of JVs with buyout options as a mean acquisition relative to direct M&As. The results of the empirical study have policy implications for the way acquisitions should be conducted.

The objective of this chapter is to find out which type of acquirers performs best: Acquirers who engage in a direct M&A strategy or acquirers who set up JV with buyout option as a mean of acquisition? The sample with the best long-term performance, measured by stock price performance, is the best performing sample. We find stock price performance to be the best measure of long-term shareholder value⁴⁵.

This chapter mainly presents how the empirical study was conducted, as well as the empirical results. The discussion of the empirical results will follow at the end of the chapter.

The structure of the chapter is seen in Equation E1(note all figures and equations in this chapter are denoted with "E", thus highlighting the Empirical focus). The focus will be directed towards how the sample observations are selected and how we intend to measure the differences in the performance of the two samples. The JV Sample consists of a Buyout Sample and an Adjusted Bias Sample. The Buyout Sample contains JVs that have exercised their option to buyout their counter parts, whereas the Adjusted Bias Sample contains JVs that have not exercised their buyout option. The latter sample is included in order to eliminate the positive bias that is included in only using the Buyout Sample. A discussion of this will follow in upcoming sections.

The key methodology used in the chapter is the event study (Campbell *et al.* (1997)), as argued in section 1.3.2.

⁴⁵ Alternative measures includes market to book value, earnings per share, economic value added (EVA), etc.

Through out this chapter, regression analysis is used as a method to show relations between different variables. The standard assumptions for the regression analysis are generally assumed to hold⁴⁶.





Source: Own construction

The spreadsheet calculations and graphs can be found on the CD-rom attached to the thesis. Whenever the calculations and graphs in the figures can be found on the CD-rom, *JVM&A.EmpiricalResults.xls* followed by the sheet name will be denoted in the source.

⁴⁶ The standard linear regression assumptions can be found in any textbook on statistics and econometrics. Guajarati (1999) describes them as being:

¹⁾ The explanatory variables are uncorrelated with the disturbance term u

²⁾ The expected, or mean, value of the disturbance term u is zero. That is, $E(u_i)=0$.

³⁾ The variance of each u_i is constant, or homoscedastic. That is var $(u_i) = \delta^2$

⁴⁾ There is no correlation between two error terms. This is the assumption of no autocorrelation. Algebraically, this assumption can be written as $cov(u_i, u_j)=0$, $i \neq j$

⁵⁾ For hypothesis testing, the error term u follows the normal distribution with mean zero and (homoscedastic) variance δ^2 . That is, $u_i \sim N(0, \delta^2)$

3.1 The JV Sample

The JV Sample consists of national and international JVs in which one JV partner has a buyout option that he might choose to exercise, after no more than 3 years⁴⁷. This period is measured from the initial JV announcement date and is defined as the JV period. National JVs are defined as a JV formed by two partners from the same country, whereas international JVs are formed by partners from different countries.

The JV-period is defined as the period it takes for the potential acquirer to eliminate asymmetric information, i.e. reducing the information gap between the potential acquirer and the potential target. According to this definition, the potential acquirer therefore has full information of potential target firm at the end of the JV period. For this reason potential acquirer can fully rationally make his purchasing decision, when asymmetric information is eliminated. This line of game definition and argument is directly drawn from the similar scenario at t=3 in Figure M2 in The JV-M&A Asymmetric Information Model presented in chapter 2.

The JV period is set to no more than 3 years from the following line of argument: Looking at more than 1,000 JV transactions, we have observed an approximately average time of 6 months from the date of the JV announcement until the beginning of the JV. Next, we believe it takes no more than 2 years before all asymmetric information is eliminated, that is, when the potential acquirer knows whether his JV partner is of a good or bad type⁴⁸. Finally, from the time of elimination of asymmetric information until buyout takes place, on average 6 months will occur. These 6 months are related to the fact that final buyout of the JV partner will not take place immediately after elimination of asymmetric information, since approval from the board needs to be made, terms and conditions (if not already predetermined) of the buyout needs to be finalized, cash (if constrained) needs to raised, etc. Eventually, we find good reasons to believe that JV firms with buyout option

⁴⁷ When screening JV transactions used for the JV Sample, not all announcements disclosed whether an option had been written to one of the JV partners. We do however believe that when setting up a JV both parties ensure contractual agreements, which enables them to buyout each other on specified terms, thus granting each other options (a special thank to Sam Julaei working as a lawyer at Bech Brun Dragsted in Copenhagen for this remark)

⁴⁸ AT Kearney: Executive Agenda, Volume 5, Number 2, Fourth Quarter 2002

and a JV-period of less than 3 years before buyout can represent a JV setup as a mean of acquisition⁴⁹.





Figure E2 shows how the 3 years, as a cut-off date, for the JV period is reached.

All the observations in the JV Sample has either had a JV announcement or exercised their buyout option in the period 01.01.1996-01.01.2003. This year was chosen as the break off date, as we aspired to construct the newest and largest possible sample. In working with the empirical data, 1996 was found to maximize the amount of useful observations, while still making the sample fairly up to date. An important implication of how the JV sample was selected is the up to date usefulness, so that the conclusions, made in this chapter, can be used for adding new perspectives on acquisitions.

For each observation, the following data was registered: Potential acquirer's name, potential target's name, date, month and year of JV announcement and buyout, potential acquirer's industry and country, potential target's industry and country.

Source: Own construction

⁴⁹ As will be explained later, setting the criteria for the JV period to less than 3 years plays an important for role for the up coming event study, since the event period is set to measure the performance 3 years (or 36 months) after the announcement of the event.

3.1.1 The Buyout Sample

The Buyout Sample consists of JVs in which a buyout has taken place. The sample was selected by using Factiva and LexisNexis Professional. The latter database was accessed through the Copenhagen Business School library. The source used under LexisNexis Professional was Mergerstat M&A Database ("Mergerstat"). Mergerstat contains the following sub-sources: IDD Mergers and Acquisition Database - Canada - Archival, IDD Mergers and Acquisition Database -European Reports - Archival, IDD Mergers and Acquisition Database - US Reports - Archival, IDD Mergers and Acquisitions Database - UK Reports - Archival, Mergers & Acquisitions in Canada and the Mergerstat M&A Database. The overall coverage in Mergerstat, under the permission of LexisNexis Professional, is from January 1996 to present. Due to vendor restrictions some sources have been excluded from group. The search terms in LexisNexis Professional were "joint venture and remaining". In this way the search was focused on JV deals in which a JV partner was actually bought out of the partnership. However, for many of the useful observations the JV announcement date was not revealed in this search. As a consequence of this, the findings in Mergerstat were supported with transactions found in *Factiva*⁵⁰ with *"joint venture and buyout"* as the search terms. Also, Factiva was used to find the JV announcement date for the buyout transactions found in Mergerstat where the JV announcement date was not revealed. The search terms for this search in Factiva were "joint venture and form".

Using LexisNexis and Factiva from the period 01 January 1996 to 01 September 2001 yielded around 1256 hits. Not all JVs in which buyout had taken place were used in the JV Sample. The following criterias were set in order for a JV to qualify for the JV Sample:

Potential target firms could not originate from Malaysia, Viet Nam, Taiwan or China. This
relates to the fact that foreign firms by law are required to set up JVs when they intend to
expand to these countries. Including JVs from the above mentioned countries in our JV
Sample would thus be misleading, since the reason behind the JV is more of a legal
requirement than as a mean of eliminating asymmetric information.

⁵⁰ Factiva (<u>www.factiva.com</u>) is the head operator of Reuters and Dow Jones. We wish to thank Trine Gammelmark for letting us borrow access to Factiva.com. Without this access, we would not have reached the obtained sample size

- Only JVs between two firms were included in our JV Sample. In some cases, we found JVs in which more than 2 firms had engaged in a JV. These firms were excluded from our sample, since it was the impression that the intention in these JVs was not an acquisition.
- Some JV buyouts were caused by either bankruptcy of one of the JV partners or regulation from competition authorities⁵¹. These transactions were excluded from the JV Sample.
- In some cases, one of the JV partners was initially given a put option⁵². Cases where buyout had taken place due to one of the JV partner's exercise of its put option were excluded from the JV Sample.
- In some cases a complete buyout was not the case, e.g. when one partner increases his ownership from 50% to 80%. Whenever one JV partner bought a majority interest in the JV in which it did not have before, it was considered a buyout and therefore included in the JV Sample.
- The firm buying out the other JV partner must be listed at a stock exchange. This is due to stock prices being used as performance indicator. If the JV partner was a subsidiary of a large conglomerate (e.g. GE Capital of Generel Electric) and the subsidiary had engaged in a JV, the stock price of the subsidiary was used if the subsidiary was a listed firm itself. In case the subsidiary was not listed, the parent's or the conglomerate's stock price was used instead⁵³.
- Due to the use of estimation period, stock prices of firms should be available for the following period: -36 months before JV announcement and +36 months after JV announcement.
- Liquidity in the stock was required. This ensures a stock price is valued at market prices⁵⁴. To examine for liquidity *Datastream* was used. If the stock price showed sign of no trading activity, the firm was excluded from the sample.
- The standard deviation on the returns of the stock price must not differ significantly from the mean of the sample. This restriction ensures absence of outlier effect.

⁵¹ Fortunately, all transactions in Mergerstat has a "Deal Briefing" where a short description of the transaction is given. This enables us to explore whether buyout had taken place due to bankruptcy or regulation by competitive authorities.

⁵² The holder of a put option has the right to sell the underlying asset at a predetermined price

⁵³ One disadvantage of the latter approach lies in the noise created by the parent firm's or the conglomerate's other business divisions.

⁵⁴ If a stock is not sufficiently traded, it is most likely not valued at the fair market price and the stock price is therefore not a good measure for the value of the firm.

• Absence of stock splits was a requirement. This was verified by looking at the stock prices. An immediate and very strong decrease in prices could indicate a stock split⁵⁵.

After excluding firms that did not meet the above criteria, the sample consisted of 49 JVs in which buyout had taken place. In the following, the 49 transactions were grouped into 8 industry categories depending on their line of business. The industry grouping was made for the purpose of simplifying the industry composition of the JV Sample. The 8 categories were⁵⁶:

TMT ("Telecom, Media, Technology")

The JV firms grouped under TMT were firms operating within: Telecommunications, Software Development, Software Supplies and Services, Media, Entertainment, and Internet Related Services.

Pharmaceutical

The JV firms grouped under Pharmaceutical were firms engaged in: Drug Discovery, Drug Development, Marketing and Distribution of Drugs, Production and Sales of Equipment to the Pharmaceutical Industry.

Utility

JV firms grouped in the utility category consist of firms in Oil and Gas (both up-steam and downstream), Power Supply, Waste and Drinking Water Services to Residents and Industry.

Financial Services

JV firms grouped under Financial Service consist of firms within: Insurance, Commercial Banking, Investment Banking, Brokerage, Investment Consultancy and Mangement Consultancy.

⁵⁵ For a more profound discussion on stock splits and empirical results, see Fama, Jensen, Roll (1969).

⁵⁶ Operating with broad industry categories is, however, not free of problems since business risk and financial risk can vary highly across firms within an industry. No analysis has been undertaken in order to reveal whether that was the case for the observations.

Heavy Manufacturing

JV firms grouped under Heavy Manufacturing consist of firms with manufacturing within: Paper, Chemicals, Paints & Coatings, Rubber, Steel, Metal, Construction, Automotive, Aviation, Mining and Industry Equipment & Machinery.

Light Manufacturing

JV firms grouped under Light Manufacturing consist of firms with manufacturing within: Shoes, Clothing, Household Goods and Agricultural Production.

Retail

JV firms grouped under Retail consist of firms with operations within: Supermarkets, Hypermarkets, Wholesale in general and Retail in general.

Other

This category captures services, which are not represented in the previous mentioned service categories. JV firms grouped under Other consist of firms with services within: Housing (Real Estate), Hotel and Facility Management in general.

3.1.2 The Adjustment Bias Sample

By only including the JV buyout transactions described in the previous section, the JV Sample could have a potential positive bias⁵⁷, for the following reason: Only the successful JVs would exercise their buyout option leading to a higher return in this sample. In order to adjust for the potential positive bias, JVs which have not exercised within 3 years, are also included in the JV sample. These JVs are assumed to be lemons, and make up the Adjustment Bias Sample. The underlying reason for this goes as follows: If the target firm was a peach, the buyout option would have been exercised, when the asymmetric information was eliminated, given a rational potential acquirer firm. Given the firms in the Adjustment Bias Sample have not exercised their buyout option, it indicates that the target firm are lemons.

⁵⁷ The potential positive bias is analogous to the discussion on survivorship bias in betas. That is, only firms who survive are used when making historical performance measurement. This creates a bias since firms who "dies" also should be included in the sample.

The selection criteria for the Adjustment Bias Sample are similar to those of the Buyout Sample and we refer to the previous section for further details. In addition to the same selection criteria, we strived to match the Adjustment Bias Sample with the Buyout Sample in terms of JV announcement date and industry. In this way, the overall difference between each buyout and adjustment observation would be the exercising of the buyout option.

The same number of observations is found in the Adjustment Bias Sample as in the Buyout Sample, i.e. 49 observations.

In Figure E3, we have illustrated the performance (in terms of cumulative average return⁵⁸) for the Buyout and Adjustment Bias Sample.



Figure E3: Cumulative Average Return for Buyout and Adjustment Bias Sample

Source: JVM&A.EmpiricalResults.xls (sheet: "AllDataStockperformanceMonthly")

Looking at Figure E3, it intuitively seems as if there is a positive bias within the Buyout Sample compared to the Adjustment Bias Sample. The spread between the 2 samples increases 8 months before and after the JV announcement date. In the following we will however test whether this bias is significant.

⁵⁸ $\overline{CR}_{t} = (1 + \overline{CR}_{t-1}) \times (1 + \overline{R}_{t}) - 1$, \overline{CR} =Cumulative average return, \overline{R}_{t} =average stock return, cf. Coleman (1999)

To test whether the positive bias in the Buyout Sample is significant compared to the Adjustment Bias Sample, we will make use of *Dummy Regression*. The *analysis-of-variance (ANOVA) model*⁵⁹, which only contains dummy explanatory variables, is used.

The dummy regression model for the Buyout Sample vs. Adjustment Bias Sample, is based on the following equation

$$Y_t = B_1 + B_2 D_1 + u_i$$
 Equation E1

where

 Y_t = Cumulative Average Return for Buyout Sample or Adjustment Bias Sample in time period t

*D*₁ = 1 if Buyout Sample = 0 otherwise (i.e. Adjustment Bias Sample)

In Equation E1 we assume the standard linear regression model assumptions holds⁶⁰, as described in the beginning of this chapter.

Based on Equation E1, the cumulative average return of the Adjustment Bias Sample, is:

$$E(Y | D_1=0) = B_1 + B_2(0) = B_1$$

and the cumulative average return of the Buyout Sample, is:

 $E(Y | D_1=1) = B_1 + B_2(1) = B_1 + B_2$

In the following, the null hypothesis, H_0 : $B_2 = 0$ and H_1 : $B_2 \neq 0$, will be tested, by running Equation E1. The input data for running the dummy regression can be found in Figure E4.

⁵⁹ Gujarati (1999)

INPUT DA	TA: DUMMY REGR	RESSION					
t	Туре	Yt	D ₁	t	Туре	Yt	D ₁
-8	Buyout	3,5%	1	15	Buyout	51,9%	1
	Adjustment Bias	1,8%	0		Adjustment Bias	33,3%	0
-7	Buyout	7,0%	1	16	Buyout	57,3%	1
	Adjustment Bias	6,2%	0		Adjustment Bias	35,5%	0
-6	Buyout	10,8%	1	17	Buyout	58,2%	1
	Adjustment Bias	7,6%	0		Adjustment Bias	40,1%	0
-5	Buyout	13,4%	1	18	Buyout	61,3%	1
	Adjustment Bias	8,9%	0		Adjustment Bias	40,4%	0
-4	Buyout	13,2%	1	19	Buyout	60,1%	1
	Adjustment Bias	10,3%	0		Adjustment Bias	42,4%	0
-3	Buyout	17,4%	1	20	Buyout	58,7%	1
	Adjustment Bias	14,0%	0		Adjustment Bias	40,6%	0
-2	Buyout	17,7%	1	21	Buyout	56,3%	1
	Adjustment Bias	13,5%	0		Adjustment Bias	39,3%	0
-1	Buyout	21,2%	1	22	Buyout	59,0%	1
	Adjustment Bias	16,0%	0		Adjustment Bias	38,0%	0
0	Buyout	23,3%	1	23	Buyout	63,0%	1
	Adjustment Bias	18,8%	0		Adjustment Bias	39,3%	0
1	Buyout	24,0%	1	24	Buyout	66,1%	1
	Adjustment Bias	15,5%	0		Adjustment Bias	45,7%	0
2	Buyout	26,4%	1	25	Buyout	69,9%	1
	Adjustment Bias	15,6%	0		Adjustment Bias	50,4%	0
3	Buyout	26,3%	1	26	Buyout	68,2%	1
	Adjustment Bias	19,4%	0		Adjustment Bias	55,3%	0
4	Buyout	30,5%	1	27	Buyout	66,4%	1
	Adjustment Bias	17,8%	0		Adjustment Bias	55,2%	0
5	Buyout	33,3%	1	28	Buyout	67,2%	1
	Adjustment Bias	20,5%	0		Adjustment Bias	50,9%	0
6	Buyout	39,4%	1	29	Buyout	64,1%	1
	Adjustment Bias	22,4%	0		Adjustment Bias	46,3%	0
7	Buyout	42,0%	1	30	Buyout	64,8%	1
	Adjustment Bias	17,6%	0		Adjustment Bias	46,9%	0
8	Buyout	41,0%	1	31	Buyout	58,8%	1
	Adjustment Bias	17,5%	0		Adjustment Bias	44,9%	0
9	Buyout	40,4%	1	32	Buyout	61,4%	1
	Adjustment Bias	21,6%	0		Adjustment Bias	45,2%	0
10	Buyout	40,9%	1	33	Buyout	63,8%	1
	Adjustment Bias	24,7%	0		Adjustment Bias	45,0%	0
11	Buyout	45,1%	1	34	Buyout	66,4%	1
	Adjustment Bias	26,4%	0		Adjustment Bias	50,0%	0
12	Buyout	45,2%	1	35	Buyout	73,6%	1
	Adjustment Bias	27,5%	0		Adjustment Bias	50,0%	0
13	Buyout	52,2%	1	36	Buyout	70,9%	1
	Adjustment Bias	27,5%	0		Adjustment Bias	52,7%	0
14	Buyout	53,3%	1				
	Adjustment Bias	32,8%	0				

Figure E4: Input Data for Dummy Regression: Buyout Sample vs. Adjustment Bias Sample

Source: JVM&A.EmpiricalResults.xls (sheet: "Dummy(Buyout vs. Adj.Bias)")

⁶⁰ According to Gujarati (1999), ANOVA models build on the same assumption as the assumptions in the standard

The results from the dummy regression in Figure E4 can be found in Figure E5.

Regression S	Statistics							
Multiple R	0,381079375							
R Square	0,14522149							
Adjusted R Square	0,135508098							
Standard Error	0,180916371							
Observations	90							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	1	0,489345615	0,489346	14,95065	0,000210929			
Residual	88	2,880304521	0,032731					
Total	89	3,369650136						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	0,30916345	0,02696942	11,46348	3,79E-19	0,255567353	0,362759547	0,255567353	0,362759547
X Variable 1	0.147474384	0.03814052	3.866607	0.000211	0.071678057	0.223270711	0.071678057	0.223270711

Figure E5.	Test Statistics for	r Dummv	Regression	Buyout Sample	vs Adjustment	Bias Sample
Figure ES.	I est statistics in	n Dummy	Regiession.	Duyout Sample	vs. Aujustinent	Dias Sampie

Source: JVM&A.EmpiricalResults.xls (sheet: "Dummy(Buyout vs. Adj.Bias)")

From the results in Figure E5, the null hypothesis can be rejected at the 5% level of significance, since $B_2 = 0.147$ (p = 0.00021).

Based on these findings, evidence has now been found which supports the existence of positive bias in the Buyout Sample.

3.1.3 The Final JV Sample

In the latter section we found evidence for positive bias in the Buyout Sample. Therefore it makes sense to include the Adjustment Bias Sample in the JV Sample, in order to eliminate for positive bias. The next important question, which arises in respect to this, is what weight should be assigned to the Adjustment Bias Sample in the JV Sample? We have not found clear evidences for stating that either the one or the other group in the JV sample should be weighted more than the other. Due to lack of knowledge about the distribution of the two groups in the entire population, we have assumed that the prior probability of a target firm being a peach⁶¹ is 50%, making the weight of the two groups of JVs equal in the JV Sample. By making this assumption, we are aware there is a risk

linear regression

⁶¹ Notice, this was denoted by θ in The JV-M&A Asymmetric Information Model presented in chapter 2

of having a bias in the JV Sample in case the distribution in the entire population is different from the sample. However, we find no alternative approaches than making the mentioned assumption. Since a 50%-50% distribution of the Buyout Sample and the Adjustment Bias Sample is assumed, *the final JV Sample size is 98 observations* (= 49 Buyout observations + 49 Adjustment Bias Observations)⁶².

3.1.4 Descriptive Statistics for the Final JV Sample

Figure E6 shows an overview of the geographical exposure of the potential acquirer in the final JV sample. USA and UK are pooled into one category, as their corporate governance systems are very alike⁶³. The corporate governance systems in USA and UK are characterized by:

- Dispersed ownership, many owners and few large owners
- An active market for corporate control
- No ownership by banks
- Early entry on the stock market by successful medium sized firms

Given that the corporate governance systems are alike, it can be argued that the market for corporate takeovers work in the same way, making the same mechanisms and strategies for M&A possible.

⁶² Source: JVM&A.EmpiricalResults.xls (sheet: "JV Database")

⁶³ Shleifer & Vishny (1997) and lecture note 1 from Cand Merc AEF course by Morten Bennedsen, "Firm Theory and Corporate Governance", CBS, spring 2002

JV Sample and Ge	ographica	I Exposure						
n = 98 (=100%)	- <u>9</u>							
Potential Acquirer	1994	1995	1996	1997	1998	1999	2000	Total
Australia		1%			1%			2%
Belgium					1%		1%	2%
Canada		1%			1%		1%	3%
Denmark		1%	1%					2%
Finland	1%				1%		2%	4%
France					1%	2%	2%	5%
Germany	1%		1%	1%		1%	1%	5%
Holland		1%		1%	1%	1%	2%	6%
Hong Kong	1%							1%
India								0%
Ireland		1%				1%		2%
Italy					1%	1%		2%
Japan				1%		1%	6%	8%
Korea					1%			1%
Malaysia			1%					1%
New Zealand					1%			1%
Portugal								0%
Russia								0%
Scotland		1%			1%			2%
South Africa		1%						1%
Spain		1%				1%		2%
Sweden	1%			1%	2%			4%
Switzerland		1%				1%	1%	3%
USA & UK		4%	6%	3%	8%	5%	6%	42%
Total	4%	13%	9%	7%	20%	14%	22%	100%

Figure E6, Overview of Geographical Composition in The Final JV Sample

Source: JVM&A.EmpiricalResults.xls (sheet: "Word Output")

The figure shows that the majority of the potential acquirers are from USA and UK. The 2 countries convey 42% of the JV sample, in terms of number of firms. Not surprisingly do Japan, Holland, France and Germany also contribute with a relatively high percentage of the overall sample size. The figure also shows that a large part of the observations are found from 1998 – 2000.

Figure E7 shows the industry composition in the final JV sample. A high percentage of the sample observations are from the Heavy Manufacturing and TMT industry. The high share of TMT observations can be partly explained by the rally in the internet business in this period.

Figure E7, Overview of Industry Composition in the Final JV Sample

n=98 (=100%)									
Potential Acquirer's Industry	Heavy Manufac.	TMT	Light Manufac.	Retail	Pharmaceutical	Utility	Financial Services	Other	Total
1994	2%	2%					2%		6%
1995	3%	2%			3%		4%	1%	13%
1996	4%				2%			4%	10%
1997	2%	4%	4%						10%
1998	5%	4%	2%		2%	4%	2%	2%	21%
1999	4%	4%			2%	2%		2%	14%
2000	6%	12%				2%	4%		24%
Total	26%	28%	6%	0%	9%	8%	12%	9%	100%
Potential Target's Industry	Heavy Manufac.	TMT	Light Manufac.	Retail	Pharmaceutical	Utility	Financial Services	Other	Total
1994	1%	1%	1%	1%		1%	1%		6%
1995	2%	3%			3%		3%	2%	13%
1996	1%	2%			2%		1%	4%	10%
1997	3%	5%	2%						10%
1998	7%	4%	1%	1%	1%	2%	2%	3%	21%
1999	3%	3%	1%	1%	3%	1%		2%	14%
2000	4%	11%	2%			2%	5%		24%
Total	21%	29%	7%	3%	9%	6%	12%	11%	100%

Source: JVM&A.EmpiricalResults.xls (sheet: "Word Output")

3.2 The M&A Sample

The purpose of the M&A Sample is, as mentioned previously, to create a sample for direct comparison to the JV Sample. The theoretical ideal M&A Sample should thus consist of firms with the exact same business risk and financial risk as the firms in the JV Sample. The only difference in the two samples should therefore lie in the mean of acquisition. That is, firms in the JV Sample use JVs with buyout option as a mean of acquisition, whereas firms in the M&A Sample use direct M&As as a mean of acquisition. Hence, this corresponds to the game setup in the JV-M&A Asymmetric Information Model presented in chapter 2.

The M&A transactions used in the M&A Sample was selected from *Bloomberg's M&A database*⁶⁴. Transactions, where the M&A was announced before 01.01.1997, was recorded by using LexisNexis Professional, since Bloomberg's M&A database only dates back to 01.01.1997.

In terms of announcement dates, we have, when finding comparable M&A transactions to each JV transaction, chosen direct M&As, where announcement of the direct M&A takes place in the same

⁶⁴ A special thanks to Nordea Markets in Copenhagen for letting us using their Bloomberg terminal.

month of the year as the announcement of the JV. The purpose of this was to ensure an equally macroeconomic exposure in the two samples⁶⁵. For the 98 transactions used in the M&A Sample, 59% of the direct M&A announcements took place in the exact same month of the year as the JV, 25% took place in -1;+1 month around the JV announcement month, and 16% took place -2;+2 months around the JV announcement month. No transactions used in the M&A Sample had an announcement day of more than -2;+2 months compared to the JV Sample.

Measured on a daily basis, the average duration differential between the JV Sample and the M&A Sample was 4,01 days per observation⁶⁶. Taken into consideration that the JV and M&A data will later be used to measure performance during a period of several years, a deviation of 4,01 days is considered to have minimal distortion effect.

In other words, an exact theoretical match of the two samples was not possible, but the obtained results are considered fairly good, taking the existence of data into consideration.

3.2.1 Descriptive Statistics for the M&A Sample

Figure E8 shows the geographical composition of the M&A Sample. Compared to Figure E6 it can be concluded that the M&A Sample overall has the same geographical composition as the JV Sample. Most important, the USA & UK share of observations is 43%, compared to 42% in the JV sample. Japan, Holland, France and Germany also have fairly high shares in the M&A Sample.

⁶⁵ One could thus assume that if this condition was not met, the sample with the highest exposure to periods with rising stock markets would be the best performing due to its biased time period exposure and not the mean of acquisition. An example of the importance of similar time period exposure for the two samples can e.g. be drawn from the recent 9/11-terror attack in NY. In case the M&A Sample had a higher exposure to the period after the attack, the exogenous given disturbance would simply not enable a correct comparison of the two samples

⁶⁶ JVM&A.EmpiricalResults.xls (sheet: "Duration")

M&A Sample and	I Geographie	cal Exposu	ire					
<u>n = 98 (=100%)</u>	1004	1005	1996	1007	1008	1000	2000	Total
Australia	1334	1995	1330	1337	1990	1%	1%	2%
Relaium						170	170	0%
Canada		2%	1%			2%	3%	8%
China		1%	170			2 /0	570	1%
Denmark		170				1%		1%
Finland					1%	170		1%
France					2%	2%	1%	5%
Cormany		1%			∠ /0	∠ /0 1%	1 /0	5%
		1%	1%			1 /0	3 /0 1 %	3%
		1 /0	1 /0			1%	1 /0	J /0 1 %
						1%		1 %
linula				1%		170		1%
				1 %				10/
				1 /0	2%		2%	1 /0
llanan				1 0/	2 /0	204	2 /0 1 0/	+ /0 6%
Japan				1 /0	2 /0	∠ /o 10/	1 /0	10/0
Now Zoolond				1 /0	2 /0	1 /0		+ /0 0%
New Zedianu	1 %			1 0/	1 0/	1 0/		10/0
Dortugal	1 /0			1 /0	1 /0	1 /0	1 0/	4 /0
Portugai							1 70	170 ∩0⁄
Russia					1 0/			10/
Scotland South Africa					1 70 1 0/		10/	1 70 20/
South Anica Spoin					1 70	10/	1 70	∠70 20/
Spain			1 0/		1 70	1 70	1 70	J 70 1 0/
Sweuen			1 70					1 70 00/
	E 0/	0%	70/	60/	4.0/	20/	00/	U70 420/
	3% 6%	970	1 70	0%	4 %	3% 170/	0%	43%

Figure E8, Overview of Geographical Composition in the M&A Sample

Source: JVM&A.EmpiricalResults.xls (sheet: "Word Output")

When creating the M&A Sample, the same 8 industry categories were used as in the JV Sample (for industry categories, see section 3.1.1.). The purpose of this was to ensure that both samples had the same industry exposure. Likewise, the criteria for selecting the JV sample were applied to the M&A sample. The M&A Sample, which consists of 98 firms, is thus characterized by acquisitions, where the acquirers are from the same industries as the acquirers in the JV Sample. Creating an equally weighted industry exposure, in terms of acquirers, for the two samples thus ensures, ceteris paribus, an equal business risk composition in the two samples.

Figure E9 shows the industry composition of the M&A Sample.

=98 (=100%)		ile ile							
Acquirer's Industry	Heavy Manufac.	TMT	Light Manufac.	Retail	Pharmaceutical	Utility	Financial Services	Other	Total
1994	2%	2%					2%		6%
1995	4%	2%			2%		4%	2%	14%
1996	4%				2%			4%	10%
1997	2%	4%	4%			1%			11%
1998	4%	4%	2%			3%	2%	2%	17%
1999	4%	5%			4%	2%		2%	17%
2000	6%	11%				2%	4%		23%
Total	26%	28%	6%	0%	8%	8%	12%	10%	100%
Target's Industry	Heavy Manufac.	TMT	Light Manufac.	Retail	Pharmaceutical	Utility	Financial Services	Other	Total
1994	2%	2%					2%		6%
1995	6%	2%			2%		4%		14%
1996	3%	1%			2%			4%	10%
1997	3%	4%	3%			1%			11%
1998	3%	4%	4%			2%	2%	2%	17%
1999	4%	5%			4%	2%		2%	17%
2000	3%	10%	3%			2%	4%	1%	23%
Total	24%	28%	10%	0%	8%	7%	12%	9%	100%

Figure E9, Overview of Industry Composition of the M&A Sample

Source: JVM&A.EmpiricalResults.xls (sheet: "Word Output")

Comparing Figure E9 with Figure E7, it can be concluded that the JV Sample and the M&A Sample has an equally weighted industry composition.

As described in this section, we have strived in making the M&A Sample equally risky as the JV Sample in terms of industry, time period, and geographical exposure. Figure E10 shows the standard deviation of the stock returns (monthly data) for the two samples.

Figure E10, Std. Dev. of JV Sample vs. Std. Dev. of M&A Sample



Source: JVM&A.EmpiricalResults.xls (sheet: "AllDataStockperformanceMonthly")

As the figure shows, the standard deviation for the JV sample is moving at the same level as the M&A sample. If the standard deviation is taken as a measure of the risk in the two samples, the figure indicates an equal risk for the two samples around the announcement. Figure E11 tests whether the two standard deviations differ or not.

Std. Dev. Of JV S	ample vs. Std. De	v. Of M&A Sample	e Test
t	V	t	V
-8	1,31	15	1,20
-7	1,12	16	1,04
-6	1,11	17	1,26
-5	1,17	18	1,37
-4	1,19	19	1,05
-3	1,13	20	1,02
-2	1,13	21	1,11
-1	1,40	22	1,24
0	1,61	23	1,81
1	1,55	24	1,05
2	1,36	25	1,34
3	1,16	26	1,01
4	1,00	27	1,17
5	1,28	28	1,40
6	1,07	29	1,13
7	1,09	30	1,22
8	1,26	31	1,13
9	1,08	32	1,28
10	1,30	33	1,01
11	1,29	34	1,36
12	1,14	35	1,36
13	1,55	36	1,06
14	1,24		
$H_0: \overline{\delta}_{JV,t} = \delta_{M\&A,t}, H_1:\delta_{JV,t}$	$\neq \delta_{M\&A,t.}$ The figures in its	alic mean insignificance a	at the 5% level
of significance. Critical	/alue 1.37.		

Figure E11, Test of Significance for Std. Dev.

Source: JVM&A.EmpiricalResults.xls (sheet: "Word Output")

The test statistics, in the figure, are calculated as

$$\mathbf{V} = \frac{\max(\sigma_{JV,t}, \sigma_{M\&A,t})}{\min(\sigma_{JV,t}, \sigma_{M\&A,t})}$$

The test statistic follows the F distribution with (n-1, m-1) degrees of freedom. The critical value based on the degrees of freedom for the JV and M&A Sample is 1.37. The figure shows the

majority of the test statistics are insignificant at the 5% level of significance. This means, the null hypothesis cannot be rejected, meaning that it cannot be rejected that the standard deviations for the JV and the M&A Sample are equal. The result of the test therefore supports the findings based the graphical results in Figure E10.

3.3 The Market Model

The market model is used as the benchmark sample relative to the JV sample and the M&A sample in the estimation period, as will be explained more in detail in later sections. The composition of the market model should reflect the market risk for the JV and the M&A sample. The market model best reflecting the JV and M&A sample is the Datastream Global Indice (DS Mnemonic: TOTMKWD)⁶⁷.

Figure E12: Overview of Geographi	al Composition in Datastream	Global Indice (DS Mnemonic:	TOTMKWD)
-----------------------------------	------------------------------	-----------------------------	----------

Country	Weight in Index
AUSTRALIA	2,0%
BELGIUM	0,8%
BRAZIL	0,8%
CANADA	2,7%
DENMARK	0,4%
FINLAND	0,6%
FRANCE	4,5%
GERMANY	3,4%
HONG KONG	2,3%
INDIA	0,7%
ITALY	2,1%
JAPAN	11,1%
NETHERLANDS	1,9%
NEW ZEALAND	0,1%
NORWAY	0,3%
SINGAPORE	0,5%
SOUTH AFRICA	0,5%
SOUTH KOREA	1,0%
SPAIN	1,6%
SWEDEN	0,9%
SWITZERLAND	2,5%
TAIWAN	1,1%
UNITED KINGDOM	8,5%
UNITED STATES	45,3%
Other	4,4%
Total	100,0%

Source: Datastream

⁶⁷ In an email from Caroline Larsson (Datastream) she commented: "The composition of the index at company level has changed over time, although at country level it remains fairly constant. Unfortunately we do not store historical constituent lists for Datastream-calculated indicies". Based on this comment, comparison over time is fairly reliable in terms of geographical exposure.

Figure E12 shows the geographical composition of the Datastream Global Indice.

It is important to notice the high weight on US and UK shares equals 54%, compared to 42% and 43% in the JV and M&A sample respectively, as shown in Figure E6 and Figure E8. Japan, Canada, Germany and France weight 22% in Datastream Global Indice, compared to 21% and 24% in the JV and M&A sample respectively.

Looking at the industry composition in the Datastream Global Indice, it is seen from Figure E13 that the percentage composition in the market model in the Pharmaceutical and Utility industry highly matches with that of the JV and M&A sample shown in Figure E7 and Figure E9. The JV Sample consists of 9% whereas the M&A sample equals 8% of Pharmaceutical firms. The percentage of Utility firms for the JV as well as M&A sample is 8%. However, there is an underweight in Heavy Manufacturing, TMT, Retail and overweight in Light Manufacturing and Financial Services.

Industry Group	Weight in Index
Heavy Manufac.	10,4%
ТМТ	21,2%
Light Manufac.	14,4%
Pharmaceutical	6,9%
Utility	7,3%
Financial Services	22,5%
Retail	7,5%
Other	9,8%
Total	100,0%

Figure E13: Overview of Industry Composition in Datastream Global Indice (DS Mnemonic: TOTMKWD)

Source: Datastream

Overall it can be concluded from Figure E12 and Figure E13 that the composition of the Datastream Global Indice and the JV and M&A sample is fairly comparable. Therefore, the Datastream Global Indice is a good market model for the JV and M&A sample. This was also proven by a very high percentage of significant regression results (approximately 95%) when estimating the regression models for each observation in the JV Sample and the M&A Sample. In addition, the calculated R^2 s

show that the goodness of fit of a regression line between the dependent and explanatory variable, were all relatively high⁶⁸.

3.4 The Event Study

The event study is, as mentioned, used for the empirical study. The methodology is based on a given event's effect on the value of a firm. The usefulness of such a study comes from the fact that, given rationality in the marketplace, the effect of an event will be reflected immediate in asset prices (Campbell et al. (1997)).

Figure E14 below shows the main parts our event study. First of all, we make use of an estimation period, which is the period, in which the regression model is estimated. Second, the event occurs at t = 0. Third, there is an Event Period, which is the period in which we intent to measure the abnormal return of the event.



Figure E14, Estimation Period vs. Event Period



It should be noticed, the event period can initiate before the event occurs. However, it should not overlap with the estimation period, as this would cause incorrect interpretation of the abnormal returns calculated in the event period. The estimation period's "normal" return would in this case be reflected in the abnormal return. This would be problematic since the methodology is built around the assumption that the event's impact is captured by the abnormal return (Campbell et al. (1997)). A more thorough discussion of the estimation period and the performance will be made in the up coming two sections.

⁶⁸ JVM&AEmpiricalResults.xls (sheet: "JVregression") and JVM&AEmpiricalResults.xls (sheet: "M&Aregression")

From t=0 to the end of the event period at t=36, there is 3 years in between, which is considered a long event period. Nevertheless, this is consciously chosen, as there is a focus on long-term shareholder value in this thesis. The downside by focusing on a long event period is the risk of not measuring the initial effect on the performance of the event announcement at t=0, which is the initial purpose of the event study. On the other hand, by choosing a short event period the chances of the event announcement explaining the performance are higher. However, we believe in the case of acquisitions, that the effect of the acquisition on the potential acquirers stock price, is not only reflected shortly after the announcement at t=0. This is in line with Langetieg (1978) who chooses 72 months after the acquisition, while Schwert (1996) chooses 12 months. This is one of the reasons why, long-term shareholder value was initially chosen as the period in which to measure performance.

3.4.1. The Estimation Period

The estimation period is the period, which is used in order to derive the OLS^{69} parameter estimates. The period should be understood as the period that shows how the JV sample and M&A sample perform relative to the market model, before any announcement or market sentiment about the upcoming announcement at t=0. This is relevant, as the abnormal return will be calculated in the event period based on the OLS parameter estimates calculated in estimation period. The calculations of the abnormal return are based on the regression model residuals. Positive residuals evidence an abnormal return, i.e. the JV or M&A Sample has an abnormal return relative to the market model.

The regression model will be designed in the following way:

$$R_{i,t} = \alpha_i + \beta_i R_{M,t} + \varepsilon_{i,t}$$
Equation E2
$$R_{j,t} = \alpha_j + \beta_j R_{M,t} + \varepsilon_{j,t}$$
Equation E3

 $R_{i,t}$ = the return for acquirer JV firm *i* in period *t*. The firms in this portfolio will consist of those firms that set up JV with buyout option for the purpose of a following acquisition

 $R_{j,t}$ = the return for acquirer M&A firm *j* in period *t*. The firms in this portfolio will consist of those firms that engages in a direct M&A

 $R_{M,t}$ = the weighted average return for the market portfolio in period *t*. The market portfolio consist of the Datastream Global Indice (DS Mnemonic: TOTMKWD)

 α_i and β_i = OLS estimated parameters for JVs

 α_i and β_i = OLS estimated parameters for M&As

 $\varepsilon_{i,t}$ = error term for JVs (~ N(0, σ_i^2)

 $\varepsilon_{j,t}$ = error term for M&As (~ N(0, σ_i^2)

The estimation period is $t_{estimation} = [-36;-12]$ months in both the JV Sample and the M&A Sample. In selecting the period, it was important not to select a period that was correlated with the upcoming announcement, so that independence could be gained between the estimation period and the event period. The actual calculations were made by use of daily observations, as this would make the probability of getting significant results higher. Regression analysis were made based on Equation E2 and Equation E3, which can be found in JVM&AEmpiricalResults.xls (sheet: "JVregression") and JVM&AEmpiricalResults.xls (sheet: "M&Aregression").

3.4.2 The Event Period

The event period is $t_{event} = [-8;+36]$ months in both the JV Sample and M&A Sample. The reason for starting at -8 months in the event period, is in order to adjust for a possible runup period. The importance of a runup period is mainly due to insider trading and multi-bidding auctions in M&As. Several researchers find positive *CARs* during the runup period.

Schwert (1996) argues that in many M&A transactions, there is an existence of more than one bidder, and the intentions of the bidders are generally not known by the others. When the first bid

⁶⁹ Ordinary least squares

announcement comes into play, other bids will possibly follow and an auction contest has begun. The price of the target firm will increase before any M&A deal has been officially settled. Schwert states that the offered price of the bidding firms rise, as they assume the higher bid of the competing bidding firm is due to the competing firm having more information about the target firm. He calls the effect the markup pricing hypothesis. The markup pricing hypothesis reflects rational behaviour of bidders under asymmetric information. Another reason given by Roll (1996) for the markup pricing hypothesis is the well known "hubris hypothesis", which is bidders acting irrational. Irrational behaviour is caused by bidders willingness to win the auction at any price. Empire building of the bidding management team makes them act irrationally not serving the shareholders of the firm. Walkling and Edmister (1985), Bradley, Desai and Kim (1988) and Comment and Schwert (1995) show that premiums paid are higher in M&A transactions with a pregoing auction than in the absence of it. Keown and Pinkerton (1981) show that insiders typically trade before merger announcements. Meulbroek (1992) analyzes 320 firms' stocks that were known for their insider trading. Meulbroek finds a statistically significant and positive relation between insider trading and stock price increases. Another indication of the existence of insider trading in the preannouncement period, was shown by Seyhun (1985). Seyhun showed that insider trading actually increases the bid-ask spread by the market maker. This was created by the adverse selection mechanism⁷⁰.

To adjust for a possible runup in our M&A Sample, we record the stock price of the acquirer –8 months before the announcement day of the acquisition. This range was set on the basis of the results by Schwert (1996), who found that CARs begin to be positive app. 250 days (or app. 8 months) before M&A announcement. Schwert's results was used as his study is among the newest and most comprehensive in the area of runup period for M&As. Schwert used a sample of 1,523 M&As from 1975-91.

For adjustments of possible runups in our JV Sample, we have not found any researchers concluding the existence of runups in the pre-announcement period of JVs. Based on the above argument and results found in terms of insider trading, we find supportive argument that the stock market is not efficient in the strong form according to Fama's (1970) efficient market definition.

⁷⁰ The reason behind this is that when the market maker can't distinguish between inside traders and non-inside traders, he protects him self by charging all traders the expected value of their non-public information. This results in an

Analogous to the M&A Sample, we find good reasons to believe that adjustment for a possible runup in our JV-sample should be made. We have, similar to the M&A Sample chosen a runup period of 8 months before the JV-announcement date.

The linear regressions found in the estimation period are used in the event period in order to calculate the abnormal returns for the JV and the M&A Sample for the period, $t_{event} = [-8;+36]$.

The abnormal return denotes the difference between the market model and the JV sample and the market model and the M&A Sample. The abnormal return is calculated based on the residuals from Equation E2 and Equation E3:

$$AR_{i,t} = R_{i,t} - (\alpha_i + \beta_i R_{M,t})$$
Equation E4
$$AR_{j,t} = R_{j,t} - (\alpha_j + \beta_j R_{M,t})$$
Equation E5

If the abnormal returns are positive the error term will be higher than 0, i.e. JVs and M&As will perform better than the market model. The sum of abnormal returns yields the cumulative abnormal return (*CAR*). The sum of the abnormal returns for firm *i* and *j* within a time period, $t = [\tau_1, \tau_2]$, respectively gives

$$CAR_{i}(\tau_{1}, \tau_{2}) = \sum_{t=\tau_{1}}^{\tau_{2}} AR_{i,t}$$
Equation E6
$$CAR_{j}(\tau_{1}, \tau_{2}) = \sum_{t=\tau_{1}}^{\tau_{2}} AR_{j,t}$$
Equation E7

The cumulative abnormal average return, *CAAR* (τ_1 , τ_2), for the abnormal return over the time period τ_1 to τ_2 is now given as

$$CAAR_{JV}(\tau_{1},\tau_{2}) = \frac{1}{N} \sum_{i=1}^{N} CAR_{i}(\tau_{1},\tau_{2})$$

increasing bid-ask spread and thereby reducing the efficiency of the stock market.
$$CAAR_{M\&A}(\tau_{1},\tau_{2}) = \frac{1}{N} \sum_{j=1}^{N} CAR_{j}(\tau_{1},\tau_{2})$$

where *N* is the number of observations in the time period τ_1 to τ_2 . Notice *CAAR* is calculated by summing over the number of firms. The relationships between the key terms presented above are illustrated in Figure E15.

Figure	E15, Ke	y Terms	and How	They are	Calculated

AR_{1,τ_1}	 AR_{N, au_1}	$AAR_{\tau_1} = \frac{1}{N} \sum_{i=1}^{N} AR_{i,\tau_1}$
AR_{1,τ_2}	 AR_{N,r_2}	$AAR_{\tau_2} = \frac{1}{N} \sum_{i=1}^{N} AR_{i,\tau_2}$
$CAR[\tau_1;\tau_2] = \sum_{t=\tau_1}^{\tau_2} AR_{1,t}$	 $CAR[\tau_1;\tau_2] = \sum_{t=\tau_1}^{\tau_2} AR_{1,t}$	$CAAR = \sum_{t=\tau_1}^{\tau_2} AAR_t = \frac{1}{N} \sum_{i=1}^{N} CAR_t$

Source: Own construction and handout notes from supurvisor Caspar Rose

The figure also illustrates, how the underlying spreadsheet generating the important figures is constructed.

In a following section, the *CAAR* values will be tested statistically. Four different test statistics will be presented, of which one test statistic will be used. If the event period differs significantly from the estimated model in the estimation period, the t statistics will be higher than the critical values, and the null hypotheses will therefore be rejected. If $CAAR_{JV}(\tau_1, \tau_2)$ and $CAAR_{M\&A}(\tau_1, \tau_2)_j$ are positive it implies the samples perform better than the market model in the event period. To find out whether JVs perform better than M&As, their abnormal returns will be compared by the U-Test. The described construction would give the following design of the test:

H₀: $CAAR_{JV}(\tau_1, \tau_2) = CAAR_{M\&A}(\tau_1, \tau_2)$ H₁: $CAAR_{JV}(\tau_1, \tau_2) > CAAR_{M\&A}(\tau_1, \tau_2)$ If H_0 is rejected it can be concluded that the JV Sample performs better than the M&A Sample at the given *t*. Such an outcome would indicate that the shareholders of the JV Sample firms have benefited from investing in a firm that chooses the JV setup before a following acquisition, compared to if they had invested in a firm engaged in a direct M&A.

3.4.3 Data Types

In terms of data types for the use of calculating returns, we use Datastream to record stock prices for both the JV Sample and M&A Sample. In Datastream the data type called "*Return Index (RI)*" has been used. *RI* has the excellent feature of showing the theoretical value of a share holding over a specified period, assuming that dividends are re-invested to purchase additional units of an equity at the closing price applicable on the ex-dividend date.

Our recorded stock prices are thus based as:

$$R[i]_{t} = R[i]_{t-1} * \frac{P[i]_{t}}{P[i]_{t-1}}$$

Where:

 $R[i]_{t} = \text{return on stock } i \text{ on day } t$ $R[i]_{t-1} = \text{return on stock } i \text{ on day } t-1$ $P[i]_{t} = \text{price on stock } i \text{ on day } t$ $P[i]_{t-1} = \text{price on stock } i \text{ on day } t-1$

Except when t = ex-date of the dividend payment D_t , then we use the following:

$$R[i]_{t} = R[i]_{t-1} * \frac{Px[i]_{t} + D_{t}}{Px[i]_{t-1}}$$

Where:

 $Px[i]_{i}$ = price on stock *i* on the ex-date $Px[i]_{i-1}$ = price on stock *i* on the dividend date D_t = dividend payment associated with ex-date *t* (All dividends calculations ignores tax and tax reinvestment charges)

All of our dividend-adjusted stock prices are based on closing prices.

3.5 Parametric Tests

In this section $CAAR_{JV}(\tau_1, \tau_2)$ and $CAAR_{M\&A}(\tau_1, \tau_2)$ will be calculated. Figure E15 showed how the calculations are made. The overall long-term performance evaluation is based on *CAAR* and the section is therefore very important for the thesis. Besides presenting the actual *CAAR* values, test statistics will show whether the null hypotheses of *CAAR*'s being equal to 0 can be rejected on a 5% level of significance. The test statistics will therefore show whether the *CAAR* results are reliable or not.

In making parametric tests, different kind of test statistics can be applied. Among people with a great knowledge in this field, there is generally no consensus on one test statistic to be widely used. Thus, the section will start out with an introduction to test statistics, which will be followed by a discussion of the choice of test statistic.

3.5.1 Parametric Test Statistics

In general, the four most widely used parametric test statistics are: 1) Parametric Test of Abnormal Return Using Estimation Period as Benchmark cf. Campbell & Wasley (1991) and Brown & Warner (1985). 2) Standardized Parametric Test of Abnormal Return Using Estimation Period as Benchmark cf. Campbell *et al.* (1997). 3) Parametric Test of Abnormal Return Using Event Period as Benchmark cf. Campbell *et al.* (1997). 4) Standardized Parametric Test of Abnormal Return using Event Period as Benchmark cf. Campbell *et al.* (1997). 4) Standardized Parametric Test of Abnormal Return using Event Period as Benchmark cf. Campbell *et al.* (1997). The four methods, which we label *T*1, *T*2, *T*3 and *T*4, will shortly be presented in the section below.

For all the test statistics T_0 and T_1 denote the starting and end point of the estimation period, respectively. T_1 and T_2 denote the starting and end point of the event period.

T1: Parametric Test of Abnormal Return Using Estimation Period as Benchmark

The Parametric Test of Abnormal Return Using Estimation Period as Benchmark can be described by the following formula:

$$T1 = \frac{AAR_t}{s_1(AAR)}$$

where $T1 \sim t(T_1 - T_0)$

and $s_1(AAR) = \sqrt{\frac{1}{T_1 - T_0} * \sum_{t=T_0}^{T_1} (AAR_t - E(AAR))^2}$ and where $E(AAR) = \frac{1}{T_1 - T_0 + 1} * \sum_{t=T_0}^{T_1} AAR_t$

T1 is based on the Student t distribution with $T_1 - T_0$ degrees of freedom.

T2: Standardized Parametric Test of Abnormal Return Using Estimation Period as Benchmark The Standardized Parametric Test of Abnormal Return Using Estimation Period as Benchmark can be given as:

$$T2 = \left(\frac{1}{\sqrt{N}}\right)_{i=1}^{N} \frac{AR_{i,t}}{s_2(AR)}$$

where $T2 \sim N(0,1)$

and
$$s_2(AR) = \sqrt{\frac{1}{T_1 - T_0} * \sum_{t=T_0}^{T_1} (AR_{i,t} - E(AR_i))^2}$$

and where $E(AR_i) = \frac{1}{T_1 - T_0 + 1} * \sum_{t=T_0}^{T_1} AR_{i,t}$

T3: Parametric Test of Abnormal Return Using Event Period as Benchmark

The Parametric Test of Abnormal Return Using Event Period as Benchmark, can be given as following:

$$T3 = \frac{AAR_t}{s_3(AAR)}$$

where $T3 \sim t(T_2 - T_1)$ and $s_3(AAR) = \sqrt{\frac{1}{T_2 - T_1} * \sum_{t=T_1}^{T_2} (AAR_t - E(AAR))^2}$ and where $E(AAR) = \frac{1}{T_2 - T_1 + 1} * \sum_{t=T_1}^{T_2} AAR_t$

T4: Standardized Parametric Test of Abnormal Return using Event Period as Benchmark

The Standardized Parametric Test of Abnormal Return using Event Period as Benchmark, is calculated in the following way:

$$T4 = \frac{CAAR(\tau_{1}, \tau_{2})}{\sqrt{\frac{1}{N^{2}}\sum_{i=1}^{N} \hat{\sigma_{i}}^{2}(\tau_{1}, \tau_{2})}})$$

where $T4 \sim N(0,1)$

and $\hat{\sigma}_{i}^{2}(\tau_{1},\tau_{2}) = \frac{1}{L_{2}} * \sum_{t=\tau_{1}}^{\tau_{2}} (AR_{i,t} - E(AR_{i,t}))^{2}$ where $E(AR_{i,t}) = \frac{\sum_{t=\tau_{1}}^{\tau_{2}} AR_{i,t}}{L_{2}}$ and $L_{2} = \tau_{2} - \tau_{1} + 1$

In testing the performance of the JV and the M&A sample T4 has been chosen. The choice of T4 is based on the calculation of the variance in the denominator. From the above equations, it is seen that the denominator in T4 is not constant through out the measuring period in contrast to the other test statistics. In T4 the variance varies depending on the time period chosen for the test. *CAAR* and the variance are in other words matched in T4, which is the underlying reason for choosing T4.

3.5.2. The Results

The result of the *CAAR* calculations for the JV Sample is shown in Figure E16. The graph is increasing at different rates for different time intervals. At any *t*, *CAAR* is higher than that of the market, as the graph is above 0 at any given *t*. Hence, the JV Sample performs better than the market. If *t*=-8 is set to the base year, an investment in the JV Sample would yield 38% more than the market model over a period of 45 months.



Figure E16, CAAR for JV Sample

Source: JVM&A.EmpiricalResults.xls (sheet: "CARmonthly(JV)")

Looking at the variance of the abnormal returns for the JV Sample in Figure E17, it is seen that the variance is moving around an average variance level of 0,022, except for the sudden peak at t=28, during the event period. It is believed that the peak is due to the high number of buyouts, which causes an increased volatility in the market.

Figure E17, Variance of Abnormal Return for JV Sample



Source: JVM&A.EmpiricalResults.xls (sheet: "CARmonthly(JV)")

For the M&A Sample, it seems, as if the increase in *CAAR* is more moderate. However, *CAAR* is constantly moving above 0, shortly after t=0 till the end of the event period, indicating that the M&A Sample is performing better that the market.

Figure E18, CAAR for M&A Sample



Source: JVM&A.EmpiricalResults.xls (sheet: "CARmonthly(M&A)")

Figure E19 shows the variance of the abnormal return for the M&A Sample. The average variance is 0,010, which is lower than the variance level for the JV Sample. This indicates higher return variation among the JV observations than the M&A observations.



Figure E19, Variance of Abnormal Return for M&A Sample

Source: JVM&A.EmpiricalResults.xls (sheet: "CARmonthly(M&A)")

Before commenting further on the obtained graphical results, it is appropriate to statistically test the significance of the results. Figure E20 shows the test of significance for the JV Sample. The test statistic is calculated based on test statistic T4 shown in the previous section. It is interesting to notice, how all $CAAR_{JV}$ are significant, implying that it can be rejected that the CAAR at each given t is equal to 0.

Null Hypothesis of CAAR _{JV}								
t	CAAR _{JV}	T4 - test statistic	t	CAAR _{JV}	T4 - test statistic			
-8	0,0326	*	15	0,2289	3,4033			
-7	0,0564	5,0651	16	0,2495	3,6246			
-6	0,0702	4,3437	17	0,2648	3,7607			
-5	0,0694	3,4371	18	0,2779	3,8455			
-4	0,0640	2,7567	19	0,2809	3,8276			
-3	0,0974	3,7537	20	0,2694	3,5962			
-2	0,0833	2,8432	21	0,2655	3,4879			
-1	0,1009	3,1347	22	0,2797	3,6186			
0	0,1181	3,4332	23	0,2988	3,8123			
1	0,1043	2,7625	24	0,3283	4,1301			
2	0,1135	2,7799	25	0,3546	4,3741			
3	0,1233	2,8417	26	0,3651	4,4092			
4	0,1220	2,6897	27	0,3664	4,3721			
5	0,1354	2,8471	28	0,3670	4,2971			
6	0,1531	3,0595	29	0,3490	3,9240			
7	0,1425	2,7664	30	0,3519	3,9143			
8	0,1369	2,5789	31	0,3247	3,5777			
9	0,1480	2,6940	32	0,3409	3,7204			
10	0,1646	2,8520	33	0,3474	3,7280			
11	0,1914	3,2122	34	0,3480	3,6875			
12	0,1919	3,1214	35	0,3832	3,9697			
13	0,2123	3,3578	36	0,3820	3,8643			
14	0,2359	3,6050						
H ₀ :CAAR =	= 0, H ₁ :CAAR ≠ 0. Th	e figures in italic mean insig	nificance	at the 5% level of signi	ficance. Critical			
value 1.96.	*The test statistic for	the first observation is not o	alculated,	due to the denominate	or being 0			

Figure E20, Test of Significance for JV Sample

Source: JVM&A.EmpiricalResults.xls (sheet: "Word Output")

The above figure confirms the reliability of Figure E16. Thereby, it can statistically be concluded that the JV Sample has a consistent better performance than the market in the event period.

Looking at the test of significance in the M&A Sample, the outcome is quite different. Figure E21 shows the test statistics for the M&A Sample. In the period t=[-8;26], all test statistics, except t=24, are insignificant at the 5% level of significance. Thus, it cannot be rejected that *CAAR* in this period equals 0, due to the high number of insignificant results. Therefore, there is no statistical support for saying that the M&A Sample performs better than the market.

Null Hypothesis of CAAR _{M&A}								
t	CAAR _{M&A}	T4 - test statistic	t	CAAR _{M&A}	T4 - test statistic			
-8	-0,0030	*	15	0,0754	1,6485			
-7	0,0024	0,2915	16	0,0666	1,3687			
-6	0,0008	0,0756	17	0,0701	1,4146			
-5	-0,0099	-0,7405	18	0,0676	1,3337			
-4	0,0008	0,0544	19	0,0763	1,4762			
-3	0,0107	0,6148	20	0,0736	1,3988			
-2	0,0036	0,1860	21	0,0718	1,3426			
-1	0,0134	0,6133	22	0,0834	1,5216			
0	0,0258	1,0841	23	0,1082	1,9430			
1	0,0276	1,0633	24	0,1224	2,1089			
2	0,0288	1,0315	25	0,1158	1,9442			
3	0,0331	1,1489	26	0,1097	1,8186			
4	0,0402	1,3357	27	0,1295	2,1276			
5	0,0298	0,9478	28	0,1326	2,1445			
6	0,0406	1,2548	29	0,1392	2,2003			
7	0,0426	1,2611	30	0,1502	2,3405			
8	0,0442	1,2317	31	0,1497	2,3080			
9	0,0354	0,9492	32	0,1422	2,1713			
10	0,0602	1,5385	33	0,1522	2,3043			
11	0,0604	1,4887	34	0,1534	2,2940			
12	0,0425	1,0240	35	0,1533	2,2670			
13	0,0553	1,3013	36	0,1551	2,2728			
14	0,0665	1,5096						
H ₀ :CAAR	= 0, H_1 :CAAR \neq 0. The	e figures in italic mean insig	nificance	at the 5% level of signif	icance. Critical			
value 1.96	6. *The test statistic for	the first observation is not o	alculated,	due to the denominato	r being 0			

Figure E21, Test of Significance for M&A Sample

Source: JVM&A.EmpiricalResults.xls (sheet: "CARmonthly(M&A)")

The results for the M&A Sample are in line with existing research on the field.

3.6. Differences between the JV Sample and M&A Sample (U-Test)

In the previous section the JV and the M&A Samples were analyzed independently. In this section we test whether inferences can be drawn in terms of differences between the two samples. An U-Test will be used in order to conduct this analysis (Andersen *et al.* (1997)).

The purpose of the U-Test is to compare the means in two samples, assuming that the observations in the two samples are normally distributed. Applying the U-Test to our empirical analysis, implies testing the null hypothesis against the following alternative hypothesis:

Equation E8

H₁: $AAR_{JV,t} > AAR_{M\&A,t}$

where

 $AAR_{JV,t}$ = average abnormal return for JV Sample in time period *t* $AAR_{M\&A,t}$ = average abnormal return for M&A Sample in time period *t*

If H_0 is rejected, it can be concluded, that the JV Sample performs better than the M&A Sample at a given time, *t*. Such an outcome would indicate that the shareholders of the JV sample firms have benefited from investing in a firm that chooses JV with buyout option as a mean of an acquisition, relative to a direct M&A.

The above null hypothesis, can also be written as

$$H_0: AAR_{JV,t} - AAR_{M\&A,t} = 0$$
 Equation E9

Based on Equation E9, the U-Test can be given as follows (Andersen et al. (1997))

$$U_t = \frac{AAR_{JV,t} - AAR_{M\&A,t}}{\sqrt{(S_{JV,t}^2 / N) + (S_{M\&A,t}^2 / N)}}$$
Equation E10

where

 $S_{JV,t}^2$ = the estimator of the variance of the abnormal return in the JV Sample in time period *t*. $S_{JV,t}^2$ can be calculated as, $S_{JV,t}^2 = \sum (AR_{i,t} - AAR_t)/(N-1)$; *N* is the number of observations in the JV Sample. $S_{M\&A,t}^2$ = the estimator of the variance of the abnormal return in the M&A Sample in time period *t*. $S_{M\&A,t}^2$ can be calculated as, $S_{M\&A,t}^2 = \sum (AR_{j,t} - AAR_t)/(N-1)$; *N* is the number of observations in the M&A Sample.

When making the U-Test, the researcher is normally at first obliged to test whether the variances of the returns in the two samples are equal. However, when N > 30 for each sample, estimators of the variances can be used as given in Equation E10, and no pre-variance test needs to be made (Andersen *et al.* (1997)).

The results from the U-Test using AAR values are given in Figure E22.

t	AAR _{JV,t} - AAR _{M&A,t}	Ut	t	AAR _{JV,t} - AAR _{M&A,t}	Ut
-8	3,6%	2,1683	15	-1,6%	-0,7189
-7	1,8%	1,1956	16	2,9%	1,7291
-6	1,5%	0,9659	17	1,2%	0,5944
-5	1,0%	0,7173	18	1,6%	0,9628
-4	-1,6%	-1,1691	19	-0,6%	-0,3087
-3	2,4%	1,3307	20	-0,9%	-0,5562
-2	-0,7%	-0,4059	21	-0,2%	-0,1068
-1	0,8%	0,4807	22	0,2%	0,1612
0	0,5%	0,2335	23	-0,6%	-0,2633
1	-1,6%	-0,8492	24	1,5%	0,7211
2	0,8%	0,5272	25	3,3%	1,6349
3	0,5%	0,3365	26	1,7%	1,1030
4	-0,8%	-0,4569	27	-1,9%	-0,9428
5	2,4%	1,3394	28	-0,2%	-0,0855
6	0,7%	0,4340	29	-2,5%	-1,4501
7	-1,3%	-0,7233	30	-0,8%	-0,5226
8	-0,7%	-0,4259	31	-2,7%	-1,7431
9	2,0%	0,9367	32	2,4%	1,2521
10	-0,8%	-0,4439	33	-0,4%	-0,2006
11	2,7%	1,5201	34	-0,1%	-0,0236
12	1,8%	1,0777	35	3,5%	1,5276
13	0,8%	0,3706	36	-0,3%	-0,1535
14	1,2%	0,6220			

Figure E22, U-Test of JV Sample vs. M&A Sample Based on AAR Values

Source: JVM&AEmpiricalResults.xls (sheet: "U-Test")

The results in Figure E22 shows insignificant results for all time periods, except for t=-8, t=16 and t=31, meaning that the null hypothesis, H₀: $AAR_{JV,t} - AAR_{M\&A,t} = 0$, cannot be rejected. Based on AAR values, no evidence is found that JV with buyout option as a mean of acquisition is more value increasing transactions than direct M&As. This is somehow interesting since the analysis from the previous section gave an indication of the JV Sample was performing better than the M&A Sample. However, it should be noticed that AAR suffers from the flaw of only measuring short-term performance whereas the value creation, if any, is expected to occur over a longer period of time, i.e. 36 months. Based on the latter, an U-Test based on CAAR values is made. The U-Test based on CAAR values, are given as

$$U_{(\tau_1,\tau_2)} = \frac{CAAR_{JV}(\tau_1,\tau_2) - CAAR_{M\&A}(\tau_1,\tau_2)}{\sqrt{(S_{JV,(\tau_1,\tau_2)}^2/N) + (S_{M\&A,(\tau_1,\tau_2)}^2/N)}}$$
Equation E11

The results from the U-Test based on *CAAR* values are found in Figure E23. Figure E23 shows more significant results at the 5% level of significance than Figure E22. 27 out of the 45 observations in the figure are significant, showing indication for the JV Sample performing better than the M&A Sample. At the 10% level of significance, using the critical value 1.28, 40 out of 45 observations are significant, supporting the individual tests of the JV and the M&A Sample. The big difference, in the results, going from the 5% to the 10% level of significance, shows many observations have a test value just below the critical value at the 5% level. This is a good argument for using the 10% level of significance, thereby concluding that we have found strong support for the JV Sample performing better than the M&A Sample.

Null Hyp	othesis of U-Test based on CAA	2			
t	$CAAR_{JV}(\tau_1,\tau_2) - CAAR_{M&A}(\tau_1,\tau_2)$	$U(\tau_1,\tau_2)$	t	$CAAR_{JV}(\tau_1,\tau_2) - CAAR_{M\&A}(\tau_1,\tau_2)$	$U(\tau_1,\tau_2)$
-8	3,6%	2,1683	15	15,4%	1,6124
-7	5,4%	2,4058	16	18,3%	1,9201
-6	6,9%	2,4258	17	19,5%	2,0069
-5	7,9%	2,5913	18	21,0%	2,1513
-4	6,3%	1,8229	19	20,5%	2,0259
-3	8,7%	2,0013	20	19,6%	1,9416
-2	8,0%	1,7570	21	19,4%	1,8544
-1	8,8%	1,6641	22	19,6%	1,8755
0	9,2%	1,5483	23	19,1%	1,7753
1	7,7%	1,2613	24	20,6%	1,8721
2	8,5%	1,4099	25	23,9%	2,0711
3	9,0%	1,4144	26	25,5%	2,1838
4	8,2%	1,1563	27	23,7%	1,9552
5	10,6%	1,4330	28	23,4%	1,9034
6	11,3%	1,4421	29	21,0%	1,6703
7	10,0%	1,2578	30	20,2%	1,6010
8	9,3%	1,1295	31	17,5%	1,3545
9	11,3%	1,3619	32	19,9%	1,5244
10	10,4%	1,2156	33	19,5%	1,5096
11	13,1%	1,4898	34	19,5%	1,4962
12	14,9%	1,6525	35	23,0%	1,7769
13	15,7%	1,7102	36	22,7%	1,7337
14	16,9%	1,7726			
H ₀ : CAAR _J	$_{\prime}(\tau_1,\tau_2)$ - CAAR _{M&A} (τ_1,τ_2) = 0, H ₁ :CAAR _{JV} (τ_1,τ_2)) - CAAR _{M&A} (τ_1, τ_2) >	0. The figure	s in italic mean insignificance at the 5% level	
of significa	nce. Critical value 1.65.				

Figure E23, U-Test of JV Sample vs. M&A Sample Based on CAAR Values

Source: JVM&AEmpiricalResults.xls (sheet: "U-Test")

One critical point, regarding the U-Test on *CAAR* values, should however be emphasized. In general, data observations in each sample underlying the U-Test, are assumed to be *independent* and *stochastic* (Andersen *et al.* (1997)). Using *CAAR* in Figure E23, to some extent, violates these assumptions since returns are accumulated in the time series of each security, thus creating a drift in the data observations. From a strict theoretical point of view, the U-Test based on *CAAR* values is therefore dubious. Nevertheless, it is reasonable from an economic point of view to use the U-Test based on *CAAR* values, since it helps to cope with the problem of short term vs. long term performance.

3.7 Nonparametric Tests

Parametric tests have so fare been used for the empirical study. In this section a nonparametric test will be added to the empirical analysis.

Unlike parametric tests, nonparametric tests allow us to ignore any assumption about the distribution of the stock returns (Campbell *et al.* (1997)). In addition, the nonparametric test has the advantage of revising the robustness of the results provided by the parametric test.

The two most widely used nonparametric tests are *The Sign Test* and *Corrado's Rank Test* (Corrado (1989)). The sign test is based on the sign of the *CARs* across the securities in a sample⁷¹, whereas Corrado's Rank Test ranks each security's abnormal return in a sample. In our study we will only focus on the rank test, since the sign test suffers from serious flaws. The weakness of the sign test is it ignores the possibility of skewed distribution of stock returns, which is often the case in daily stock returns. A consequence of this is the expected proportion of positive abnormal returns can differ from 0.5 specified by the null hypothesis (Campbell *et al.* (1997)). A reason supporting the use of the Rank test, in our case, is found in the way data has been collected. Campbell and Wasley (1993) find that Corrado's Rank Test performs better when stock returns are based on daily observations. Since we have collected stock prices on a daily basis, it is appropriate to use the Rank test.

3.7.1 Corrado's Rank Test

The test statistics in Corrado's Rank Test for the null hypothesis of no abnormal stock return, can be written as

$$Z = \frac{1}{N} \sum_{i=1}^{N} \left(K_{i,t} - \frac{L_2 + 1}{2} \right) / s(L_2)$$

where *N* is the number of firms in the sample, L_2 is the length of the event period (i.e. [-8; 36]), $K_{i,t}$ denotes the rank of the abnormal return for security *i* for event period *t*, and *s*(L_2) is defined as

$$s(L_2) = \sqrt{\left[\frac{1}{L_2}\sum_{\tau=T_1+1}^{T_2} \left(\frac{1}{N}\sum_{i=1}^{N} \left(K_{i,t} - \frac{L_2 + 1}{2}\right)\right)^2\right]}$$

⁷¹ A sign test for our study could thus e.g. be based on the following H₀: $p \le 0.5$ and H₁: p > 0.5

where T_1 and T_2 denotes the first and last day of the event period, respectively.

The null hypothesis and the alternative hypothesis in the rank test is given as

H₀:
$$\frac{1}{N} \sum_{i=1}^{N} \left(K_{i,t} - \frac{L_2 + 1}{2} \right) = 0$$

H₁: $\frac{1}{N} \sum_{i=1}^{N} \left(K_{i,t} - \frac{L_2 + 1}{2} \right) \neq 0$

Where $\frac{1}{N} \sum_{i=1}^{N} \left(K_{i,t} - \frac{L_2 + 1}{2} \right)$ is called the average rank deviation.

In implementing the rank test to our study, we start out by ranking each security's abnormal return, in their respective samples, from 1 to L_2 (see: *JVM&AEmpiricalResults.xls (sheet: "Nonparametric Test(JV)"*) and *JVM&AEmpiricalResults.xls (sheet: "Nonparametric Test(M&A)"*).

The results from the rank test for the JV Sample are given in Figure E24.

Null Hyp	Null Hypothesis of Average Rank Deviation for JV Sample								
t	Average rank deviation	Z-statistic	t	Average rank deviation	Z-statistic				
-8	1,84	1,3934	15	-1,10	-0,8361				
-7	2,49	1,8889	16	2,46	1,8657				
-6	2,44	1,8502	17	0,59	0,4490				
-5	0,06	0,0464	18	1,21	0,9212				
-4	-1,71	-1,3005	19	0,53	0,4025				
-3	2,37	1,7960	20	-2,11	-1,6024				
-2	-1,35	-1,0219	21	0,48	0,3638				
-1	1,40	1,0606	22	1,97	1,4941				
0	0,65	0,4954	23	1,41	1,0683				
1	-1,35	-1,0219	24	1,97	1,4941				
2	0,23	0,1780	25	2,07	1,5715				
3	0,93	0,7045	26	0,46	0,3484				
4	0,30	0,2245	27	1,35	1,0219				
5	0,37	0,2787	28	-0,48	-0,3638				
6	1,30	0,9831	29	-0,58	-0,4413				
7	-1,30	-0,9831	30	0,29	0,2168				
8	-1,33	-1,0064	31	-2,46	-1,8657				
9	0,42	0,3174	32	0,91	0,6890				
10	0,99	0,7509	33	0,79	0,5961				
11	1,37	1,0373	34	0,23	0,1780				
12	0,18	0,1393	35	1,15	0,8748				
13	0,19	0,1471	36	0,01	0,0077				
14	0,87	0,6580							
$H_0: \frac{1}{N} \sum_{i=1}^{N} \begin{pmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $	$\left(K_{i,t} - \frac{L_2 + 1}{2}\right) = 0, H_1 : \frac{1}{N} \sum_{i=1}^{N} \left(K_{i,t} - \frac{1}{N}\right)$ significance. Critical value 1.96.	$\frac{L_2+1}{2} \neq 0$	The figures i	in italic mean insignificance at th	e				
	U								

Figure E24, Corrado's Rank Test for the JV Sample

Source: JVM&AEmpiricalResults.xls (sheet: "Nonparametric Test(JV)")

The results from the rank test for the JV Sample show insignificant results for all time periods at the 5% level of significance. At first sight this does not support our findings in the previous parametric test for JV Sample, cf. section 3.6. However, if we look at the results of the rank test for JV Sample at the 10% level of significance, using a critical value of 1,65, we find significant result for t = -7, t = -6, t = -3, t = 16 and t = 31. The average rank deviation for all of these time periods, except t = 31, shows a positive average rank deviation, which to a large extent support the findings in the parametric test for the JV Sample.

A reason for not finding the exact same results lies in the differences in the basic assumption on normal distribution of the returns. A difference in the results of the two tests could indicate that the assumption on normal distribution of the returns to some extent is violated.

Regarding the negative average rank deviation found for t = 31, which does not support the findings in the parametric test, we find several possible explanations for this specific result. One of the strongest candidates, are found in the following argument: From the period t = 16 to t = 30, most of the buyouts in the JV Sample takes place. At t = 31 there are, however, only 11 firms of the 49 in the Buyout Sample, which have not been exercised, thus making an over-representation of Adjustment Bias observations in the JV Sample. Since Adjustment Bias observations are weaker performers, or lemons from a strict theoretical point of view, it is expected that a negative result may occur in the time period t = 31 to t = 36. As the rank test is based on *AAR* values, whereas the parametric test is based on *CAAR* values, radical changes in the return will have higher immediate impact on *AAR* than *CAAR* values. This influences the findings of the nonparametric and parametric test, since *AAR*, as mentioned previously, is affected by short-term differences whereas *CAAR* is affected by the historical performance.

However, as the results of the nonparametric test contain positive significant results on an overall basis, we find evidence of support for the results found in the parametric test.

The results from the rank test for the M&A Sample are given in Figure E25. The results from the rank test for the M&A Sample show insignificant results for all time periods, except t = 10, t = 22 and t = 27, which all show a significant positive average rank deviation. The results from the rank test for the M&A Sample supports the results from the parametric test in the time period t = -8 to t = 21, except for t = 10. Moreover, from the period t = 22 to t = 36, there seem to be a quite high level of consistency between the results from the rank test and the parametric test for the M&A Sample: The rank test find positive significant rank for t = 22 and t = 27, where the parametric test find positive significant rank for t = 22 and t = 27, where the small difference in the parametric and the nonparametric test is caused by the difference in how the two tests are conducted and the different assumptions on normal distribution of the returns.

From the above it can be concluded that when applying Corrado's Rank test, we find support for the findings in the parametric test, i.e. high degree of robustness in the parametric test.

Null Hyp	Null Hypothesis of Average Rank Deviation for M&A Sample								
t	Average rank deviation	Z-statistic	t	Average rank deviation	Z-statistic				
-8	-1,11	-0,7624	15	0,46	0,3148				
-7	0,16	0,1119	16	-1,77	-1,2101				
-6	-0,50	-0,3427	17	0,42	0,2868				
-5	-2,67	-1,8327	18	-0,28	-0,1889				
-4	1,44	0,9863	19	1,16	0,7974				
-3	1,78	1,2171	20	1,21	0,8324				
-2	-2,32	-1,5878	21	0,80	0,5456				
-1	1,37	0,9373	22	3,38	2,3153				
0	1,59	1,0912	23	1,67	1,1472				
1	0,74	0,5106	24	-0,65	-0,4477				
2	0,85	0,5806	25	-0,55	-0,3777				
3	0,32	0,2168	26	-0,68	-0,4687				
4	0,32	0,2168	27	3,55	2,4342				
5	-1,03	-0,7065	28	2,02	1,3850				
6	0,67	0,4617	29	2,73	1,8746				
7	1,23	0,8464	30	0,27	0,1819				
8	1,22	0,8394	31	0,92	0,6295				
9	-0,61	-0,4197	32	-0,45	-0,3078				
10	3,53	2,4202	33	0,69	0,4757				
11	-0,05	-0,0350	34	0,65	0,4477				
12	-0,72	-0,4966	35	-1,01	-0,6925				
13	0,01	0,0070	36	0,29	0,1959				
14	1,45	0,9933							
$H_0: \frac{1}{N} \sum_{i=1}^{N} \left(\frac{1}{N} \right)^{N}$ 5% level of	$H_0: \frac{1}{N} \sum_{i=1}^{N} \left(K_{i,t} - \frac{L_2 + 1}{2} \right) = 0, H_1: \frac{1}{N} \sum_{i=1}^{N} \left(K_{i,t} - \frac{L_2 + 1}{2} \right) \neq 0$ The figures in italic mean insignificance at the 5% level of significance. Critical value 1.96.								

Figure E25, Corrado's Rank Test for the M&A Sample

Source: JVM&AEmpiricalResults.xls (sheet: "Nonparametric Test(JV)")

3.8 Industry Differences

The purpose of this section is to test whether there are differences in the performance across industries. The end goal of the section is to answer whether there is a difference and specific advantages in making a JV with buyout option in some industries relative to the same industries in the M&A Sample.

3.8.1 The Industry Dummy Test

Regression on dummy explanatory variables will be used in order to distinguish between the impact of the different industries.

The regression will look as follows:

$$Y_t = B_1 + B_2 D_{2,t} + B_3 D_{3,t} + B_4 D_{4,t} + B_5 D_{5,t} + B_6 D_{6,t} + B_7 D_{7,t} + u_t$$
 Equation E12

Y_t	= CAAR values at period t
u_t	= residual term at t, $E(u_t) = 0$
$D_{2,t}$	= 1 if the observation belongs to industry 2
	= 0 otherwise
$D_{3,t}$	= 1 if the observation belongs to industry 3
	= 0 otherwise
$D_{4,t}$	= 1 if the observation belongs to industry 4
	= 0 otherwise
$D_{5,t}$	= 1 if the observation belongs to industry 5
	= 0 otherwise
<i>D</i> _{6,t}	= 1 if the observation belongs to industry 6
	= 0 otherwise
$D_{7,t}$	= 1 if the observation belongs to industry 7
	= 0 otherwise

We thus obtain:

Mean return for industry 1:

 $E(Y_t | D_{2,t}=0, D_{3,t}=0, D_{4,t}=0, D_{5,t}=0, D_{6,t}=0, D_{7,t}=0) = B_1$

Mean return for industry 2:

 $E(Y_t | D_{2,t}=1, D_{3,t}=0, D_{4,t}=0, D_{5,t}=0, D_{6,t}=0, D_{7,t}=0) = B_1 + B_2$

Mean return for industry 3:

 $E(Y_t | D_{2,t}=0, D_{3,t}=1, D_{4,t}=0, D_{5,t}=0, D_{6,t}=0, D_{7,t}=0) = B_1 + B_3$

Mean return for industry 4:

$$E(Y_t | D_{2,t}=0, D_{3,t}=0, D_{4,t}=1, D_{5,t}=0, D_{6,t}=0, D_{7,t}=0) = B_1 + B_4$$

Mean return for industry 5:

 $E(Y_t | D_{2,t}=0, D_{3,t}=0, D_{4,t}=0 D_{5,t}=1 D_{6,t}=0, D_{7,t}=0) = B_1 + B_5$

Mean return for industry 6:

 $E(Y_t | D_{2,t}=0, D_{3,t}=0, D_{4,t}=0 D_{5,t}=0 D_{6,t}=1 D_{7,t}=0) = B_1 + B_6$

Mean return for industry 7:

 $E(Y_t | D_{2,t}=0, D_{3,t}=0, D_{4,t}=0, D_{5,t}=0, D_{6,t}=1, D_{7,t}=0) = B_1 + B_7$

In case the dummy explanatory variables are significant⁷², it can be concluded that the given industry has a significant impact relative to the benchmark. The benchmark is defined as the industry not having a dummy, in our case industry 1. The sign and the size of the estimated B parameters will tell how the return of the dummy industry performs relative to the benchmark. If a dummy is significant and the corresponding estimated B is and positive, it means that for the industry for which the dummy is calculated, there is a significantly large positive difference. The industry dummy impacts more on the total return than the benchmark industry.

It should be noticed, that the JV and M&A samples contain observations from 7 industries. In order to avoid the dummy variable trap, Equation E12 is constructed with only 6 dummy variables. In case 7 dummy variables were chosen, we would be faced with the problem of perfect multicollinearity. However, the approach by using one dummy less than the number of industries is not free of problems. When Equation E12 is used, the relation among the dummy industries cannot be clearly specified. Equation E12 only highlights the difference between the base industry and the industry dummies. Despite a dummy, e.g. D_2 , being significant and B_2 larger than e.g., B_3 for another insignificant dummy, D_3 , it cannot be concluded that industry 2 generally impacts more on the overall result than industry 3. By running Equation E12 we have only found that industry 2 relative to industry 1, has a generally higher return than industry 3 relative to industry 1. The reason for not being able to conclude on the absolute power of the estimated and significant B_2 relative to

⁷² Rejection of H₀. H₀: B_i =0, H₁: B_i ≠0, $i \in [1;7]$

 B_3 is related to not knowing, whether there is a significant relation between industry 2 and industry 3. The implied problem makes it necessary to run Equation E12 6 times with different benchmark industries, so that all possible combinations of the industries are tried out and the implied *B*s with their respective *t* tests are calculated. A ranking of the industries can then be made based on the sizes of the *B*s and their level of significance. The mentioned ranking is not intended to show the absolute return difference between the industries in JV and M&A samples, but more as a tool to give an overview of significance and the direction of the relations (positive or negative) among industries. The intention is therefore to use the ranking exercise in addition to calculating the spread between the JV and M&A industries. The spread is defined as the return differential (using *CAAR*) for a given industry between the JV Sample and the M&A Sample.

The results of the ranking exercise just described are shown in Figure E26. The first column to the left denotes the rank of the industry in respect to the benchmark industry. Rank 1 is the industry with the highest B parameter. A significant and positive B would place this industry higher than industries that are not significant or significant but with negative B. The overall ranking to the right of the figure is the overall result of the ranking when looking at the results from running the industry dummy regression in Equation E12 with 6 different benchmark industries. Notice, Financial Services is not placed as a benchmark industry, as its relations with all the other industries is already calculated when setting all the other industries as benchmarks.

From Figure E26 we see that Financial Services is the industry with the highest impact on the *CAAR* for the JV Sample. The Heavy Manufacturing industry has the lowest ranking, evidencing the lowest impact on the *CAAR* for the JV Sample. For the M&A Sample it is the TMT industry with the highest and again the Heavy Manufacturing with the lowest rank. Three of the industries, namely Heavy Manufacturing, Light Manufacturing and Other keep their ranking in the JV Sample as well as in the M&A Sample. As more than 50% of the industries change rank dependent on the sample, it seems, as if there is difference in successful industries for the 2 samples.

Figure E26, Ranking Exercise

Benchmark Industries							
Rank	Other	Pharmaceutical	TMT	Heavy	Light	Utility	Overall Ra
1	*(+)Financial	*(+)Financial	*(+)Financial	*(+)Financial	Financial	*(+)Financial	1 Financial
2	*(+)Utility	*(+)Utility	Utility	*(+)Utility	Light	*(+)Light	2 Utility
3	TMT	*(+)Light	Other	*(+)Light	TMT	*(-)Other	3 Light
4	Light	*(+)TMT	Light	*(+)TMT	Other	*(-)Pharmaceutical	4 TMT
5	Pharmaceutical	Other	(-)Pharmaceutical	Other	(-)Pharmaceutical	*(-)Heavy	5 Other
6	(-)Heavy	Heavy	(-)Heavy	Pharmaceutical	(-)Heavy	TMT	6 Pharmace
							7
ance, (+)=po	sitive parameter estimate, (-)	= negative parameter estir	nate				7 Heavy
ance, (+)=po	sitive parameter estimate, (-)	= negative parameter estir	nate				7 Heavy
ance, (+)=po anking (h	sitive parameter estimate, (-)	= negative parameter estir	ummy regression Benchmar	k Industries			7 Heavy
ance, (+)=po anking (h Rank	sitive parameter estimate, (-) iighest parameter es Other	 negative parameter estin timate) based on d Pharmaceutical 	nate Iummy regression Benchmar TMT	k Industries Heavy	Light	Utility	7 Heavy Overall Ra
ance, (+)=po anking (h Rank 1	sitive parameter estimate, (-) sighest parameter estimate Other *(+)TMT	= negative parameter estin timate) based on d Pharmaceutical *(+)TMT	nate ummy regression Benchmar TMT *(-)Pharmaceutical	k Industries Heavy *(+)TMT	Light *(+)TMT	Utility *(+)TMT	Overall Ra
ance, (+)=po anking (h Rank 1 2	sitive parameter estimate, (-) sighest parameter estimate Other *(+)TMT *(+)Pharmaceutic	= negative parameter estir timate) based on d Pharmaceutical *(+)TMT al Light	nate ummy regression Benchmar TMT *(-)Pharmaceutical *(-)Light	k Industries Heavy *(+)TMT *(+)Pharmaceutica	Light *(+)TMT al Financial	Utility *(+)TMT *(+)Pharmaceutical	Overall Ra 1 TMT 2 Pharmace
ance, (+)=po anking (h Rank 1 2 3	sitive parameter estimate, (-) sighest parameter estimate Other *(+)TMT *(+)Pharmaceutic *(+)Light	= negative parameter estir timate) based on d Pharmaceutical *(+)TMT al Light Financial	nate ummy regression Benchmar TMT *(-)Pharmaceutical *(-)Light *(-)Financial	k Industries Heavy *(+)TMT *(+)Pharmaceutica *(+)Light	Light *(+)TMT al Financial Pharmaceutical	Utility *(+)TMT *(+)Pharmaceutical *(+)Light	Overall Ra 1 TMT 2 Pharmace 3 Light
ance, (+)=po anking (h Rank 1 2 3 4	sitive parameter estimate, (-) iighest parameter es Other *(+)TMT *(+)Pharmaceutic *(+)Light *(+)Financial	= negative parameter estir timate) based on d Pharmaceutical *(+)TMT al Light Financial *(-)Other	nate ummy regression Benchmar TMT *(-)Pharmaceutical *(-)Light *(-)Financial *(-)Other	k Industries Heavy *(+)TMT *(+)Pharmaceutica *(+)Light *(+)Financial	Light *(+)TMT al Financial Pharmaceutical *(-)Other	Utility *(+)TMT *(+)Pharmaceutical *(+)Light *(+)Financial	Overall Ra 1 TMT 2 Pharmace 3 Light 4 Financial
ance, (+)=po anking (h Rank 1 2 3 4 5	sitive parameter estimate, (-) ighest parameter es Other *(+)TMT *(+)Pharmaceutic *(+)Light *(+)Financial Utility	= negative parameter estir timate) based on d Pharmaceutical *(+)TMT al Light Financial *(-)Other *(-)Utility	nate Benchmar TMT *(-)Pharmaceutical *(-)Light *(-)Financial *(-)Other *(-)Utility	k Industries Heavy *(+)TMT *(+)Pharmaceutica *(+)Light *(+)Financial *(+)Other	Light *(+)TMT al Financial Pharmaceutical *(-)Other *(-)Utility	Utility *(+)TMT *(+)Pharmaceutical *(+)Light *(+)Financial Other	Overall Ra 1 TMT 2 Pharmace 3 Light 4 Financial 5 Other
ance, (+)=po anking (h Rank 1 2 3 4 5 6	sitive parameter estimate, (-) ighest parameter es Other *(+)TMT *(+)Pharmaceutic *(+)Light *(+)Financial Utility (-)Heavy	= negative parameter estir timate) based on d Pharmaceutical *(+)TMT al Light Financial *(-)Other *(-)Utility *(-)Heavy	nate Benchmar TMT *(-)Pharmaceutical *(-)Light *(-)Financial *(-)Other *(-)Utility *(-)Heavy	k Industries Heavy *(+)TMT *(+)Pharmaceutica *(+)Light *(+)Financial *(+)Other *(+)Utility	Light *(+)TMT al Financial Pharmaceutical *(-)Other *(-)Utility *(-)Heavy	Utility *(+)TMT *(+)Pharmaceutical *(+)Light *(+)Financial Other *(-)Heavy	Overall Ra 1 TMT 2 Pharmace 3 Light 4 Financial 5 Other 6 Utility

Source: JVM&AempiricalResults.xls (sheet: "Dummy(JVIndustries)")

The used method in Figure E26 seems fairly straightforward and correct in order to rank the industries. However, there is a problem with repeated *t* tests, which is the used method. The industry dummy test contains 6 explanatory variables and each *t* test is performed at the 5% level of significance. There are 7(7-1)/2 = 21 pairs⁷³ of means to compare each with a 5% probability of type 1 error⁷⁴. The chance of making at least one type 1 error is much higher than 5%. It is difficult to calculate the exact probability, but a pessimistic approximation can be derived by assuming the comparisons are independent, giving an upper bound to the probability of making at least one type 1 error (the experimentwise error rate) of

 $1 - (1 - 0.05)^{21} = 0.66$

The actual probability is somewhat less than 0.66, but as the number of means increase, the chance of making at least one type 1 error approaches 1.

⁷³ In Figure E26, we have shown more than 21 pairs, as many of the repeated pairs have also been shown. This is due to the way Equation E12 was set up, and the explanation on repeating the industry dummy regression.

If the individual type 1 error rates for each comparison are made, you are controlling the individual or comparisonwise error rate. On the other hand, if you want to control the overall type 1 error rate for all the comparisons, which is the purpose of our case, you should use the experimentwise error rate⁷⁵.

The above argument is the reason why repeated t tests might cause unreliable conclusions, i.e. the probability of committing a type 1 error is higher than 5%, which was the initial goal of the industry dummy test. One way to correct for the error just mentioned is found in the multiple comparisons procedures that will be introduced in the coming section.

3.8.2 Multiple Comparison

The ranking exercise could have been solved differently by use of multiple comparison procedures also called mean separation tests. Multiple comparison procedures are used as a method to compare the average effect of the industries on the sample. The method enables us to see average mean values between an industry and the other industries, as well as whether the relations are significant. The traditional ANOVA *F*-test comes short, as it only tells whether the explanatory variable means are significantly different from each other, but not which means differ from which other means.

The purpose of this section is not to give a profound discussion of Multiple Comparison Procedures, but more using it as a practical tool. For a more profound discussion, we refer to the extensive literature on the field. In the existing literature several multiple comparison tests have been suggested. Among the most important contributors have been Tukey (1952, 1953), Scheffé (1953, 1959), Kramer (1956), Sidak (1967), Hochberg (1974), Gabriel (1978), Dunnett (1980), Miller (1981), Hayter (1984), and Hsu (1992, 1996).

Nevertheless, Hayter (1984) proves that the Tukey test is more powerful than the Bonferroni, Sidak, and Scheffé for multiple comparison.

The one-way ANOVA tests presented in this section are all made in SAS Enterprise Guide.

⁷⁴ A false rejection of the null hypothesis.

⁷⁵ SAS Enterprise Guide help function

Class Levels Values JV Type 7 Financial Servic Heavy Manufac. Light Manufac. Other Pharmaceutical TMT Utility	Class Level I	nformatio	n
JV Type 7 Financial Servic Heavy Manufac. Light Manufac. Other Pharmaceutical TMT Utility	Class	Levels	Values
	JV Туре	7	Financial Servic Heavy Manufac. Light Manufac. Other Pharmaceutical TMT Utility

	Numl	Number of observations				
Source	DF	Sum of Squares	Mean Squar	e	F Value	Pr > F
Model	6	1.22907858	0.20484643		8.43	<.0001
Error	308	7.48133460	0.02429005			
Corrected Total	314	8.71041318				

R-Square	Coeff Var	Root MSE	JV Yt Mean
0.141105	66.73375	0.155853	0.233544

Source	DF	Anova SS	Mean Square	F Value	Pr > F
JV Туре	6	1.22907858	0.20484643	8.43	<.0001

Source: Own construction, SAS Enterpriseguide

Figure E27 shows the results of the traditional F test that shows a significant result, meaning that the impact of the industries' return are significantly different. Figure E28 shows Tukey's test at the 5% level of significance (Alpha). All the As, Bs and Cs in the left hand side shows for which industries there is insignificance. From Tukey's test, the following can be concluded about multiple comparisons for the JV Sample:

Financial services have the highest mean, i.e. largest impact on the JV Sample return.

CAAR for Financial Services and Utility is significantly higher than the mean for Other, Pharmaceutical and Heavy Manufacturing.

1. *CAAR* for Light Manufacturing and TMT is significantly higher than the mean for Heavy Manufacturing.

Heavy manufacturing has the lowest mean, i.e. smallest impact on the JV Sample return.

Differences between all other means are not significant.

Figure E28, Tukey's Studentized Range Test For JV Sample

Alpha	0.05
	308
Error Mean Square	0.02429
Critical Value of Studentized Range	4.19731
Minimum Significant Difference	0.0975

Means with the same letter are not significantly different.				
Tukey Grou	ping	Mean	N	JV Type
	А	0.31573	45	Financial Servic
	А			
	А	0.30842	45	Utility
	А			
В	Α	0.25595	45	Light Manufac.
В	Α			
В	А	0.24559	45	TMT
В				
В	С	0.20586	45	Other
В	С			
В	С	0.15931	45	Pharmaceutical
	С			
	С	0.14395	45	Heavy Manufac.

Source: Own construction, SAS Enterpriseguide⁷⁶

All the mean values in the figure are positive, meaning that all industries in the JV Sample contribute positive to the total return.

Comparing Figure E28 with the ranking exercise in Figure E26, it is clearly seen that the overall ranking is the same, confirming the reliability of the obtained results. However, it is also seen that more insignificant results are obtained when using Tukey's test than in the industry dummy regression. The reason for this was given at the end of section 3.8.1, when the difference between

the comparisonwise error rate and the experimentwise error rate was discussed. Tukey's test uses the experimentwise error rate, whereas the ranking exercise uses the comparison error rate. As the comparison error rate undershoots the real chances of making a type 1 error, the use of the experimentwise error rate results in more insignificant results, as is also seen by the difference in significant results from Figure E28 to Figure E26.

Figure E29 shows the ANOVA test for the M&A Sample. Like the JV Sample it shows a significant result, meaning that the returns for industries in the M&A Sample are significantly different.

Figure E29, The M&A Industry ANOVA Test

Class Level Information				
Class	Levels	Values		
М&А Туре	7	Financial Servic Heavy Manufac. Light Manufac. Other Pharmaceutical TMT Utility		

	Number of observations			315		
Source	DF	Sum of Squares	Mean Squar	e	F Value	Pr > F
Model	6	5.07416533	0.84569422		114.87	<.0001
Error	308	2.26762421	0.00736242			
Corrected Total	314	7.34178954				

R-Square	Coeff Var	Root MSE	M&A Yt Mean
0.691135	96.93076	0.085805	0.088521

Source	DF	Anova SS	Mean Square	F Value	Pr > F
М&А Туре	6	5.07416533	0.84569422	114.87	<.0001

Source: Own construction, SAS Enterpriseguide

Figure E30 shows Tukey's test for the M&A Sample at the 5% level of significance. The pattern in the M&A Sample is clearer than it is in the JV Sample. For the JV Sample comparisons were less

⁷⁶ Please note SAS Enterpriseguide use N for number of periods and not number of observations in the sample

clear as many of the relations were insignificant. Thereby, making it difficult to separate the results of the means. The multiple comparisons results from Tukey's test for the M&A Sample are:

- 1. TMT has the highest mean, i.e. largest impact on the M&A Sample return.
- 2. Pharmaceutical, Light Manufacturing and Financial Services have the second highest mean.
- 3. Other and Utility have the third highest mean.
- 4. Heavy Manufacturing has the lowest mean.
- 5. Differences between all other means are not significant.

Not all the means in the M&A Sample are positive. The mean for Heavy Manufacturing is negative, which means that direct M&As in the Heavy Manufacturing industry is not creating value for its shareholders in the event period. The industry is influencing the total $CAAR_{M\&A}$ in a negative direction. Though the mean is not negative for Utility and Other, the mean is very close to 0. For Utility the value creation is about 1% and for Other it is 5% for the entire event period.

Figure E30, Tukey's Studentized Range Test For M&A Sample

Alpha	0.05
Error Degrees of Freedom	308
Error Mean Square	0.007362
Critical Value of Studentized Range	4.19731
Minimum Significant Difference	0.0537

Means with the same letter are not significantly different.					
Tukey Grouping	Mean	N	М&А Туре		
А	0.26201	45	TMT		
В	0.17468	45	Pharmaceutical		
В					
В	0.14385	45	Light Manufac.		
В					
В	0.14206	45	Financial Servic		

Means with the same letter are not significantly different.				
Tukey Grouping	Mean	N	М&А Туре	
С	0.04571	45	Other	
С				
С	0.01064	45	Utility	
D	-0.15930	45	Heavy Manufac.	

Source: Own Construction, SAS Enterpriseguide

Tukey's test for the M&A Sample shows the same ranking results, as in the ranking exercise in Figure E26, once again proving the reliable results found in the ranking exercise. What concerns the number of insignificant results, which was the main difference between Tukey's test and the ranking exercise for the JV Sample, there is no difference in the M&A Sample. Most likely, this is due to the clear return pattern for the industries that can be divided into four groups, with no insignificant results, across the industry groups.

In this section, both the ranking exercise and Tukey's test have been used to assess industry differences in the JV and M&A Sample. We consider it relevant to demonstrate both approaches, as this creates more reliable test results, even though from a strict theoretical point of view on error rates, it can be argued that Tukey's test is the most reliable, as it is based on the experimentwise error rate. The downside by using Tukey's test is its "black box" effect, meaning that the intuitive understanding of the methodology and reliability might be difficult to assess, as the methodology is complicated and the effect is enforced by the use of the SAS Enterprise Guide output. For that reason many of the underlying formulas and calculations have not been presented. This is where the ranking exercise has its great advantage, as the approach is fairly straightforward and the steps in reaching the final rank can be closely followed.

Supporting evidence for the results found in the ranking exercise in the previous section has been found by use of Turkey's test. The results suggest it is worth considering mean of acquisition depending on the industry the potential acquirer is operating in. However, more specifically, how should a potential acquirer choose in terms of absolute return difference, and not only in ranking

terms, between a JV with buyout option and direct M&A, given the industry he operates in? This question will be taken up in the next section.

3.8.3 The JV-M&A Industry Spread

To see the differences in the absolute returns for the JV and M&A industries, a spread is calculated between the *CAAR* values of the JV industry and the M&A industry. Figure E31 shows the spread for the Pharmaceutical, Heavy Manufacturing, Light Manufacturing, TMT, Utility, Financial Services and Other industries.

The spread for the Pharmaceutical industry shows relative higher performance for the JV Sample than the M&A Sample prior and just after the announcement. After t=2 the spread gets negative keeping this level except for small changes at the end. However, generally the spread moves on average around 0. This means there is essentially no difference in the performance of the JV Sample relative to the M&A Sample.

The Heavy Manufacturing industry shows a clear and continuously growing tendency. Prior to t=0 the spread increases more than in the period following the announcement day. Nevertheless, the strong increase initiates once more from t=8 till the end of the event period.

The spread for the Light Manufacturing industry moves in cycles with an average well above the 0 % level.

TMT is characterized by a constant move around the 0 % level till it reaches t=26. From this period there is a clear downward tendency.

For the Utility industries there is a downward trend from t=-5 to t=8. This is followed by a steep increased movement to t=25, after which the spread stabilises at a fairly high level.

Financial Services strongly increases around t=0, followed by a very stable level above 0 %. From t=28 there is a strong increase in the spread.



Figure E31, Spread between JV and M&A sample

Source: JVM&AEmpiricalResults.xls (sheet: "Dummy(M&A Industries)")

Finally, the Other industry category is characterized by a relatively steady growth in the spread from t=2 towards the end of the event period. The spread is, however, negative from t=-8 until t=5 where it reaches 0.

Generally, there seems to be clear differences between the spreads for the industries. However, support is still found for JV with buyout option performing better than M&A, as it is generally seen that the spreads move above the 0 % level. For all the industries, the periods before t=0 show positive spread meaning that JV with buyout option performs better than direct M&A before the announcement. However, differences in the runup patterns are found and the runup period is therefore not affected similarly across industries. It is interesting to notice how Utility and Light Manufacturing declines from t=-6 and Pharmaceutical and TMT from t=-2, despite being in the positive spread area. A key observation from Figure E31 is that the advantages of making a JV with buyout option instead of a direct M&A highly depends on the industry as the return differential measured by difference in *CAAR*) highly varies across industries.

Figure E32 shows that over the entire event period the Heavy Manufacturing industry yields the highest return difference between the JV and the M&A Sample. It is followed by Utility, Other, Financial Services, Light Manufacturing, Pharmaceutical and TMT.

right Low, spread between of and mean sample - Difference in Chini [0,00] /0 points
--

t	Heavy Manufac.	Utility	Other	Financial Services	Light Manufac.	Pharmaceutical	TMT
(-8;36)	57,75%	49,41%	41,47%	36,46%	27,63%	2,02%	-31,68%

Source: JVM&AEmpiricalResults.xls (sheet: "Dummy(M&A Industries)")

For TMT the difference in *CAAR* is negative, implying the return is higher if direct M&A and not JV with buyout option is used as the mean of acquisition. For the Pharmaceutical industry there is a slight higher return when choosing JV with buyout option for direct M&A, but the difference is very small. For the rest of the industries it is clearly value added to choose JV with buyout option for direct M&A as a mean of acquisition.

3.9 National and International Differences

The objective of this section is to look into the differences between national and international transactions within JVs with buyout option and direct M&As. More specifically, we test the return differential between IJVs and DJVs and the return differential between IM&As and DM&As (*I* denotes *I*nternational and *D* denotes *D*omestic). One can argue that international transactions lead to more asymmetric information between the acquirer and target, as e.g. cultural gaps and legislative issues make transparency less likely.

In order to analyze whether potential higher degree of asymmetric information exist in international transactions, two dummy tests is made. The first dummy test measures the performance differential between IJVs and DJVs based on our previous described JV Sample. The second dummy test measures the performance differential between IM&As⁷⁷ and DM&As. Both dummy tests are made using ANOVA models with one dummy variable⁷⁸.

3.9.1 IJV vs. DJV Dummy Test

The IJV vs. DJV dummy test, is based on the following equation

$$Y_t = B_1 + B_2 D_1 + u_i$$

Where

 $Y_t = CAAR$ for IJVs or DJVs $D_I = 1$ if IJV = 0 if otherwise (i.e. DJV)

Based on Equation E13, CAAR for the DJV Sample, is

 $E(Y|D_1 = 0) = B_1 + B_2(0) = B_1$

Equation E13

⁷⁷ Often called cross-border M&As in the M&A literature

⁷⁸ For an explanation of the one-variable ANOVA model, please see section 3.1.2. Adjustment Bias Sample

And CAAR for IJV sample, is

$$E(Y|D_1 = 1) = B_1 + B_2(1) = B_1 + B_2$$

In the following, the null hypothesis, $H_0: B_2 = 0$ and $H_1: B_2 \neq 0$, is tested, by running Equation E13. However, before doing this, an important note to the input data should be made. When grouping the data, an unequal weight of Buyout observations and Adjustment Bias observations among IJVs and DJVs were found. These are seen in Figure E33.

Figure E33, Distribution of Buyout Observations and Adj. Bias Observations Among IJVs and DJVs

IJVs		Domestic JVs	
Buyout	56,36%	Buyout	40,54%
Adjustment Bias	43,64%	Adjustment Bias	59,46%

Source: JVM&AEmpiricalResults.xls (sheet: "Dummy(IJV vs. Domestic JV"))

From Section 3.1.2, we know that the Buyout Sample observations in the JV Sample performs significantly better than the Adjustment Bias Sample observations. It is therefore important, that an equal weighting of Buyout Sample and Adjustment Bias Sample observations exist within IJV and DJVs⁷⁹. The IJV Sample is therefore taken as the sample with the weight to be applied to the DJV Sample, thus using synthetic weights. Applying the weights to the DJV Sample and calculating the average returns for the Buyout and the Adjustment Bias Sample for both the IJV Sample and the DJV Sample yields the regression results in Figure E34.

The results from the IJV vs. DJV dummy test, shows that p > 0,05. Based on the results in Figure E34, we cannot reject the null hypothesis, $B_2 = 0$. In other words, no evidence is found that IJV performs better than DJVs. This contradicts previous results found by Lee & Wyatt (1990) and Chung, Koford & Lee (1993), who find negative wealth effects for firms engaging in IJVs. It should however be noted that their results are based on event periods of 60 and 90 days, respectively, whereas our event period has a length of 45 months.

SUMMARY OUTPUT based on CAAR value

		_						
Regression Statistics		-						
Multiple R	0,072479273	-						
R Square	0,005253245							
Adjusted R Square	-0,006050695							
Standard Error	0,151287574							
Observations	90	-						
ANOVA								
	df	SS	MS	F	Significance F			
Regression	1	0,010636636	0,010636636	0,464726883	0,497213359			
Residual	88	2,014137856	0,02288793					
Total	89	2,024774492						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	0,23824411	0,02255262	10,56392161	2,5206E-17	0,193425482	0,283062738	0,193425482	0,283062738
X Variable 1	-0.021742571	0.031894221	-0.681708796	0.497213359	-0.085125682	0.04164054	-0.085125682	0.04164054

Source: JVM&AEmpiricalResults.xls (sheet: "Dummy(IJV vs. Domestic JV"))

3.9.2 IM&As vs. DM&As Dummy Test

The IM&As vs. DM&As dummy test is made in a similar way to Equation E13. The basic modification is

 $Y_t = CAAR$ for IM&As or DM&As

 $D_1 = 1$ if IM&A

= 0 if otherwise (i.e. DM&A)

The results from the IM&A vs. DM&A dummy test, are given in Figure E35. The results of Figure E35 shows that the estimated B_2 parameter is negative and significant at the 5% level, meaning that the null hypotheses can be reject. Therefore, we can conclude that DM&As performs better than IM&As.

⁷⁹ If a disproportional weighting of the two sub samples was made, we would not be able to clarify whether crosscountry would have an effect since difference in performance might as well be explained by different weighting of the two sub samples.

Figure E35, Results From IM&As vs. DM&As Dummy Test

SUMMARY OUTPUT	based on CAAR							
Regression Statistics		-						
Multiple R	0,369028415							
R Square	0,136181971							
Adjusted R Square	0,126365857							
Standard Error	0,061352013							
Observations	90	_						
ANOVA								
	df	SS	MS	F	Significance F			
Regression	1	0,052220095	0,052220095	13,87330786	0,000344679			
Residual	88	0,331238114	0,003764069					
Total	89	0,383458209						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	0,090758143	0,009145818	9,923458179	5,16212E-16	0,072582738	0,108933549	0,072582738	0,108933549
X Variable 1	-0,048175648	0,01293414	-3,724688962	0,000344679	-0,073879554	-0,022471743	-0,073879554	-0,022471743

Source: JVM&AEmpiricalResults.xls (sheet: "Dummy(IM&A vs. Domestic M&A"))

3.10 Critical View of the Empirical Analysis

The purpose of this section is to take a general view of the empirical analysis, which have been conducted through sections 3.1 - 3.9, and discuss potential improvements in terms of sampling methodology (collection of data) and event study technicalities.

The first part of this section will start out by discussing the sampling methodology, that is, the potential implications of ignoring certain criteria when selecting the sample observations. This will be followed by a discussion of the event study technicalities, which deals with issues such as, a potential improvement of the used market model, the absence of control variables and possible biases.

3.10.1 Sampling Methodology

In section 3.1.1 criteria for the JV Sample and the M&A Sample were set. Among the criteria was e.g. liquidity in the stock, absence of stock splits etc. In addition, further criteria could have been set in order to minimize the noise in the samples. The purpose of minimizing the noise is to have a sample, which is not affected by other important events besides the event, which you intent to analyze. In order to achieve a sample with potential less noise, 3 additional criteria could have been set:

Absence of Secondary Offerings (SEOs)
It can be argued that the samples should have been adjusted for SEOs, since they have a negative impact on the stock price. In case of a SEO, the value of the existing shares will be diluted, which is why a negative impact on the stock price can be expected. When collecting the observations for the JV Sample and the M&A Sample, this was not taken into account. First of all, we find no reason to assume that more SEOs occur for either the JV or the M&A Sample. In case the capital from the SEO is used as a mean of cash to pay for the acquired stake, it can be argued that the decrease in stock price is a consequence of the JV and M&A, respectively. This means, the SEO is a natural part of the acquisition, and therefore there is no need to adjust for this effect. On the other hand, if SEO is not used in a connection related to the acquisition, there is a need to adjust for this effect. However, as mentioned previously, there is no reason to assume that either the JV or the M&A Sample has more SEOs than the other.

Absence of Other Important Events

In general, when designing an event study it is important to exclude observations, which are affected by other important events in the event period since these potentially create a noise in the event period. When selecting the two samples, no examination of other important events in the estimation period or event period was made. As a consequence of this, we cannot reject whether the positive performance of the JV Sample is caused by e.g. a larger CEO turnover in the JV Sample than in the M&A Sample, assuming positive announcement effect of CEOs. Because of two relatively large samples, we do not find any good reasons to believe why one sample should be exposed to contain more negative or positive announcement of other events than the other sample. Despite of this, less noise in the performance of the two samples would have been obtained if corrections by exclusion were made.

Country-listing

When collecting data for the M&A Sample, specification of "country-listing" was not set as a requirement. The country-listing requirement is of importance since the overall purpose of the M&A Sample is to create a benchmark to the JV Sample. A more precise benchmark would thus ensure that the M&A observations were listed on the same stock exchanges as the JV Sample observations. As discussed with Edward Plumbly (Head of Equities, Enskilda Securities, London

Office)⁸⁰ observations in the M&A Sample does not necessarily correspond to those in the JV Sample despite the observations meet the criteria of being located in the same industry and the same time period as the JV Sample. The underlying reason for this is that short-term movements can vary highly across stock exchanges. It is however our impression that the country-listing requirement is of greater importance in event studies were the event period is relatively short. Due to the fact that our analysis covers an event period of 45 months, we believe that the country-listing requirement, ceteris paribus, is of less importance since stocks in the long run follow the same industry and/or global cycles.

3.10.2 Event Study Technicalities

The Market Model

As described in section 3.4.1, we have used a market model for modeling the abnormal and cumulative abnormal returns. The market model was a so-called one factor or single index market model (Elton & Gruber 1995). The one-factor market model assumes a stable linear relation between the security return and the market return. In some cases a two-factor or multi-factor market model can be applied. The advantage of a multi-factor model lies in the potential advantage of reducing the variance of the abnormal return by explaining more of the variation in the normal return (Sharpe 1970). In practice, as pointed out by Campbell *et al.* (1997), the benefit from multi-factor models in event studies are limited, since the marginal explanatory power of adding one factor is often small, thus leaving the variance of the abnormal returns more or less unchanged⁸¹. It should be noticed that we have not tried to apply a multi-factor model to our empirical analysis. The reason behind this lies in the above discussion along with the fact that the single-factor model yielded very satisfying results in terms of achieving fairly high R^2 s and significant results when estimating α and β in the estimation period.

Campbell *et al.* (1997) suggest another model for measuring the normal return called the Constant-Mean-Return Model. Despite its simplicity, Brown and Warner (1980, 1985) find it often yields results similar to those of more sophisticated models. Jesper Lund (2002) argues for no critical difference between the Market Model and the Constant-Mean-Return Model in cases where the

⁸⁰ The interview with Edward took place the 13th of October 2003 in Copenhagen

⁸¹ The variance reduction in multi-factor models seems to be the greatest in cases where all sample companies have a common characteristic such as e.g. industry or market capitalization (Campbell *et. al.* 1997). Since our samples varies across industries capitalization, a multi-factor model from this perspective seems of less benefit in our empirical study.

market reaction to the event is strong. Overall, we find no reason to believe that the use of the Constant-Mean-Return Model would result in a better model for modeling the returns for the event study.

Despite of the above discussion, we cannot reject that other results would have been reached in applying another model.

Control Variables

When analyzing the JV Sample and the M&A Sample, no robustness examinations for the two samples were made. Without a test of robustness, we cannot reject whether e.g. the positive *CAARs* found for the JV Sample are caused by other factors. A cross-sectional regression model with *CAAR* as the dependent variable, and e.g. market/book, volatility, size, leverage or ownership by large shareholders as explanatory variables, could however reveal, whether other firm-specific characteristics had an influence on the results found. Applying control variables to the analysis, would without a doubt have strengthened the results found.

Possible Biases

In our empirical analysis we adjusted for a positive bias in the JV Sample. Event studies are however subject to other possible biases. Among these are *nonsynchronous* trading. The influence of nonsynchronous trading affect the market pricing and variance of the stocks in the two portfolios, which can feed into a bias in the betas for the market model used. The problem is of particular relevance when using daily data in the estimation period (which is the case in our empirical study). In general, we have not examined whether nonsynchronous trading exists in our samples. It cannot therefore be rejected that other results would have been reached if adjustment towards the nonsynchronous trading was made. However, Scholes & Williams (1977) find that nontrading adjusted beta estimates of thinly traded securities are app. 10-20% larger than the unadjusted estimates. For actively traded securities, the adjustments are in general smaller. Also Jain (1986) examines the influence of thin trading. Jain compares the distribution of abnormal returns from OLS betas with Scholes & Williams (1977) and Jain (1986), we find indications that adjustment for nonsynchronous trading in our JV Sample and M&A Sample seems to be of minor importance.

From the above discussion of the critical view of the empirical analysis we find the sampling methodology chosen for the event study reflects the initial purpose of the study. Potential corrections were discussed but none of these were found to be serious candidates for making any new adjustments. Based on the sampling methodology, we find good reasons to believe that the samples chosen for the event study are reliable compared to the intentions of the study. At the same time it cannot, however, be rejected that other results would be found if other sampling methodologies were established. The same conclusion, except for the potential use of control variables, is reached for the discussion of event study technicalities.

3.11 Chapter Discussion

This section will discuss the obtained empirical results in this chapter and compare them to the results of other researchers. This will be followed by a discussion of whether the 3 hypotheses in the problem statement should be accepted or rejected.

The first finding in chapter 3 shows the JV Sample performing significantly better than the market model. $CAAR_{JV}$ increased at a constant high rate throughout the event period. The results evidence that JV with buyout option creates more long-term value for its shareholders than the market model. As mentioned in the very beginning of the thesis, Berg & Friedman (1981), McConnell & Nantell (1985), Balakrishnan & Koza (1993) and Reuer & Koza (2000), all find evidence for JV announcements creating value for shareholders. Nevertheless, there are important differences between these studies and the one we have just conducted. First of all, the JV observations in our JV Sample are characterized by having a buyout option, which is not a characteristic of the other studies. Second, our event period intends to measure the long-term gains in shareholder wealth, whereas the other studies intend to measure the short-term gains⁸². Third, our study contains DJVs and IJVs, whereas their samples only include DJVs. Since Lee & Wyatt (1990) Chung, Koford & Lee (1993) find a negative performance in IJVs, a direct comparison should therefore be taken with caution.

Nevertheless, overall it seems as if our results shows a slightly stronger JV performance than the other studies on the field. For t=2 our study presents a $CAAR_{JV}$ of 2,8% whereas McConnell &

Nantell (1985) finds 2,15%. It is, however, difficult to make direct comparison to McConnell & Nantell's study since their study is based on a sample of DJVs, whereas our study also include IJVs. However, notice we found no difference in the performance between IJVs and DJVs meaning that it is without importance that our sample contains IJVs compared to the results of McConnell and Nantell. On the other hand, if assumed that the results of Lee & Wyatt (1990) and Chung, Koford & Lee (1993) hold, it can be argued that the result of 2,8% should have been revised for the IJV observations in our sample, thereby adding an additional return to our return figure. Whether assumed that our results or Lee & Wyatt (1990) and Chung, Koford & Lee (1993) results hold for IJV performance, we still find that our JV sample performs slightly stronger than McConnell & Nantell's sample. To what extent, this is directly related to our sample containing JVs with buyout options and the other studies containing JVs, is difficult, but also interesting to answer. Assuming it has an impact on the performance that the JV observations in our sample has buyout options, two possible explanations can be given for the difference in the performance between our study and McConnell and Nantell's study⁸³: i) Stock market analysts on average systematically overvalue the buyout option, ii) Potential acquirers on average systematically pay a price of the buyout option, which is below the true value of the option. The argument related to the first explanation is linked to how the stock market makes its valuation on the buyout option. Given that the potential acquirer and the potential target agrees on a price on the buyout option, which is equal to the correct market price, neither the potential acquirer or the potential target has made a bargaining. From an efficient market argument, the market should be able to value the buyout option at its true market value, thereby taking account of the additional value added of the buyout option. Ceteris paribus, this would in an efficient market lead to no additional return to the investors who invest in the JV with buyout option than a "normal" JV. However, in case the market is not efficient and the market on average systematically overvalue the value of the buyout option, this would lead to the JV with buyout option performing better than a "normal" JV, which could be an explanation for why the sample with JV with buyout option performs better than the "normal" JV Sample. In the second explanation, the market is assumed to be efficient, but where the bargaining process between the potential acquirer and potential target makes the potential acquirer on average get a systematical bargaining, i.e. he gets to pay a lower price than the true market price of the buyout option. In this case, it is assumed that potential acquirers on average systematically cheat potential targets, thereby

⁸² Most event periods in these studies are 60 to 90 days.

adding a positive return differential to the JV with buyout option relative to the "normal" JV transaction. We find the above arguments useful, however, it is out of the scope of this thesis to test these explanations.

In terms of M&A performance, the graphical results of the performance of the M&A Sample showed positive $CAAR_{M\&A}$, i.e. indicating better performance than the market model. Nevertheless, based on the test of significance, all the obtained results except for *t*=24 and *t*=[27;36] were insignificant at the 5% level, suggesting that it cannot be rejected that the results are different from 0. With such a strong statistical result, the implications appear to be fairly strong. On top of this, the results are in line with the extensive research on the field for the performance of acquirer firms in M&As. Weston, Siu, Johnson (2001) concludes based on Mitchell & Stafford (2000), Loughran & Vijh (1997) and Rau & Vermalen (1998) that it cannot be rejected that the long-term performance of M&As equals 0. Our results of the long-term performance of the M&A Sample along with the already mentioned research on the field, questions why M&A occur, when they do not create shareholder value for the acquirer? Many studies have tried to contribute to the existent debate on the field. Among the most well known we find Jensen (1986), with his theory on the free cash flow, Roll (1986) with the theory on managerial hubris and Shleifer & Vishny (1989), with the model of managerial entrenchment. Nevertheless, it is out the scope of this thesis to contribute to the ongoing discussion on this interesting topic.

The most important finding in chapter 3 was based on the U-Test. It showed, at the 5% level of significance that the JV Sample performs better than the M&A Sample. The result of this test enables us to support *Hypothesis 1*, namely that JV with buyout option is a better mean of acquisition than direct M&A. The underlying belief is that by choosing the JV with buyout option instead of the direct M&A approach, asymmetric information is eliminated. The results favor the view that there are certainly greater advantages in eliminating asymmetric information before engaging in an acquisition.

Going from the overall picture of the JV and M&A Sample to an analysis on the industry level revealed clear differences within industries. In light of this, 4 out of 7 industries were different from

⁸³ Please bear in mind that the two explanations assumes that everything else is equal between our JV Sample and McConell and Nantell' sample.

the JV Sample to the M&A Sample, indicating differences in contribution to the sample depending on the mean of acquisition and the industry. For the JV Sample, we found Financial Services to have the highest mean value, although the mean was not significantly different from Utility, Light Manufacturing and TMT. In the lower end of the mean return we found Heavy Manufacturing, although it was not significantly different from Pharmaceutical and Other. For the M&A Sample the evidence were clearer and we found TMT to have the highest mean, significantly different from all the other industries. This was followed by a group of Pharmaceutical, Light Manufacturing and Financial Services, which were all insignificant within the group. The last group consisted of Other, Utility and Heavy Manufacturing.

A question arising is to what extent our underlying belief on asymmetric information, JV and M&A is confirmed by the above results? There is no doubt the test results suggest different approaches to mean of acquisition depending on the industry in which the acquirer operates. This was additionally confirmed by the results of the JV-M&A Industry Spreads, which showed clear different patterns across industries. Nevertheless, based on the spread calculations it is more advantageous to make a JV with buyout option than direct M&A in 6 out of 7 industries, only confirming the overall support for *Hypothesis 1*. However, the Pharmaceutical industry difference was only 2% points, a fairly small difference showing weak evidence for a real difference in the return across mean of acquisition for this industry. Bearing this in mind, the real figure should possibly be in 5 out of 7 industries does the JV with buyout option perform better than direct M&A. TMT is showing a high negative spread, meaning that in this industry it is fare more advantageous to conduct a direct M&A than a JV with buyout option.

An important implication from the above discussion is that industry matters for the choice of mean of acquisition, being JV with buyout option or direct M&A. Supportive evidence for *Hypothesis 2* is therefore also found.

Looking at the differences between IJV and DJV suggested no rejection of the null hypothesis, meaning that an actual difference in the performance could not be identified. In contrast to this result, the null hypothesis was rejected when testing IM&A and DM&A, meaning DM&A perform better than IM&A. Assuming that international transactions, ceteris paribus, incur a higher degree

of asymmetric information, i.e. less transparency than domestic transactions, we believe these results shows support for *Hypothesis 3*.

3.12 Chapter Summary

In this chapter an empirical analysis of JV with buyout option vs. direct M&A performance was conducted. The overall results of the analysis showed that JVs with buyout option perform better than direct M&As. These findings show new evidence not previously found in the M&A literature.

The analysis was conducted by use of an event study approach. In this approach, two samples were used, a JV Sample and a M&A Sample. The JV Sample was selected from Lexis Nexis and Factiva and consisted of two sub samples; The Buyout Sample and the Adjustment Bias Sample. This construction was undertaken so that a positive bias in the stock returns was potentially avoided. The total size of the JV Sample was 98 firms equally divided between the Buyout Sample and the Adjustment Bias Sample. The M&A Sample, which was selected from Bloomberg, also consisted of 98 firms. The industry and time period exposure in the JV Sample and the M&A Sample were basically alike. All observations took place in the period 01.01.1996-01.01.2003.

The event period was set to [-8;36] months and starts with a runup period, as most theoretical work on the field, has found evidence for a prior effect of the event before the actual announcement. The abnormal returns for the JV Sample and M&A Sample were calculated relative to the market model, which was based on Datastream Global Indice (DS Mnemonic: TOTMKWD). It was found that the composition of the market model, very well reflected the geographical and industry composition of the JV and M&A Sample, thereby reflecting the market risk of the JV and M&A Sample.

The graphical results of *CAAR* for the JV Sample showed a steep increasing graph, well above the 0% level, indicating the JV Sample performs better than the market model. The corresponding result for the M&A Sample showed a graph slightly above the 0% level, but with a rate of increase in *CAAR* less than the JV Sample. Comparing the variances of the two samples showed the JV Sample variance to be higher than the M&A Sample. Statistical test of the JV Sample showed that all of the reported results were significant at the 5% level, thereby rejecting the null hypothesis. For

the M&A Sample, only the last couple of observations were significant, indicating the M&A Sample not being significantly different from 0.

In order to compare the mean performance of the JV and M&A Sample an U-Test was made. At the 5% level of significance the test overall showed support for the JV Sample performing better than the M&A Sample.

Also, a nonparametric test was made, where Corrado's Rank Test was chosen. The results of the Rank Test at a 10% level of significance showed support for the results in the parametric test. Hence, the Rank Test confirmed the robustness of the parametric test results.

To test for JV and M&A differences across industries and countries, dummy tests were used. For the dummy test on industry level, 6 dummy regressions were conducted so that all possible outcomes for the industries were tried out. The objective of the dummy test was to identify significant relations among industries. We pointed out the problem with the repeated *t* test, which was used in the dummy test and which was the reason why the multiple comparison procedures were used to enforce the results of the ranking exercise. The result of the multiple comparison procedures for the JV Sample, Financial Services had the highest mean performance, although it was significantly different from Utility, Light Manufacturing and TMT. For the M&A Sample, TMT had the highest mean performance, significantly differently from all the other industries.

A spread between the JV and M&A Sample was calculated on an industry level. The results showed that the industries performed quite differently and had different performance patterns. For the event period, the Heavy Manufacturing industry yielded the highest return difference between the JV and M&A Sample, followed by Utility, Other, Financial Services, Light Manufacturing, Pharmaceutical and TMT.

In testing for differences of making an IJV compared to a DJV, the dummy test showed that the null hypothesis of no difference between the two samples, could not be rejected. For the IM&A relative to DM&A the dummy regression results showed a significant relation, thereby finding evidence for DM&As performing better than IM&As.

At the end of the chapter, a section took a critical view of the empirical analysis. Potential improvements of sampling methodology such as the influence of SEOs, noise from other important events and different country listings were discussed. In addition, event study technicalities in the form of alternative market models, control variables and possible biases were discussed. The overall conclusion from the critical view of the empirical analysis was that, except for the absence control variables, the sampling methodology and event study technicalities was found to be reliable and in line with the intentions and purpose of the event study. Despite of this, it was recognized that other results could have been reached if other methodologies or technicalities were used.

Finally, the empirical results were discussed and related to the findings of other researchers. Furthermore, it was argued for acceptance of Hypothesis 1, Hypothesis 2 and Hypothesis 3.

4. Bridging the Gap Between the JV-M&A Asymmetric Information Model and the Empirical Results

The main two chapters of this thesis, which are chapter 2 and 3, have now been presented. This chapter intends to bridge the gap between the JV-M&A Asymmetric Information Model from chapter 2 and the empirical results from chapter 3. This implies relating the empirical results back to the JV-M&A Asymmetric Information Model and draw important policy implications for managers with intentions of engaging in M&A activity. Finally, we undertake several different perspectives on the JV-M&A Asymmetric Information Model and the empirical results.

4.1 Policy Implications

The JV-M&A Asymmetric Information Model was the theoretical framework model for this thesis. Important factors in finding the equilibriums were θ and t'. θ was defined as the potential acquirer's prior probability assessment of potential target being a peach, i.e. a good acquisition target, while t' was defined as the potential target's share of the integration costs.

In the model, θ was assumed to be exogenously given, and both the potential acquirer and target knew θ . It was an important assumption making simplification possible of a complex problem. In applying the model to the empirical results there is an important difference in that the empirical results are based on individual beliefs. Each potential target has a perception of θ and each potential acquirer has his θ . From a strict theoretical point of view, in case θ was not an individual belief, the outcome of the empirical results would only show 1 sample, as potential targets would know θ and play the corresponding t'. At the end, this would result in all potential acquirers playing the same equilibrium strategy and we will thereby only have one mean of acquisition.

The empirical results in chapter 3 showed support for JV with buyout option as a mean of acquisition performs better than direct M&A for the potential acquirer's point of view. According to the JV-M&A Asymmetric Information Model this shows, at the added welfare to society level, an outcome, which relatively speaking, is less efficient than direct M&A (full information benchmark). Recall, that the optimal outcome would lead to potential target not having to incur any cost, i.e.

 $t^{t}=0$. However, this also required θ to be higher than $\theta_{directM\&A}^{Undo\min ated}$, in case Equation M5 was assumed to hold, and $\theta_{directM\&A}$ in case Equation M5 was assumed not to hold.

When applying the empirical results to the model, it shows the potential acquirer should be critical and have a θ value below $\theta_{directM\&A}^{Undo\min ated}$ or $\theta_{directM\&A}$, if he wants to maximize shareholder value. A θ value below these values would according to Figure M11 and result in a JV with buyout option. Thus, it is of less importance for the potential acquirer to choose a pooling equilibrium with JV and buyout option, or a separating equilibrium with JV and buyout option, as in both cases they would yield a higher return, than if he had chosen a pooling equilibrium with direct M&A. The model shows that for the value added to society, the pooling equilibrium with JV and buyout option would yield a higher value than in the separating equilibrium with JV and buyout option. This also means that it is not important whether the criteria for separation is fulfilled or not (c.f. Equation M5) since the potential acquirer should always choose JV with buyout option as the preferred mean of acquisition based on the empirical results.

At this point, we can thus state our first policy implication for managers in acquirer firms:

Policy implication 1: Based on the theoretical findings in chapter 2 and the empirical findings in chapter 3, managers in acquirer firms should be critical and not overoptimistic, since JV with buyout option in general creates more long-term shareholder value than direct M&A.

Based on the model, the reason underlying this policy implication is the relative advantage found in JVs with buyout options compared to direct M&As. From our previous discussion in section 2.10, it was given from the model that JVs with buyout options had the advantage of providing the acquirer with a real option. This option is an option to expand in case *PT* would turn out to be *P*. Based on the model, the disadvantage of JVs with buyout options was found in the inefficient capitalization of synergies.

The first policy implication is stated at a general level, that is, industry differences has not been taken into account. The empirical results in chapter 3 found that industry origination plays an important role, since the performance of a given industry was affected by the mean of acquisition.

The overall results, as highlighted in the previous chapter, shows however that in 5 out of 7 industries, JVs with buyout option perform better than direct M&As. Based on the model, this underlines the advantage of being able to eliminate asymmetric information before the final acquisition in most of the industries. However, it also shows that in some industries it is not an advantage to eliminate asymmetric information in the JV with buyout option setup compared to direct M&A, as this depends on industry. The fact that TMT and Heavy Manufacturing show the lowest and highest spread, respectively, is in our opinion not a coincidence when relating it to the model. Take for instance TMT. This industry is characterized by a high focus on fast innovation. It can be argued that a clear key success factor for the industry is being able to be first mover, thereby gaining market share and a strong position before a new product is introduced to the market. A good example of this tendency is seen in the market for mobile phones, in which the product life cycle is very short, and the price elasticity high. There is a need for a quick acquisition, as synergies should immediately be mobilized and used in the innovation process of generating new ideas. JV with buyout option as a mean of acquisition is a slower way to do an acquisition as previously mentioned. It can be argued that the slower capitalization of synergies is related to the inefficiency of having two management teams. In respect to this, the relative advantage in direct M&As out weights the relative advantage in JVs with buyout option, that is, the fast capitalization on synergies net the risk of acquiring a lemon, out weights the value of the real option less the slow capitalization on synergies.

In the other end of the spread between the return on the JV and the M&A Sample, we find Heavy Manufacturing, which is characterized by high fixed and sunk costs, large investment projects and economies of scale. Take for instance an automotive manufacturer or the airline industry, which is part of the Heavy Manufacturing industry group. Among the most crucial aspects influencing these industries are overcapacity problems in economic recessions. Because of high levels of fixed and sunk costs, a key success factor for these industries is the ability to adjust the production capacity to the market demand. A continuous adjustment of capacity is therefore extremely important in these industries in order to stay profitable. According to the model, we believe, the reason why JV with buyout option shows the greatest advantage in our empirical findings is the value of the real option in these industries. The JV with buyout option provides the potential acquirer with the possibility of buying additional capacity whenever needed, by exercising the option. On the other hand, it can be argued that choosing the JV with buyout option instead of direct M&A in an economic upturn, is a

disadvantage. When the economies is in an upward trend the firms that chooses the direct M&A for the JV with buyout option, have the advantage of being able to capitalize faster on synergies, thereby getting an advantage before the JV firm gets to exercise their option. However, apparently the overall results from chapter 3 shows that the relative advantages relative to the disadvantages in economic upturns verses economic downturns are higher for JV with buyout option than the direct M&A.

Hence, the second policy implication for managers in acquirer firms is:

Policy implication 2: Based on the theoretical findings in chapter 2 and the empirical findings in chapter 3, managers in acquirer firms should be critical in evaluating the relative advantages and disadvantages within JVs with buyout option and direct M&As, as they are industry related.

The third and final policy implication relates to hypothesis 3. In the empirical study we found that no long-term shareholder value differential existed between IJVs and DJVs, whereas the long-term shareholder value differential was greater in DM&As than in IM&As. Under the assumption that there is more asymmetric information in international transactions than in domestic transactions, our third policy implication for managers in acquirer firms is:

Policy implication 3: Based on the theoretical findings in chapter 2 and the empirical findings in chapter 3, managers in acquirer firms should rather choose JV with buyout option than direct M&A as the mean of acquisition, when engaging in international transactions.

The above discussion have thus fare focused on policy implications for managers in acquiring firms based on the JV-M&A Asymmetric Information Model and the empirical findings in chapter 3. In the section below, we allow us for a moment to step outside the model and the empirical findings, and ask our selves the following question: Now that we know that JV with buyout option is generally performing better than direct M&A and how this can be related to the JV-M&A Asymmetric Information Model, how come has this mean of acquisition not obtained more attention in the academic literature, the financial press or in actual M&A deals? For this we find two possible explanations:

First of all, we know that stock markets in general punish managers for lack of transparency. We believe that JVs to some extent can reduce the transparency within a firm's financial statements and overall business strategy. Imagine a company that has 20 JVs with 20 different companies! We believe there is a great likelihood that stock market analysts would discount the value of this stock since no "half-solutions" are generally accepted by the stock market. Clear messages about decisions in the firm are often rewarded by the stock market. If there is uncertainty, it will rather discount the stock price, than consider it a "none event". Engaging in JVs can therefore add to the likelihood that the company itself becomes a potential takeover target, since replacement of management would clean up the firm and make it more focused.

Another explanation is found in Jensen's Empire Building argument⁸⁴. Jensen argues that one motive for M&As is found in managers' strong desire to increase the size of the firm for personal benefits. The bigger the firm gets, the more power and the higher salary are granted to the CEO. Using the Empire Building argument, it can therefore be argued that potential acquirer decision makers refuse to decide on a JV with buyout option, as this will not grant them the unanimous control of the potential target firm, though it would yield a higher return to the shareholders. Such a situation would result in an agency problem, in which the managers of the firm do not serve the interest of the shareholders.

4.2 Different Perspectives on the JV-M&A Asymmetric Information Model and the Empirical Results

Thus fare, the above discussion have focused on potential acquirers in JVs with buyout option and direct M&As, as this has been the analytical level chosen for the thesis. In the section below we relax this focus and include potential targets in the discussion. This will be done at both a theoretical level and empirical level. Also, we look at the game in the case in which both the potential target and potential acquirer is aware of our empirical results found in chapter 3.

One of the main critique points of our empirical study lies in not knowing how target firms perform in both the JV Sample and the M&A Sample. Much evidence in the M&A literature has shown that

⁸⁴ Brealy & Myers (2000)

targets in M&As gain approximately 25-30%⁸⁵. Whether this also holds for buyouts in JVs is difficult to answer. In case target firms in the JV Sample perform weaker than the target firms in the M&A Sample, it can be argued that no real productivity gains as a whole, has been created. In that case, only a redistribution of wealth from target shareholders to acquiring shareholders in the JV Sample compared to the M&A Sample has occurred. Naturally, this is only the case, if the weaker performance of the targets in the JV Sample compared to the performance of the targets in the M&A Sample, exactly amounts the return differential between acquirers in the JV Sample and the M&A Sample. Assuming this was the real case among our target sample companies, we still believe our findings would add interesting results to the M&A literature, since it can be argued that JVs with a buyout option creates a mechanism, which protects the potential acquirer from the well known winner's curse problem in M&A deals. Making a JV thus potentially keeps other potential acquirers from bidding on the target firm, which could be one reason for the better performance in the JV Sample than the M&A Sample. Now, on the other hand, if target firms in our JV Sample performed just as well or better than target firms in the M&A Sample, we believe to have found a way for improving M&A, which adds value to the overall society. In that case, policy implications should not only be set to managers in acquiring firms but also at a higher political level. In respect to this, incentives for managers in both acquirer and target firms to engage in JV activity should be improved. It is however up to further research to analyze the performance for targets firms in JV buyouts, in order to deal with the relevance of this issue.

We now finally illustrate the outcome of the JV-M&A Asymmetric Model assuming that both the potential target and potential acquirer is aware of our empirical results found in chapter 3. In this case, it will only reinforce the position of the peach, and there will be less possibility for the lemon to get into the game. From a rational point of view, this last statement also makes perfect sense, as potential acquirer has become more critical in selecting the potential target. Well knowing that the potential acquirer is less reluctant to be very optimistic, i.e. high θ , as the empirical results have shown, the peach is now less willing to take the risk and play a pooling strategy with $t' < \frac{upper,L}{t}$. As Figure M11 shows, in case the peach is convinced $\theta_{JV+buyout} \leq \theta < \theta_{JV+buyout}^{Undo \min ated}$, PT's dominated upper.L message will be resulting in the separating equilibrium, in t, and case

⁸⁵ E.g. Westion, Siu and Johnson (2001)

 $\theta_{JV+buyout}^{Undo\min ated} \leq \theta < \theta_{directM\&A}^{Undo\min ated}$, *PT*'s dominated message would be $t_{N\min 0}^{t}$. Given that the probability, before knowing of the empirical results, was equally possible between the separating equilibrium with JV and buyout option, pooling equilibrium with JV and buyout option, and pooling equilibrium with direct M&A. In this case, there would be greater possibility for a lemon to participate in the game than if separating equilibrium with JV and buyout option, and pooling equilibrium with JV and buyout option was consistently chosen as an outcome of the empirical results.

These last results are not new to us, as this was how the model was constructed before knowing the empirical results of chapter 3. However, given the above scenario that the potential target knows of the empirical results and assuming the potential acquirer acts according to these results, the probability that the lemon gets into play is now lower than it was before taking the empirical results into account. It can be argued, based on the just mentioned line of thinking that the market mechanisms have self-selected, creating a way to deselect lemon firms. The market has found a way for the potential acquirer to select peaches and the mechanisms for this is based on eliminating asymmetric information. Our claim in this thesis has been based on the arguments of eliminating asymmetric information by use of JV with a buyout option.

5.0 Conclusion

The overall objective of this thesis has been to analyze whether JV with a buyout option, creates more long-term shareholder value than traditional direct M&A. To answer this, a *Theoretical Framework Model* build on game theory in chapter 2 and an empirical study based on event study in chapter 3, was undertaken.

The theoretical framework model, called the JV-M&A Asymmetric Information Model, illustrates the game between a potential acquirer and a potential target. The potential acquirer is faced with an adverse selection problem as outlined by Akerlof (1970). The model is designed so that the potential acquirer through a JV with buyout option can identify the true nature of the potential target firm, that is, whether it is a peach or a lemon. Setting up a JV with buyout option, however, incur inefficiency costs, since it is assumed that the potential target is less efficient in undertaking integration costs, which is needed in order to combine the activities of the potential acquirer and the potential target. Only through signaling the level of integration costs the potential target can separate itself whether being a peach or a lemon. The alternative to the JV setup is a direct M&A. The advantage for the potential acquirer in undertaking a direct M&A is the absence of the potential target's inefficient share of the integration costs. On the other hand, a direct M&A increases the risk of acquiring a lemon, since no elimination of asymmetric information is made. A tradeoff between elimination of asymmetric information and incurring efficiency costs is therefore stated to be the basic structure underlying the model. In general, from the acquirer's perspective, the tradeoff when engaging in JV with buyout option is assumed to lie in balancing between the value of a real option against the less efficient capitalization on synergies. The tradeoff in a direct M&A lies, on the other hand, between balancing between the more efficient capitalization on synergies against the higher risk of acquiring a lemon.

When deriving separating and pooling equilibria, θ and t' was found to be the most important factors, where θ was defined as the potential acquirer's prior probability assessment of potential target being a peach, while t' was defined as the potential target's share of the integration costs. The equilibria lying on the equilibria paths were illustrated in relation to the added welfare to society from the combined activities of the potential acquirer and potential target. Given the requirement for separating equilibria was not fulfilled, pooling equilibria with direct M&A was found to yield

higher expected added welfare to society than pooling equilibria with JV with buyout option. Given the requirement for separating equilibria was fulfilled, undominated pooling equilibria with direct M&A was found to yield the highest expected added welfare to society, followed by pooling equilibria with JV with buyout option and finally separating equilibria with JV with buyout option. Next, refinements were made, which lead to the potential target's dominated message, that is, the message that will survive sequential rationality. Finally, the potential acquirer's choice of equilibrium strategy was illustrated based on potential target's dominated message.

The JV-M&A Asymmetric Information Model was used as a framework when undertaking the empirical study in chapter 3. In the empirical study two samples were selected: A JV Sample where a potential acquirer had engaged in a JV with buyout option with the assumed purpose of buying the target firm, and a M&A Sample characterized by direct M&A. Each sample consisted of 98 firms where industry, geography and time period exposure were basically alike for the two samples. All observations took place in the period 01.01.1996-01.01.2003.

An adjustment to the JV Sample was made as evidence was found that including only JVs where buyout had taken place, would results in a positive bias for this sample.

Based on an U-Test, the overall results of the empirical analysis showed that JVs with buyout option perform better than direct M&As during the event period, which was [-8,36] months. Corrado's Rank test confirmed the robustness of the parametric test results. The overall finding thus supported *Hypothesis 1*, and shows new evidence not previously found in the M&A literature.

In testing for differences on the industry level between the JV Sample and M&A Sample, dummy test, ranking exercise and multiple comparisons were used. The results showed that using JV with buyout option as a mean of acquisition, created more long-term shareholder value than direct M&A for 5 out of 7 industries. Also, differences between the industries for each sample, was found to be significant. These results supported *Hypothesis 2*.

The final analysis undertaken in the empirical study was pointed at the performance of IJVs vs. DJVs and IM&As vs. DM&As. Using dummy regression it was found that the null hypothesis of no difference between IJV and DJV, could not be rejected. For the IM&A relative to DM&A, the

regression results showed a significant relation, thereby finding evidence for DM&A performing better than IM&A. In summary, this supported *Hypothesis 3*.

The final chapter of the thesis included a discussion where a bridge of the gap between the JV-M&A Asymmetric Information Model and the empirical results, was established. In bridging the gap between the model and the empirical findings, three policy implications according to the model, were found of importance:

Policy implication 1 states that mangers in acquirer firms should be critical and not overoptimistic, since JV with buyout option in general creates more long-term shareholder value than direct M&A.

Policy implication 2 states that managers in acquirer firms should be critical in evaluating the relative advantages and disadvantages within JVs with buyout option and direct M&As, as these are industry related.

Policy implication 3 states that managers in acquirer firms should rather choose JV with buyout option than direct M&A as a mean of acquisition, when engaging in international transactions.

Finally, to determine whether policy implications at a broader level should be set, it was suggested that further research should solve the issue of analyzing the performance of potential targets in JVs with buyout option.

6.0 Perspectives

As mentioned in the problem statement, the focus of the thesis has been to take the perspective of an acquirer who wants to engage in M&A under asymmetric information. The empirical findings in the thesis suggests that JV with buyout option should be considered an alternative, since evidence shows that this mean of acquisition creates more long-term shareholder value for acquirers. However, as there is nothing such as a free lunch, one might ask the following obvious question: What incentive do target firms have in engaging in JV, in which an option is granted to the acquirer firm? This is questioned, as a downside for the target firm is it keeps away potential bidders, thereby ensuring that a bidding war does not initiate, which would clearly have benefited the shareholders of the target. It can be argued that the price of the option, which the target receives, compensates for the potential loss in a bidding war. However, we believe target firms that engage in JV with buyout option believe they are initially under valued in the market, which is why they are initially not compensated in the price of the option. Thus, we do not believe the answer is found in a compensation in the price of the option. Instead we believe the answer to this question can be found in the case of Philips and Whirlpool, which was given in the introduction to this thesis. The Philips-Whirlpool case was a restructuring case from Philips' point of view (Weston, Siu and Johnson (2001)). Philips was in a period of transition where core competencies were revalued, and in order to reach future growth and profitability, a restructuring was undertaken. Divestment of non-core business was, however, as mentioned previously, not free of problems. Philips' management could not receive the valuation for the appliance business, which they believed the business division was worth. This problem was, nevertheless, solved through the JV setup with Whirlpool, and the endgame resulted in a valuation of \$ 610 millions, which was \$270 millions more than if the division was sold outright before the JV.

The Philips-Whirlpool case indicates that JV with buyout option might also be an efficient setup from the target's perspective. In the case of restructuring, where the general perception from potential acquirers in the market results in a heavy discount of the potential target's value, a JV with buyout option can potentially create more long-term shareholder value for the potential target's shareholders. In the context of a restructuring where much uncertainty about the value of a business exists, we claim that incentives for targets in engaging in JV with buyout option can be found. We do, however, also claim that in case a firm is healthy and deliver value to its shareholders, a JV with

buyout option from the target's perspective should be taken with cautious, as this might keep other bidders away.

Appendix 1

The left hand side of Equation M20 is given as

$$\pi_{p}^{C} - (1 + \psi)t' + \Delta(\pi_{p}^{C} - 1 - \varphi) - \frac{1 - \varphi - t'}{\theta} - \frac{\omega}{\theta} E \left[S[t'] \right]$$

Adding the synthetic term $\frac{1}{\theta} E \left[S[t'] \right] - \frac{1}{\theta} E \left[S[t'] \right]$, gives us
$$\pi_{p}^{C} - (1 + \psi)t' + \Delta(\pi_{p}^{C} - 1 - \varphi) - \frac{1 + \varphi - t'}{\theta} - \frac{1}{\theta} E \left[S[t'] \right] + \frac{1 - \omega}{\theta} E \left[S[t'] \right]$$

Substituting for $E\left[S\left[t'\right]\right]$ cf. Equation M16, except from in the last term, gives us

$$\pi_{p}^{C} - (1 + \psi)t^{t} + \Delta(\pi_{p}^{C} - 1 - \varphi) - \frac{1 + \varphi - t^{t}}{\theta} - \frac{1}{\theta} \Big[\theta((1 + \Delta)(\pi_{p}^{C} - \varphi - 1 - \pi_{p}^{A}) - \psi t^{t}) + (1 - \theta)((\pi_{L}^{C} - \varphi - 1) - \psi t^{t}) \Big] + \frac{1 - \omega}{\theta} E \Big[S \Big[t^{t} \Big] \Big]$$

Eliminating the brackets, except from in the last term gives:

Eliminating the duplicating terms, $\pi_p^C - \pi_p^C + \Delta \pi_p^C - \Delta \pi_p^C - \Delta + \Delta - \varphi \Delta + \varphi \Delta - \frac{1+\varphi}{\theta} + \frac{1+\varphi}{\theta} + 1 - 1 + \varphi - \varphi + \psi t' - \psi t'$, gives us

$$\frac{1-\omega}{\theta}E\left[S\left[t^{\prime}\right]\right]-t^{\prime}-\psi t^{\prime}+\frac{t^{\prime}-\pi_{L}^{C}+\psi t^{\prime}}{\theta}+\pi_{p}^{A}+\Delta\pi_{p}^{A}+\pi_{L}^{C}$$

Substituting $\pi_L^C = (1 + \psi)^{upper,L} t$ cf. Equation M2

$$\frac{1-\omega}{\theta}E\left[S\left[t^{\prime}\right]\right]-t^{\prime}-\psi t^{\prime}+\frac{t^{\prime}-(1+\psi)}{\theta}t^{\prime}+\psi t^{\prime}+\pi_{P}^{A}+\Delta\pi_{P}^{A}+(1+\psi)t^{\prime}t^{\prime}$$

This can also be written as

$$\frac{1-\omega}{\theta} E\left[S\left[t^{t}\right]\right] - \frac{1-\theta}{\theta}(1+\psi)\binom{upper,L}{t} - t^{t}) + (1+\Delta)\pi_{p}^{A}$$

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