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Mergers and Acquisitions: Do They Create Value?

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Prohlášení

Prohlašuji, že jsem diplomovou práci vypracoval samostatně a použil pouze uvedené prameny a literaturu.

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Poděkování

Děkuji panu docentovi Oldřichu Dědkovi, vedoucímu této práce, a panu doktorovi Martinu Netukovi za konzultace a cenné připomínky.

Abstract

This thesis is a contribution to the discussion about value creation in mergers and acquisitions. The first section is dedicated to theoretical explanations of why mergers and acquisitions can lead to the creation of economic value and also considers the most common fallacious merger justifications. In the second section, we outline the methodologies that can be used to measure value effects of takeovers and then survey the results of relevant past studies. We focus both on their results and the methodology.

In two case studies we practically demonstrate the use of the methodologies. We shall argue that the presence of multiple events, rumours and information leaks, uncertainty and the limitations of the market model pose a serious challenge to the precision of the estimates of value creation in mergers and acquisitions. To alleviate this concern, we recommend a more careful examination and interpretation of the events leading to the merger.

Abstrakt

Tato diplomová práce se zabývá otázkou zda fúze a akvizice vytvářejí ekonomickou hodnotu. První část je věnována teoretickým důvodům, které mohou vést ke vzniku ekonomické hodnoty při fúzích a akvizicích. V této sekci také posoudíme některá klamná zdůvodnění pro fúze. Ve druhé části se věnujeme metodologiím používaným pro měření hodnoty vytvořené fúzemi a akvizicemi, a poté představíme dříve publikované práce zabývající se naším tématem. Zaměřujeme se přitom nejen na jejich výsledky, ale i na metodologii.

Ve dvou případových studiích prakticky demonstrujeme užití těchto metodologií. Naším závěrem je, že velký počet událostí, úniky informací a zvěstí, nejistota a omezení použitých tržních modelů zpochybňují odhady hodnoty vytvořené fúzemi a akvizicemi. Ke zmírnění tohoto problému doporučujeme pečlivější studium a interpretaci událostí předcházejících fúzím.

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1. Introduction

Viewed from the perspective of the Czech Republic, mergers and acquisitions – the fusion of two companies or a takeover of one company by another, respectively - are fairly rare events. However, in countries with a longer history of capitalism and more developed markets for corporate control, such as the United States, the United Kingdom or the Western Europe, executives, investors and analysts are constantly on the lookout for takeover or merger targets. Mergers and acquisitions are a widely used and respected alternative to organic growth of corporations and are a significant channel of reallocation of capital. Just as this thesis is being finished, the financial news is dominated by stories of a takeover battle for ABN Amro, one of Europe's major banks and by Microsoft's negotiations to acquire Yahoo, an internet portal and search engine. The first quarter of 2007 saw global mergers and acquisitions exceed \$1,000 billion. With such a huge activity in the takeover markets the question who, if anyone, gains in mergers and acquisitions is as important as ever.

The main theoretical justification for mergers and acquisitions is the synergies created by putting two companies together. These range from operating economies of scale, greater bargaining power and political influence, transfer of best practices to elimination of overlaps and cost-cutting. Against these, the costs of integration need to be taken into account – these may include process redevelopment, IT systems integration, severance payments to downsized employees or administrative harmonization as well as intangible adverse effects of clashing corporate cultures. The costs of carrying out the merger – lawyers', consultants' and bankers' fees, as well as administrative levies and the costs of shifting managerial attention from day-to-day operations to the merger can also be substantial. The numerous success stories prove that value creation in mergers is perfectly possible in reality and measuring it is not just a theoretical exercise. However, mergers and acquisitions are no one-way tickets to prosperity. This is perhaps best illustrated by the takeover of Time Warner by the internet service provider America Online at the height of the dotcom bubble in 2000. What was then the biggest merger in history turned into

a disaster destroying billions of dollars and left Time Warner shareholders with nearly worthless pieces of papers in exchange for their company.

Many interesting questions arise: do mergers and acquisitions create value *on average*? How can we best measure it? Are there some types of mergers that create value while others destroy it? What are the true motives for the merger? Do some motives lead to better results than others? Over the years, researchers have attempted to tackle these questions, some with more success than others.

In this thesis we focus on the issue of measuring the value creation. We thoroughly review the results of past studies and the event study methodology – the tool of choice for most M&A researchers. We then proceed to apply the methodology to two case studies – the fast and friendly takeover of Miller Brewing Company by the South African Breweries and one of the longest and most contentious takeover battles of recent years – Oracle’s acquisition of Peoplesoft. Our conclusion is that both takeovers most likely created value. Perhaps more important than this result is the hands-on demonstration of the event study methodology, which clearly exposes its strengths and shortcomings. The case studies enable us to better understand the relevance of the representative large-sample studies. We find that the shortcomings of some commonly used techniques can be quite substantial and therefore we recommend a more careful approach, perhaps applied to smaller samples than is customary.

Even though our results suggest some caution when perusing the large-sample M&A studies, their basic results are not in question. Shareholders of target firms stand to profit handsomely while acquirers sometimes gain and sometimes lose. For acquirers, the name of the game remains the same: identify the synergies, seize them decisively and above all, don’t overpay.

Mergers and acquisitions lie at the boundary of corporate finance and corporate strategy. This thesis approaches the subject from the viewpoint of corporate finance, even though the strategic aspects will be discussed where necessary.

2. Why do firms merge?

In theoretical literature considerable attention is devoted to the question why firms merge. The theories can be divided into two broad categories. The first aims to explain mergers as actions that increase shareholder value - and are therefore undertaken by agents (executives) whose incentives are correctly aligned with the interests of their principals (shareholders). The other strand of theories seeks explanation for M&A activity in decision makers' incentives to act in their own interest, which may conflict with that of the shareholders. A classical example of the latter is empire building – executives' attempts to increase the size of their companies (as well as their own might, compensation and public profile) through acquiring other firms regardless of the effect on shareholder value. We shall now discuss the main theoretical reasons for mergers in detail. Note that the reasons do not necessarily exclude each other. Indeed, mergers are often justified by a combination of these rationales. We shall also consider several fallacious rationales that were historically used to justify mergers and acquisitions.

2.1. Mergers increasing shareholder value

A merger or acquisition creates value if the two companies are worth more together than apart. This requires the two combined firms to generate cash flows whose present value exceeds the sum of the values of the bidding and target firms¹. Starting from the benchmark case when both companies are efficiently managed and efficiently priced by the stock market, this can be achieved through *synergies*.

2.1.1. Economies of scale

The most obvious source of synergies, which is claimed to exist in nearly every merger by the parties involved are the *economies of scale*. The two companies can cut costs by sharing business services such as accounting, controlling, IT, legal services or top-management. Additional savings can be

¹ This characterization is due to Jensen and Ruback (1983)

achieved through *removing overlaps* in R&D and transferring of best practice standards between the two companies. In addition to that, greater size enables the company to increase amounts ordered and thereby qualify for more favorable terms from its suppliers. In some industries, size leads to a decrease in costs or an increase in revenues due to the special characteristics of the company's product or operations. For instance in *network industries*, the utility of the product to the consumers rises with the number of its users. In such a case, this enables the newly merged company to integrate the products and thereby increase its base of users. This in turn makes the integrated product more attractive to new buyers and leads to a rise in revenue above what the two original companies could achieve on their own.

2.1.2. Complementary resources

A merger can also be beneficial if one of the firms has assets that the other needs or can use them more efficiently. *Complementary resources* give rise to top-level merger benefits, i.e. benefits that come through increases in revenues. A classical example (see Goedhart, Koller, Wessels, 2005) involves a takeover of a small company with a single promising product (e.g. a start-up pharmaceutical company) by a large player in the same industry, equipped with extensive production capacities and a developed distribution network. Complementarity is not limited to physical resources. For instance, a company can become a takeover target because it has long-standing relationships with customers that the acquirer could use to increase the sales of its product.

In a world without transaction costs, it would be possible for the two firms to reap the benefits of complementary resources without the need to merge - by agreeing to provide access to each other's resources for a fair compensation. However, in the real world, with transaction costs and incomplete contracts, it is often cheaper and more secure to integrate the firms with complementary resources into the command-and-control structure of a single corporation. Achieving a decrease in transaction costs can also motivate vertical mergers and

acquisitions (in a vertical acquisition, a company expands along the industry's value chain by purchasing a supplier or a customer).

2.1.3. Improving efficiency – the bargain theory of mergers

When a company is run inefficiently by its management either because its incompetence or focus on goals other than creating value (e.g. empire-building, private consumption of corporate resources, publicity seeking), other firms can create value for their shareholders by taking over the company and managing the target with a view to value creation. Note that no synergies need to be present in order to create value for the acquirer, the stand-alone value of the target is simply below its potential and such a company can be therefore acquired on the cheap. Therefore, this theory is also sometimes referred to as the “bargain” theory of mergers.

Performance improvements necessary to unleash the value from the target do not need to come about through an acquisition. Any investor can buy the underperforming company and earn a profit by turning it around. However, the underperforming company's competitors are in an especially good position to do this as they have valuable knowledge of the industry operations, business landscape, contacts with customers and the like. Corporations with their easy access to debt financing and ability to issue shares can also acquire companies that are beyond the reach of other investors. Possible synergies then further strengthen the advantage of competitors over other classes of bidders for the underperforming firm.

Through this channel, acquisitions are also seen as one of the core disciplining factors that motivate top managers to act in the interest of the shareholders – that is to maximize the value of the corporation. Whenever the current value of a company significantly trails its potential value, there is a threat that the company will be acquired by a competitor and its top management replaced. On the borderline between the bargain theory and the complementary assets theory lies the case where the improvements can only be achieved by a management team with industry- and region- specific skills – here the acquirer's

management skills and the target company's assets can be interpreted as complementary resources.

2.1.4 Mergers exploiting own stock overvaluation

When we relax the assumption that the market values companies correctly at all times, it is possible for managers to create value for shareholders by making acquisitions paid for by stock when they believe the stock is overvalued. Shleifer and Vishny (2001) present a model of acquisitions motivated by stock market misvaluations. The basic idea is that managers of a company have the best information about its true value. Whenever they believe that the company is overvalued by the market, they can increase the long-term shareholder value by using the overvalued shares as a currency to purchase companies that they perceive as fairly priced in the market. When the market perception of the value of the company falls to reflect the fundamentals, the company's shareholders suffer less than they otherwise would. As Andrade *et al.* (2001) point out, the stock market anticipates this and punishes companies that use own stock to pay for acquisitions².

2.1.5 Achieving market power

Firms can merge in order to gain sufficient scale to achieve market power. Such a company would then be able to capture value from customers through monopoly pricing and from suppliers through increased negotiation power. However, as Andrade *et al.* (2001) point out, the sharpened rules against abuse of market power in the last decades have made it unlikely that a company would succeed in extracting any rents through market power and surely no company would trumpet achieving market power as a reason for merger. Indeed, the suspicion that the combined enterprise could have undue market power can even result in a rejection of the merger by competition authorities. A classical example is the proposed merger of GE and Honeywell, which was marred by the European Commission on anti-competition grounds. Occasionally, the merger is

² See section 4 for details.

given approval on the condition that the merged entity will divest certain specified assets which would enable it to gain market power in some subset of the markets in which it is active.

2.2. Mergers increasing the welfare of the decision makers

The second influential group of theories seeks explanation for merger activity in the personal preferences and incentives of the relevant decision makers. Roll (1986) points out that “*takeovers reflect individual decisions.*” The CEO may seek to increase his own influence, status or paycheck or alternatively aim to protect himself from being replaced as the boss of the organization. Mergers initiated to satisfy the decision makers’ personal preferences may or may not create value for the shareholders of the companies involved. The extent to which such mergers create value is therefore a matter of correct incentives for the managers-agents and falls in the realm of corporate governance theories. For a discussion of the influence of managerial objectives on acquisition decisions, see Mock, Shleifer and Vishny (1990).

2.2.1. Accounting *earnings per share* improvements

Another dubious rationale for mergers and acquisitions, mentioned by Brealey and Myers (2005) and Dobbs et al. (2005) is aiming to increase the earnings per share (EPS). The fact that EPS is a metrics closely watched by analysts and may figure in executives’ incentive schemes could motivate EPS-accretive mergers that create no value or even destroy it.

EPS equals the share price times the inverse of the price earnings ratio. When two firms merge, the combined entity’s price/earnings ratio equals the earnings-weighted average of the P/Es of the original firms. From this it follows that a company can increase its earnings per share simply by issuing shares and exchanging them for shares in a company with a lower price earnings ratio. Earnings per share increase regardless of the value created through the deal³ and

³ As long as the acquirer’s P/E ratio is greater than that of the target, including the acquisition premium

therefore increasing earnings per share is not a valid reason for mergers. The intuition behind this result is that a company with a higher P/E ratio can “buy” more earnings relative to the number of its shares by exchanging its shares for shares of a company with a lower P/E ratio.

Lys and Vincent (1995) provide direct evidence that some companies pursue EPS improvements even when this destroys shareholder value. In their case study they show that AT&T incurred costs estimated to be between \$50 million and \$500 million in order to be able to use the pooling method of accounting instead of the purchase method for its acquisition of NCR. Under the purchase method, AT&T would have to amortize the difference between NCR’s book value and the purchase price. This would decrease accounting measures of profit but leave cash flows unchanged. According to Lys and Vincent, “*AT&T expressed concern that shareholders would misinterpret the decreased earnings under purchase accounting as decreased cash flow, resulting in a lower share price.*” An attempt to boost an accounting measure without any effect on valuation resulted in a relatively large destruction of shareholder value.

2.2.2. The Eat-or-be-eaten theory

The Eat-or-be-eaten theory was introduced by Gorton, Kahl and Rosen in their 2005 working paper. Their paper aims to explain the three stylized facts about mergers: mergers come in waves, acquirer returns are negative on average and there is a strong clustering of mergers in industries that are undergoing a technological or regulatory change. The tendency of mergers to cluster in industries and the need for a theory explaining this observation was also pointed out in Andrade *et al.* (2001). Gorton, Kahl and Rosen assume that profitable acquisition opportunities do exist. Also, managers are assumed to have a preference to avoid their companies being taken over. This is because they would be likely to play subordinated roles in the newly merged entity or would be disposed of entirely. To simplify the reasoning, the authors further suppose that firms can only acquire companies whose market capitalization is lower than their own.

If the motivation of the managers to retain their firms' independence is strong enough, even a single profitable merger opportunity may result in a chain reaction of unprofitable ones. When an event (e.g. a regulatory change) that makes acquisitions profitable occurs, managers of potential takeover targets pursue defensive acquisitions to increase the size of their companies and thus reduce the probability of a takeover. This motive propagates through the industry and induces companies of all sizes to increase their value through mergers – either to defend against the initial value-creating merger or to pre-empt being acquired by another company seeking to protect itself against a takeover. Gorton *et al.* claim that “*the potentially profitable acquisition opportunity for one firm can lead to an ‘eat or be eaten’ merger wave.*” This would explain why firms merge in waves and within industries as well as why mergers would destroy value on average.

2.3. Fallacious rationales for mergers

After looking at the “virtuous” reasons for mergers in section 2.1 and the “vicious” ones in section 2.2, we now turn our attention to the “non-reasons”, that is rationales which are sometimes given to justify a merger, even though they lack merit. Nevertheless, they were claimed as a valid reason for a merger or acquisition frequently enough to warrant exposition in textbooks and articles.

2.3.1. Gaining sufficient size to be included in a major stock index

Goedhart and Huc (2004) point out that executives often admit that their decisions to acquire other companies or dispose of parts of their business is motivated by the desire to get their company included in a major stock index or prevent ejection from such an index. The authors show on a sample of 103 US stocks listed from December 1999, that inclusion of a company in the S&P 500 stock index *did* lead to an increase in its stock price and exclusion caused the stock price to plunge⁴. However, these price movements were only short-lived as the cumulative abnormal returns of the stocks almost entirely vanished within

⁴ Goedhart and Duc used a sample of 103 US stocks listed from December 1999.

two months after the listing or delisting. Goedhart and Huc note that this should be seen as a sign of the efficiency of capital markets because *“the value of stocks is ultimately determined by their cash flow potential and not by membership in major equity indexes.”* The authors draw the conclusion that in the long run no shareholder value is created by membership in a stock index and company executives should avoid mergers and acquisitions aimed at gaining large enough market capitalization to be admitted to the index. Similarly, they should not avoid strategically sound divestitures only to prevent being ejected from an index. Goedhart and Huc add that companies from emerging markets that secure themselves a listing in a major international index might benefit permanently from this inclusion, as it serves as a “seal of quality” and induces interest on the part of analysts and investors in the developed countries.

2.3.2. Diversification

Another of the misleading reasons for mergers is the claim that the newly established company is worth more than the sum of its parts because it is more diversified and therefore carries less risk. In debunking this fallacy, we follow Brealey and Myers (2005). The authors argue that diversification is cheaper for the investors than it is for the company. Even in the absence of the merger, investors have access to a security providing exactly the same risk-return profile as would the shares of the entity created by the merger. This is because the shareholders can replicate the share of the hypothetical merged company by holding a portfolio of shares of the two companies such that the weights of the portfolio correspond to the two companies’ relative market capitalisations. By replacing the two original shares by the share of a new company, a continuum of portfolios with different weights assigned to the two shares is replaced by a single share where the proportion of investments in the two individual parts of the company is fixed. As Brealey and Myers (2005) put it, when the two companies have unique risk-return characteristics, *“the merger curtails investors’ opportunity to custom-tailor their portfolios to their own needs and preferences.”* Because an identical investment opportunity was available before

the merger was completed, it doesn't generate any extra demand for the shares of the new merged entity and their price thus will not rise above the value of the corresponding portfolio of shares of the two original firms.

Further evidence that diversification is not a good reason for mergers is supplied by Berger and Ofek (1995), who found that diversified firms were trading at a 13-15% average discount to what the stand-alone values of their components would be. If conglomerates are undervalued by the markets it doesn't seem to be rational to create more of them through mergers and acquisitions. Nevertheless, diversification could still be rational from the point of view of the acquirer's managers. By decreasing the variance in company performance through diversification, they could limit the probability of extreme negative events – and thus the probability that they will lose their job. Managers are also often remunerated with restricted stock (which they cannot sell for a specified period of time). For them, making acquisitions could be the only way to diversify their personal holdings.

2.3.3. Lower costs of financing

Mergers are sometimes justified by lowering the costs of borrowing to the firm. Brealey and Myers (2005) show that while the combined firm indeed can borrow at lower rates than the two separate firms could, this doesn't create value for the companies' shareholders. This is because after the merger the debt is secured by the assets of both companies and therefore becomes safer for the creditors. Whatever the shareholders of the merged company gain from lower borrowing rates, they lose by offering bondholders better protection and the net gain is zero.

However, Lewellen (1971) showed that under certain conditions the decreased risk of debt of the merged company *can* create value for shareholders. The more debt a company has, the more vulnerable it is to adverse events. If the cash flow falls under some critical value needed to service the debt, the company defaults. This may prevent some firms from taking full advantage of the tax shield. If the cash flows of two merging firms are not perfectly correlated, then

for any given level of debt the probability of default decreases. As we saw in the previous paragraph, this alone is not sufficient to create shareholder value. However, it also means that for any given level of default risk the merged company can have more debt than the companies could have separately. If the managers have a certain maximum acceptable level of risk, the merger would enable them to reach this level of risk with a larger amount of debt – and the larger tax shield would translate into value for shareholders. In Lewellen’s theory, the gains to the shareholders do not come from cheaper financing but from the bigger tax shield enabled by the increased debt capacity.

2.4. Costs of mergers

While mergers and acquisitions can bring about substantial benefits, they are not without costs. The most frequently mentioned costs to the company stem from the diversion of attention of the company management from day-to-day operations to the merger, costs of professional services connected to the execution of the mergers (legal, investment banking and consulting fees) and the losses caused by the implementation of the merger. The last include costs of integrating operations and shared services, costs of eliminating redundancies (severance payments to surplus employees and costs of terminating superfluous contracts), losses due to different corporate cultures and the resulting lower morale and increased turnover of employees or operating errors (incompatibility of systems, non-compliance with newly introduced processes). Brealey and Myers (2005) also use the example of the U.S. auto industry to point out that companies can in fact have more bargaining power *vis a vis* independent suppliers than with “*parts of the corporate family.*” Last but not least, there is the possibility of mergers going too far and producing diseconomies of scale as the companies become too clumsy and management attention too thinly spread.

Mergers and acquisitions can also impose costs on the corporations’ various stakeholders. Whenever a corporation is able to produce and sell the same output with lower costs, it increases the economic value it creates. In a frictionless world, the resources thus freed up would be immediately employed

for other purposes, in reality this is not the case and the costs to stakeholders are real. Because we focus on how mergers and acquisitions affect the value of the companies involved, a detailed discussion of broader social and redistribution effects of M&A, while interesting and important, lies beyond the scope of this thesis.

3. Methodology

The two principal methods that can be used to determine whether a merger has created value or not are discounted cash flow valuation and stock-market event study⁵. In this section we outline the basics of the two methodologies, their advantages and drawbacks. We examine why event study has traditionally been the method of choice in academic examination of mergers and acquisitions. Finally, we specify the methodology we will be using in our two case studies in section 5.

3.1. Discounted cash flow valuation

Discounted cash flow valuation (DCF) is the basic technique of company valuation. Underlying it is the notion that value of every asset, companies included, can be determined by the stream of cash from the asset, adjusted (discounted) for the time until the cash becomes available and the riskiness of the cash flow. The two basic modifications are free cash flow to the firm (FCFF) and free cash flow to equity (FCFE). FCFF discounts the stream of cash available to all suppliers of the firm's capital (both equity and debt) by a weighted average of the cost of debt and cost of equity – the weighted average cost of capital (WACC). The value of equity is then computed by subtracting the value of the company's debt from the total value of the company determined by FCFF. FCFE is used for direct valuation of a firm's equity and involves discounting the cash flows available to equity-holders by the cost of equity. The cost of equity is determined using some of the asset pricing models – most commonly the capital asset pricing model (CAPM). The whole approach is best summarised by the notorious formula

$$V = \sum_{t=1}^{\infty} \frac{CF_t}{(1+r)^t}$$

⁵ Bruner (2001) also lists surveys of executives and accounting studies as further methods of measuring M&A probability. Surveys of executives are marginal and accounting studies usually investigate changes in accounting performance indicators and thus answer slightly different questions.

Where V stands for value, CF_t for cash flow at time t and r is the appropriate discount rate. The discounted cash flow valuation and its variants are exposed in great detail in Brealey and Myers (2006) and especially Koller, Goedhart and Wessels (2005).

In theory, applying discounted cash flow to the valuation of effects of mergers and acquisitions is straightforward. DCF can first be used for valuation of the stand-alone value of the merging firms and then for the valuation of the merged company. The difference between the two is a measure of value destruction or creation in the merger. The changes in cash flows and discount rates, which are responsible for the difference, are a consequence of value creating and destroying effects detailed in section 2.

In practice, the DCF approach has several important drawbacks. For a start, it is laborious. Conducting a DCF valuation requires predicting many variables and functional relationships a long time into the future. A thorough valuation requires predictions of the macroeconomic environment, regulatory framework, consumers' tastes, behaviour of the competition, own company strategy, capital expenditure, debt and dividend policy and possibly many other variables. Second, it is necessarily subjective as the above predictions are influenced by the analyst's biases, decisions as to what information to use in the valuation and perceptions of the relative importance of the numerous factors to the company's future cash flows. As a result, different analysts will arrive at different valuations of the same company. The discounted cash flow valuation is a product of a single person or a small team of people. Consequently, this methodology doesn't make use of the "collective wisdom" of the markets. Third, conducting a DCF valuation requires a good understanding of the company itself, the regulatory and institutional framework within which it operates, its competitors and the workings of the industry. Also, the information needed to carry out an outside-in⁶ valuation simply is not available in many cases.

Compared with the event study method the DCF approach also has two major advantages. First, a correct DCF shows us exactly where the additional

⁶ Outside-in means "based on public information only."

value comes from and how sensitive the result is to various scenarios. However, these advantages are again limited by the knowledge, foresight and biases of the analyst. Second, the DCF approach gives us an estimate of the value of the combined enterprise even when the involved firms are not listed on a public exchange and the market value of their equity is not directly observable. Also, the DCF approach doesn't rely on the assumption of market efficiency. We are able to establish a "fair" value of a company even when the market prices temporarily diverge from the fundamentals – as they did during the late 1990s dotcom bubble, for example.

3.2. Event study methodology

The event study methodology uses the stock-market reaction to various events in order to determine the event's effect on the value of the company. An excellent source on event studies in economics and finance is MacKinlay (1997). In exposing the methodology, we loosely follow the structure of his paper. Brown and Warner (1980, 1985) provide a seminal analysis of statistical shortcomings of the event studies and a good discussion of the merits of the methodology can also be found in Moeller *et al.* (2003) and Andrade *et al.* (2001).

The principle of the methodology is simple: assuming semi-strong market efficiency (markets correctly and immediately react to any public information) we can infer the value effect of an event on a company by observing the reaction of the price of its common equity to the announcement of the event. If an event adds \$200 million to a company's value, we would expect the market capitalization of the firm to increase by the same amount when the event is announced and all uncertainty is resolved.

In practically conducting an event study, we first need to define the event of interest and the event window (the period of time over which the reaction of the firm's price to the event is investigated.) The effect of the event is measured by the abnormal returns, which are defined by MacKinlay (1997) as "*the actual ex post return of the security over the event window minus the normal return of*

the firm over the event window,” where under normal returns we understand the returns we would expect if the event had not taken place.

The simplest model for determining the normal returns is the *constant mean return model*:

$$R_t = \mu + \xi_t$$

where μ is the constant mean return and ξ_t is the time t random term which is assumed to be normally distributed with zero mean and a known variance. The error term is further assumed to be independently and identically distributed across time. The main drawback of the constant mean return model is that it does in no way attempt to separate systematic (market-wide) and specific risk. By eliminating the market-wide risk from the abnormal returns we would decrease their variance. This, in turn, would make it easier to discern any extraordinary returns connected to the event under investigation.

This problem is addressed by the most widely used model of normal returns - the *market model*:

$$R_t = \alpha + \beta R_{M_t} + \varepsilon_t$$

where ε is the error term with identical distributional properties as in the constant mean return model, α and β are model coefficients and R_{M_t} is the return of a selected broad-based index at time t . The parameters of the model are estimated over a period preceding the event period (the “estimation period”) so that they are not influenced by the returns caused by the event.

A special version of the market model is the *index model* or *market-adjusted return model* in which the alpha coefficient is restricted to zero and the beta coefficient to one. Abnormal returns are then equal to the company’s overperformance of the selected market index. The index model has an advantage in that we do not need a period of observable returns prior to the event in order to estimate the model parameters. This is convenient especially in studies of initial public offerings.

The *factor models* attempt to reduce the residual variance yet further by including additional factors (e.g. interest rates, oil price or index of consumer

sentiment) into the regression. However, MacKinlay points out that “*Generally, the gains from employing multifactor models for event studies are limited.*” Also, the availability of data is a much more serious issue for the factor model than the market model. In applied work, the factor model is rarely used⁷. From here on, we will be using the market model in our exposition of the methodology.

The models discussed above belong to the family of statistical models – they rest entirely on statistical assumptions about the distribution of returns and are not grounded in economic theory. Economic models, such as the Capital Asset Pricing Model or the Arbitrage Pricing Theory still require us to make statistical assumptions but impose a more rigorous structure on the returns. However, due to concerns that the CAPM model doesn’t stand to empirical testing and its use may introduce a bias into the results, market model is used in most cases.

We now turn to the statistical properties of the abnormal returns. In event studies, we are testing the null hypothesis that the event of our interest has no effect on the value of the company - that is, no abnormal returns are associated with the event. To carry out the test, we need to know the distribution of abnormal returns under the null hypothesis. As mentioned above, abnormal returns are the actual returns minus the returns predicted by the normal returns model. From the equation

$$AR_t = R_t - \hat{\alpha} - \hat{\beta}R_{Mt}$$

where $\hat{\alpha}$ and $\hat{\beta}$ are estimation period market model coefficient estimates, it is apparent that the abnormal returns at time t are equal to the time t residual of the market model. It follows that under the null hypothesis, the abnormal returns are normally distributed with zero mean and asymptotic⁸ variance of σ_ϵ^2 . The

⁷ Loughran and Vih (1997) is an exception, the authors use a two-factor model inspired by Fama and French (1992). The two factors included are book to market ratio and size.

⁸ The small-sample formula for variance of abnormal returns is $\sigma_\epsilon^2 + \frac{1}{L} \left[1 + \frac{(R_M - \mu_M)^2}{\hat{\sigma}_M^2} \right]$ where L is the length of the estimation period, μ_m is the average return of the market and $\hat{\sigma}_M^2$ is the sample variance of market returns during the estimation period. The second term approaches zero as the length of the estimation period increases. See MacKinlay (1997)

variance of the error term can be determined from estimation period data – we denote it $\hat{\sigma}_\varepsilon^2$. The test statistic is computed as $\frac{AR_t}{\hat{\sigma}_\varepsilon}$ and under the null hypothesis it is t-distributed with n-2 degrees of freedom, where n is the number of days in the estimation period⁹ (that is, the number of days used to estimate the market model and the variance of the error term). For large values of n the t-distribution can be approximated by the standard normal distribution.

The above discussion naturally extends to event periods of longer duration. First, we define the cumulative abnormal returns over a period of time as the sum of the abnormal returns over this period.

$$CAR_{t_1 t_2} = \sum_{t=t_1}^{t_2} AR_t$$

Thanks to the intertemporal independence of the market model errors, the asymptotic variance of the cumulative abnormal returns is equal to the sum of variances of the abnormal returns over which we aggregate. From this it follows that the standard error of cumulative abnormal returns over a period of length n is $\sqrt{n}\sigma_\varepsilon$. The test statistic is then formed by dividing the cumulative abnormal returns by the empirical standard deviation multiplied by the square-root of the number of days included in the CARs. For the two-sided alternative hypothesis $H_1: CAR_{t_1 t_2} \neq 0$ we consider the abnormal returns to be statistically significant at the 10% level when the absolute value of the t-statistic exceeds 1.64 and at the 5% level for absolute values of the t-statistic in excess of 1.96.

In event studies of sample size larger than one the assumption that the event windows of the companies included in the study do not overlap is added. This guarantees that abnormal returns are independent across securities. Abnormal returns are averaged over the N companies for every period¹⁰ t and cumulative abnormal returns are computed by summing these average abnormal returns.¹¹ That is:

⁹ This follows from Section 3.3 of Brown, Warner (1985)

¹⁰ We are using event time. That is, t denotes the number of periods since the event.

¹¹ MacKinlay (1997) points out that we can equivalently compute each company's cumulative abnormal returns and then average these CARs.

$$\overline{AR}_t = \frac{1}{N} \sum_{i=1}^N AR_{it} \quad \text{and} \quad \overline{CAR}(t_1, t_2) = \sum_{t=t_1}^{t_2} \overline{AR}_t$$

The test statistic is again formed by dividing the cumulative abnormal returns by the estimation period standard error¹². As the number of companies included and the length of the estimation window increase without bounds, the resulting t-statistic asymptotically assumes a standard normal distribution.

The statistical assumptions were thoroughly examined in two papers by Brown and Warner (1980 and 1985). Using a simulation in which they randomly chose companies and then randomly assigned each security an event date, they investigate the distributional properties of the abnormal returns. The authors' main finding is that the abnormal returns of a single security are not normally distributed¹³. This would imply that the test statistic is not t-distributed and would not enable us to reliably infer the effects of events on security prices.

However, due to the central limit theorem this problem largely disappears for samples of as few as five companies. Brown and Warner find that even in the presence of clustering (overlap of event windows) tests with such a small sample typically have the appropriate probability of the Type I error. For single company studies the t-values have to be seen as an approximation only. In our case studies we examine to what extent this approximation is an accurate one. Fortunately, as we shall see, even for single-company studies the t-statistic is a reasonable choice to determine whether the abnormal returns are statistically significant or not.

¹² The variance of the average CAR is equal to $\frac{1}{N^2} \sum_{i=1}^N \sigma_i^2 (t_2 - t_1 + 1)$ where N is the number of securities, t_1 the beginning and t_2 the end of the estimation period. For practical purposes we can compute it from the empirical variances of the individual securities. This formula also demonstrates a well-known advantage of larger samples – the variance decreases linearly with increasing number of companies, making it easier to discern any event-related abnormal returns.

¹³ This was not a surprising finding. Already Fama *et al.* (1969) note that “the distributions of the estimated residuals have much longer tails than the Gaussian.”

3.2.1. Evaluation of the event study methodology

The main allure of the case study methodology is the limited amount of data necessary. In principle, it is sufficient to know the date of the relevant event and the price of the firm's shares during some period surrounding the event. This stands in sharp contrast to the vast informational requirements of the discounted cash flow approach. Also, no particular knowledge of the company is required. The relative ease of obtaining information makes the event study methodology suitable for conducting large sample studies. Through averaging the response of many different companies to the same type of event we are able to make statistically sound conclusions about the effect of this type of event.

On the other hand, the event study methodology has some serious shortcomings. Obviously, it cannot be used for companies that are not listed on a public stock exchange. This limits the relevance of the results to listed companies and to the extent that their characteristics (e.g. size, separation of management and ownership, etc.) differ from unlisted companies, the results are also conditional on the characteristics of the listed companies. Secondly, even for listed companies we are critically dependent on the assumption of semi-strong market efficiency – if we do not believe that the stock market immediately and correctly reacts to new events then the event methodology cannot tell us anything useful. Another assumption implicit in the methodology is that the event in question is surprising. If the event were expected, part of the movement related to the event would already be included in the share price. At the extreme, the event may already be fully included in the share price by the time it becomes public if sufficiently large group of investors has prior access to the information – as when the news leaks out prior to the official announcement date or there is significant insider trading based on the information. In such a case we would observe no abnormal reaction of the stock to the event announcement even if the value effect were in fact substantial.

Other events occurring during the event period can seriously contaminate the results. The shortest interval for which share prices are typically available is one day. If there are multiple events on this day (e.g. announcement of a merger

and earnings announcement) there is no way for us to separate the effect of the individual events. Ascribing all of the abnormal returns to the event of interest can then lead either to an over- or underestimation of its value effects, depending on the effect of the contaminating events. Finally, the event study methodology is something of a black box. The input is an event and the output the reaction of the share. The methodology enables us to ascertain *whether* the event creates value but gives us no hints as to *why* it is so.

One special issue pertains to long-term event studies. The estimate of abnormal returns is only as good as the model that generates the normal returns and there are reasons to believe that over longer periods the models are flawed. For a start, even small errors in parameter estimation can significantly influence the results if they are aggregated over long periods of time. It is also not likely that the parameters will remain stable for a very long time. Different model specifications will lead to widely diverging estimates of normal returns. As Andrade (2001) concludes: *“If long-term expected returns can only be roughly estimated, then estimates of long-term abnormal returns are necessarily imprecise.”* This issue, sometimes called the “bad model” problem is not present when the event period is short. Expected returns over periods of several days are close to zero for nearly all models.

3.2.2. Discounted cash flow vs. event studies

The literature on value creation in mergers and acquisitions focuses almost exclusively on the event-study method. In fact, of the papers listed in the references only Kaplan *et al.* (1997) use a variant of discounted cash flow valuation and then only as a supplement to the event study methodology. We can only conjecture why this is the case. The easiness of conducting event studies relative to DCF valuations and their applicability to large samples are certainly a major and valid factor. Admittedly, a large-sample study using DCF is hard to imagine. Another reason may be the apparent objectivity of the event study methodology in contrast with the subjective and assumptions-driven DCF approach. However, mergers and acquisitions are mostly long and complicated

transactions that involve multiple events. As we shall see in our case studies, selecting a specific methodology, defining the event period, choosing events to be included in the investigation and interpreting the events also introduces a considerable degree of subjectivity into event studies. Note that this would not be a problem in the case of simple, one-off events such as earnings announcements.

Finally, the choice may be cultural with DCF seen as a tool employed on a daily basis by the financial industry and not “scientific” enough.

3.2.3. Other applications of the event study methodology

Mergers and acquisitions are not the sole area to which the event study methodology has been applied. In this subsection we briefly review several of them to illustrate the scope for the use of event studies.

In a classical study Fama *et al.* (1969) used event study to examine the effects of stock splits on the value of the firm. Importantly, the authors find that “*regressions of security returns on market returns over time are a satisfactory method of abstracting from the effects of general market conditions on the monthly rates of return of the individual securities,*” and then go on to conclude the stock market is “efficient” in that it incorporates new information almost immediately.

Keown and Pinkerton (1981) use the event-study methodology to investigate whether the information about a merger leaks to the market prior to the merger announcement date. The authors survey the abnormal returns of stocks of takeover targets. Keown and Pinkerton conclude that the positive cumulative abnormal returns during the twelve days prior to the merger announcement are a result of insider trading and information leaks. From near-zero abnormal returns during the ten-day period following the announcement the authors infer that the semi-strong form of market efficiency holds, as the “*market reaction to the new public information is complete by the day after the announcement.*”

MacKinlay (1997) conducts an event study focused on the value effect of earnings announcements that either exceed or lag behind the expectations. Using

600 event observations and both the market and constant mean model, MacKinlay demonstrates that abnormal returns are positive and highly statistically significant upon announcement of good results and react strongly negatively to bad news. He also suggests that to some extent the market gradually learns about the forthcoming announcement and that the results generated by the market model are consistent with those from the constant mean model.

MacKinlay quotes issues of new debt or equity, announcements of macroeconomic variables such as trade deficit and surveys of the impact on the value of a firm of a change in regulatory environment as further examples of the application of the event study methodology.

3.3. Methodologies used in the case studies

In this section we outline the methodology we will be using in our two case studies in the following sections. As we shall see in section 5.1., the most common normal returns model in case studies of this kind is the market model. Together with its clarity, simplicity and widespread use in large-sample studies the market model is an obvious choice for us as well. We set the length of the estimation period to 200 trading days. This choice enables us to approximate the distribution of the t-statistic under the null hypothesis by the normal distribution.

Harris (1983) also suggests using the $\alpha=0$ & $\beta=1$ specification of the market model as well as comparing the performance of the companies under survey to performance of other companies in the same industry in order to test the robustness of the results. In our first case study we follow Harris's first advice and in both studies we include a graphical comparison of performance against the industry.

In deciding on the length of the event window, we are facing a tradeoff. If we select too short a window, we might miss the effect of the event if we are not able to locate the time when the information reached the markets precisely enough. On the other hand selecting a long window increases the standard deviation of normal returns that can be expected during this period and makes it

more difficult to discern the effect of the event – which is demonstrated by a reduction in the t-statistic. We decide to set the length of the event period to three days – the day on which the event is reported and the two days surrounding it. By including the day prior to the announcement of the event we account for the possible delay between the arrival of the information to the market and its publication in our sources. To prevent missing the effect of events which were announced after the end of trading hours, we also include the day which follows the announcement date. The studies quoted in section 3.2.3. show that by the end of the day following the announcement the events should be already fully priced into the securities. Using only one day prior to the announcement date could cause us to miss the slow build up of abnormal returns connected to gradual leaks of information and insider trading. However, these effects are likely to be small and we would not be able to discern them from the normal movements in the share price. The three-day event window appears to be a reasonable compromise.

Table 3.1: Summary of methodology used in the case studies

Market model	Estimation period	Event window	Standard deviation	t-statistic
$R_t = \alpha + \beta R_{Mt} + \varepsilon_t$	200 trading days	3 days	$\sqrt{\frac{\sum_{t=1}^T (AR_t - \overline{AR})^2}{T-1}}$	$\frac{CAR}{\sqrt{3}SD}$

4. Review of large-sample studies

In this section we review the results of existing research of value creation in mergers. We introduce three recent papers – two large-sample studies and one summary study. These three papers are representative of the current state of the M&A literature and together they confirm the conclusions of research from previous decades – shareholders of target companies profit significantly from the mergers, bidders sometimes lose and sometimes gain and the aggregate value effect of the merger is difficult to measure.

As part of their primer on the economics of mergers and acquisitions, Andrade *et al.* (2001) carry out an analysis of about 4300 takeovers that took place between 1973 and 1998. The authors employ the two most common event periods, a three-day window surrounding the merger announcement and a longer period starting several days prior to the announcement and lasting until the completion of the transaction. Andrade *et al.* voice a strong preference for using shorter event windows, citing the bad model problem and low statistical precision of the long-window studies as reasons.

Over the three-day announcement period the share price of the target jumped on average by 16%. When the longer period is used, this figure increases to 23.8% and even in spite of the greater length of the event period remains statistically significant at the five percent level. This is evidence both that takeover targets gain and that we are missing nearly 50% of the value created for them by opting for the shorter event window. On average, acquirers lose 0.7% when the three-day window is used and 3.8% when we consider abnormal returns until the completion of the merger. However, neither of the losses is statistically significant. The total value effect for both bidder and target is then 1.8% and 1.9% respectively, with only the value for the shorter event window statistically significant. This study also illustrates an additional problem in estimating merger gains – the “size effect.” The acquiring company is usually much larger than its target. In Andrade’s sample, the median size of the target is just 11.7% of the value of the bidder. For any given dollar value gain or loss, the reaction of stocks measured in *percent* will be much higher for the target than for

the bidder. Even very large percentage gains for acquired companies can be swamped by minor percentage losses of acquirers. Worse, the small percentage changes in acquirer's value are hard to discern from random movements in the stock price which are not related to the event. As a result, we are usually able to estimate the gains to the target much more precisely than the gains to the bidder and, by implication, the overall gains from the merger.

The authors further find that mergers which are financed by cash bring higher returns to both bidders and targets. They argue that a stock-financed merger really consists of two events – a cash takeover and a seasoned stock offering. The stock market traditionally reacts negatively to news of new share issues by established companies, as investors believe that managers issue stocks at times when they believe the shares are overvalued¹⁴. Total abnormal returns for the three-day period surrounding the merger announcement are 3.6% for cash-financed takeovers and 0.6% for mergers paid for by stocks.

In sum, Andrade, Mitchell and Stafford show that mergers are good for the targets, neutral to slightly negative for the bidders and weakly beneficial overall.

These results are complemented by the findings of Moeller *et al.* (2003). Their study surveys a broader sample of 12,023 transactions¹⁵ and focuses exclusively on the effects on the acquiring firms (that is, gains or losses to targets lie outside the scope of the study). The conclusion of the paper is that while on average a merger announcement leads to a statistically significant value gain for acquiring firms of 1.1%, the aggregate value effect of mergers on the acquirers is *negative*. This is because the profitability of mergers is negatively correlated with the size of the acquirer. In monetary terms, large acquirer's small

¹⁴ Further evidence on this theory comes from Moeller et al. (2003). The authors state that they "...cannot exclude that the abnormal return associated with an equity-financed acquisition of a public firm is roughly equal to the abnormal return associated with a cash-financed acquisition plus the abnormal return associated with an equity issue."

¹⁵ The authors are using a 200-day estimation period, 3-day event window and the traditional market model – essentially a methodology identical to that employed in our case studies in the following section. The fact that the methodology was used in a very recent working paper of the National Bureau of Economic Analysis gives us some confidence that it is not outdated.

percentage losses outweigh the gains by small acquirers. This difference in performance between acquirers of different sizes persists even when the authors control for other variables that could influence the gains from merger and be correlated with acquirer's size. The authors' conclusion is an interesting one – mergers do create value for small acquirers and destroy it for the large ones. Moeller, Schlingemann and Stultz conjecture that poor acquisition decisions are caused by agency problems in large firms. In any case, the paper highlights the perils of averaging *percentage* abnormal returns without regard for the distribution of these abnormal returns over companies of different sizes.

Finally, Robert Bruner's 2001 paper "Does M&A Pay" attempts to consolidate the results of past research and reviews 128 scientific studies¹⁶ published from the 1970s till 2001. Bruner's metastudy resoundingly confirms that mergers do create value for the target firm. Of the 20 large-sample event studies that Bruner includes in his list, all twenty led to statistically significant average value creation for targets ranging from 7.45% to 40.3%. The sample sizes of the studies varied from 27 to 704, they were carried over nearly three decades and the length of the event window ranged from one-day to 1252 days. In spite of such variance in time, methodology and sample size, all studies came to the same conclusion – shareholders of target companies are big winners.

The evidence on returns to acquirers is much more mixed. Bruner identified 20 studies reporting negative returns to acquirers and 23 studies concluding that acquirers gain or their value doesn't change. In only about one half of these studies are the results statistically significant and the absolute value of the percentage gains and losses is much smaller than in the case of target firms and goes from -3.9% to 6.66%. This can again be a manifestation of the size effect or it can simply mean that mergers do not create (or destroy) much value for the buying company. Just as in Andrade's and Moeller's study, the conclusion is that determining gains for bidders is difficult and the results equivocal.

¹⁶ These 128 studies include event studies, case studies, accounting studies and surveys of executives.

Of the twenty studies measuring returns both to shareholders of the bidder and the target, only one concludes that they are negative. One study estimates the combined value effect to be neutral and the remaining 18 studies report *positive* combined returns to acquirers and the acquired. In eleven cases these positive returns are statistically significant and reach up to 11.3% of the combined value of the two companies involved in the transaction. The large-sample studies we surveyed consistently point to three conclusions:

- 1) Mergers create value for takeover targets.
- 2) Some acquirers gain and some lose, determining acquirer's gains is difficult due to the size effect.
- 3) For the two firms combined, mergers most likely create value.

5. Case studies

The main purpose of the case studies is to illustrate the use of the methodologies developed in the third section and enable us to better understand their relevance when applied in large sample studies. In particular, we question the assumption that all the relevant information concerning value creation or destruction in a merger is included in abnormal returns during a short period of time surrounding the official announcement of the merger, or any other single event. In nearly every merger, there are rumours, confirmations of negotiation, bids, rejections, verdicts of regulators and other events that increase or decrease the probability of a successful consummation of the transaction. As a consequence we are likely to miss a large part of the merger gains by focusing on just one of the events. Furthermore, we argue that the second commonly used method of measuring abnormal returns over the whole period from first rumours of the takeover until its completion is flawed as well. Especially if these events occur over a long period of time, even substantial takeover-related abnormal returns will be hard to distinguish from abnormal returns unrelated to the merger. Unrelated events may distort the estimate of the value effect of the takeover and the results can be downright misleading. Consequently, we also examine the results of measuring abnormal returns in *short event windows* around *all* the merger-related events. We hope that the two case studies and a detailed analysis of three previously published papers will enable us to evaluate the real-life usefulness and limitations of the methodologies. We then discuss what our findings mean for the results of large-sample M&A event studies. We use the case studies to test the following two hypotheses:

- i) Using a short event period around merger announcement, as is customary in event studies, causes us to miss a significant portion of the market response to the takeover.
- ii) Using long event periods makes it difficult to discern the market response to the takeover from unrelated movements in the share price. This is demonstrated by the low statistical significance of the abnormal returns.

We also use the case studies as supplementary evidence on the hypothesis that mergers create value and that the takeover targets are the greatest beneficiaries of the deal. However, we are aware that a sample of size two can only be used to illustrate, not to prove.

An illustration can help to properly explain the shortcomings of the two common methodologies used in large-sample studies and the reasoning behind our hypotheses.

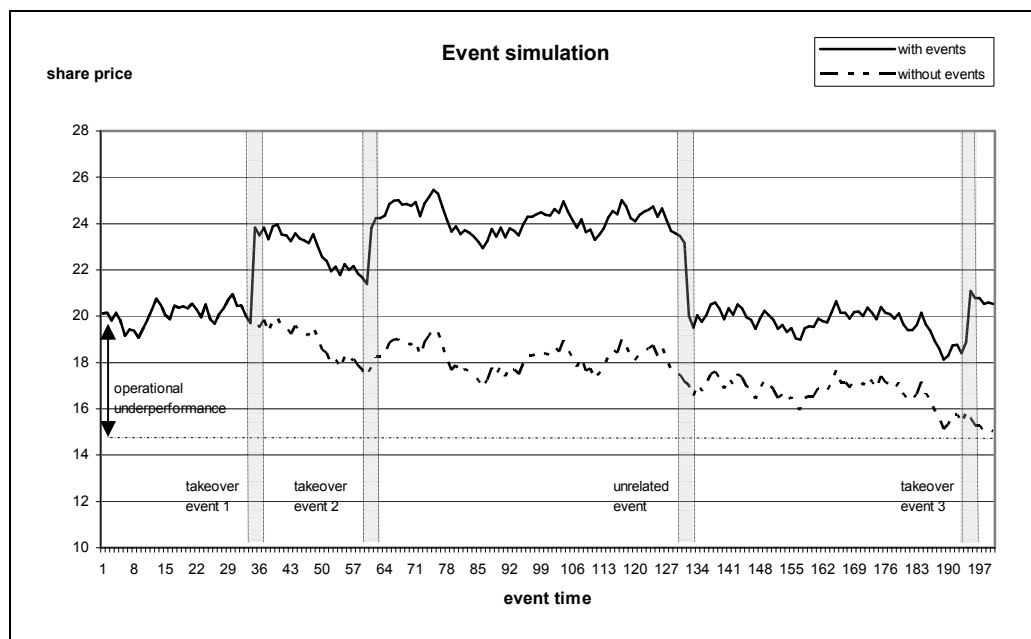
The graph on the following page shows a theoretical and simplified¹⁷ case where a company experiences three event-related events over a period of one year, each of these increasing the probability of a takeover (say, event 1 = announcement of a bid and its immediate rejection, event 2 = increase of the bid and its immediate acceptance and event 3 = approval of the merger by a regulator and its consummation) and one adverse event unrelated to the merger (e.g. fire in a production plant, loss of a lawsuit). Assume that all events come as a complete surprise and the stock market reaction accurately reflects the implications of the event for the value of the stock. Further assume that due to operational underperformance, the company's share would lose value and underperform the relevant benchmark over the period under investigation in the absence of the events.

Choosing a single event (the choice would typically be the first announcement of the merger – event 1) only captures a fraction of the total value effect of the merger (which is equal to the sum of reactions to the three events). On the other hand, measuring abnormal returns over the whole period between the first merger announcement and the completion of the deal would not enable us to distinguish merger-related abnormal returns from random movements in the share price. The share price at the end of the period is nearly identical to the starting price and we could not reject the null hypothesis that the merger had no effect on the value of the company, even though it is patently false. Worse, we would also ascribe the abnormal returns associated with the unrelated event and

¹⁷ The returns on the “share” in the graph were randomly generated with a downward drift. Events were then arbitrarily inserted. The graph serves as an illustration only.

the abnormal returns that are due to poor operational performance of the company to the merger. In this ideal case, the correct solution would be to sum the abnormal returns from short announcement windows around the merger-related events. In reality, this would not be entirely precise because the events are not completely surprising (expectation of the event may already be included in the share price) and we are not always able to identify all events related to the merger. Still, focusing on multiple short windows would be an improvement.

Chart 5.1 Event simulation



Source: author's simulation

5.1. Survey of published case studies

In this section, we shall review in detail the methodology and results of three takeover case studies, published in prestigious refereed journals¹⁸. The main aim of this section is to highlight interesting results and justify the models, procedures and test statistics used in our two case studies. In a separate section we look at what the results of these studies mean for our hypotheses. Given that

¹⁸ For the period of 1981-2003, Thomson's Journal Performance Indicators list the *Journal of Financial Economics* and the *Journal of Finance* as first and second respectively (as measured by the impact factor) among finance and business journals, with the ranking of the two reversed for the 1999-2003 sub period.

this discussion is missing in the original papers, we may consider it our own modest contribution.

5.1.1. Cities Service Takeover

The oldest paper, Richard S. Ruback's "The Cities Service Takeover: A Case Study" – published in the *Journal of Finance* in 1983 aims to examine the stock market reaction to events prior to the merger of Cities Service, a U.S. based energy company, and Occidental Petroleum Corporation, a U.S. petroleum exploration and development corporation. Ruback's goal in conducting the study is to "*demonstrate the extent to which empirical results of the prior [large sample] studies can be used to forecast the market reaction to takeover announcements,*"¹⁹ and to "*provide a detailed examination of the stock market response to the variety of events that precede the takeover.*" The main distinctive feature of this particular merger is an involvement of a total of four companies, resulting in a series of friendly and hostile bids, counter bids, targeted repurchases and standstill agreements. This enables Ruback to study 14 events over the period of three months from May to August 1982. Ruback employs a market model estimated over a period of ten months preceding the first event. Statistical significance of the event day abnormal returns is measured using the t-statistic introduced in section 3.2 with the variance of abnormal returns calculated from the residual variance of the market model over the estimation period. The author aggregates the abnormal returns over the whole period from the first leaked information until the completion of the merger and computes the abnormal equity value change by multiplying the company's equity value before the start of its event period by the cumulative abnormal return over the event period. The target's share price shows a cumulative abnormal return of 12.45% and a corresponding value gain of \$352 million and the acquirer posts a negative CAR of 5.9% and a value loss of \$64 million. Ruback's case thus study solidifies

¹⁹ Note that of all the case studies presented in this section, the aim of Richard Ruback's investigation of the Cities Services takeover most closely matches our goals. Unfortunately, Ruback provides no discussion of the implications of his study for the large sample studies.

the conventional wisdom: the merger creates value, the acquirer slightly overpays and the target company is the winner of the transaction²⁰.

5.1.2. NCR Takeover

Lys and Vincent (1995) carried out a case study of the takeover of NCR, a computer manufacturer by AT&T, a telecommunications company seeking to enhance its presence in the computer business. The stated aim of the authors was to find out why AT&T's management pursued the acquisition in spite of negative reactions of both the target's management and the stock market. Lys and Vincent conclude that this was due to a combination of hubris, managerialism²¹ and the escalation of commitment. The methodology used is essentially the same as in Ruback (1983). The same specification of the model and the same t-statistic are used. Unlike Ruback, Lys and Vincent also use the t-statistic to test for the significance of multi-day events. The t-statistic then takes the form of the sum of the t-statistics for the days in question divided by the square root of the number of days. Depending on whether abnormal returns are computed for all days in the event period or event-days only, the loss to AT&T's shareholders is estimated between \$3.9 billion and \$6.5 billion and NCR's wealth gain is approximately \$3.5 billion in both cases, implying value destruction of between \$0.4 billion and \$3 billion respectively. Most interestingly, the authors have shown that AT&T's managers have paid at least \$50 million and perhaps as much as \$500 million to prevent an accounting dilution of earnings per share, even though this would have no impact on the cash flows²². This constitutes direct evidence that managers were ready to damage value of the company to enhance a purely accounting measure.

²⁰ The only anomaly is a major loss suffered by one of the unsuccessful suitors, Gulf Oil, which is a consequence of a large fine for breach of merger agreements.

²¹ Managerialism is defined as "operating the firm for the benefit of managers, pursuing objectives attractive to the management team but which are not necessarily beneficial to the shareholders." Source: <http://www.lse.co.uk>

²² AT&T's willingness to pay for improvement of EPS is discussed in more detail in section 2.2.1.

5.1.3. Volvo/Renault Proposed Merger

Bruner's 1999 study "An analysis of value destruction and recovery in the alliance and proposed merger of Volvo and Renault" is notable for the length of the event period (5 years) and the fact that the merger didn't happen in the end. Bruner's goal is to explain the sources of market's negative reaction to the news of Volvo and Renault's plans to move from an alliance to a merger and the positive reaction to institutional opposition to this act. Bruner traces the market's appreciation of the merger as value-destroying to hubris, managerialism, escalation of commitment and path dependence.

The methodology of Bruner's paper is slightly different from the previous two studies. First, Bruner only considers abnormal returns of one of the two companies involved (Volvo). Second, instead of the market model, a simpler way of determining abnormal returns is used. Volvo's market adjusted return is calculated as the return on the Volvo share minus the return on a value-weighted index of all stocks listed on the Stockholm Stock Exchange. This seems reasonable, because the parameters of the market model are unlikely to remain stable over the extremely long event period. However, the author doesn't provide any justification for the model he uses so we can only guess whether this was his motive. As a consequence of the model choice, the estimation period only serves to ascertain sample standard deviation of abnormal returns which is then used in to compute the t-statistic.

5.1.4. Cameron Industries Takeover

Kaplan, Mitchell and Wruck (1997) used clinical study as a method to look for sources of value creation or destruction in mergers. They use primarily non-public company financial data and interviews with managers involved in the transaction. The two companies to be analyzed were largely determined by the availability of such data and the willingness of managers to discuss the merger²³. The authors first used three- and eleven-day windows around the merger

²³ The authors explicitly list "geographical proximity and school connection to executives of the acquirer" as selection criteria.

announcement date to determine the market's estimate of value created/destroyed by the merger. In the case of the 1989 Cooper Industries' acquisition of Cameron Iron Works (CC), the initial stock market reaction was significantly positive, the 1990 Premarkis takeover of Florida Tiles (PF) caused a highly negative market reaction. Cooper divested the Cameron unit five years later. The authors used the value of the unit upon divestment, cash flows from the five years of Cooper's Cameron ownership and several gross assumptions to estimate that in spite of the positive stock market reaction to the merger announcement the transaction in fact destroyed approximately \$500 million of value. That equals nearly 60% of Cameron's pre-merger market capitalization, which suggests value destruction of epic proportions.

The management of Premarkis has withdrawn its support during the course of the study. The authors attempted to assess the effect on value using external sources only but they fail to present any conclusive evidence.

Kaplan et al. conclude that in both cases value destruction was caused by a lack of understanding of target's business by the acquirer, inappropriate management incentives and inappropriate organizational design imposed on the target. This paper has two important implications for us – first, even with access to companies' executives and internal data, determining the value created or destroyed by the merger is difficult and imprecise. Second, as the Cooper Cameron case showed, positive stock-market reaction to merger announcement doesn't necessarily translate into value creation. Note that this doesn't mean that the market was wrong – the expectation that the merger will create value might have been correct and the subsequent development could have been merely a realization of an unfavourable event with a low probability of occurring.

5.1.5. Summary and implications

The methodologies used in the four case studies are very simple²⁴. In all cases, a model of the form $R_{jt} = \alpha_j + \beta_j R_{Mt} + \varepsilon_t$ is used. Bruner's case study

²⁴ In fact, some papers concerned with estimating value creation by companies make do with even simpler methodology. Dial and Murphy (1995) investigate the effect on value of

assumes that normal returns are equal to returns of the market index (and thus fixes α to equal 0 and β to equal 1). In all remaining studies, the model coefficients are estimated by ordinary least squares regression. None of the studies test the structural stability of the market model (that is, whether the market model coefficients are constant over the estimation period). All case studies use the t-statistic to determine whether the abnormal returns are statistically significant but none of them tests whether they are actually t-distributed under the null hypothesis. There is no clear pattern of value creation or destruction in the case studies. Only Ruback's result matches the stylized facts (mergers create value, no effect or gain for bidder and a large gain for the target), while Lys and Vincent confirm that value is channeled to target's shareholders. However, both Bruner (1999) and Lys and Vincent (1995) intentionally chose high-profile cases of value destruction, so this should come as no surprise and doesn't constitute evidence against the results of the large-sample studies.

Basic information about the studies is summarized in the table below.

Table 5.1 Summary of published case studies

study	normal returns model	estimation period	event period	no. of events
<i>Ruback (1983)</i>	market model	506 days	3 months	14
<i>Lys, Vincent (1995)</i>	market model	1 year	10 months	13
<i>Bruner (1999)</i>	index model	202 days	5 years	48

study	event window	value bidder	value target	value combined
<i>Ruback (1983)</i>	1 day	0	+	+
<i>Lys, Vincent (1995)</i>	2 days	-	+	-
<i>Bruner (1999)</i>	2 days	n/a	n/a	n/a

We now turn to the implications of the studies for our hypotheses and large-sample studies²⁵. Lys and Vincent (1995) is perfectly consistent with both our hypotheses. The cumulative abnormal return over the whole trading period is

introducing a controversial management incentive system at General Dynamics. To demonstrate the value created, they simply state the returns to shareholders for the given period, without statistical testing or controlling for the returns of a broad market index.

²⁵ Note that with the exception of Ruback (1983), looking for the implications of case studies for large-sample research was not the aim of the authors. The authors (including Ruback) do not analyse and comment on these implications.

not statistically significant. When only event days are considered, the cumulative abnormal returns become highly significant due to the reduction in the standard error. Focusing on any single event, as is common for large-sample studies, would lead to an underestimation of the merger effect. Even the largest single-event abnormal return only accounts for about 40% of the total value change that can be ascribed to the merger.

Ruback's Cities Service takeover study includes a series of bids and retractions of bids by companies other than the eventual acquirer. We see the share price increase in response to new bids and higher probability of takeover and *vice versa*. In this case, focusing on a single event (takeover announcement by the eventual acquirer and his tender offer two days later) actually leads to a *higher* estimate of value created for the target's shareholders than focusing on multiple events would suggest. Upon closer inspection we discover that several days later another competitor ruled out its interest in Cities Services and the share price of CS fell sharply. This suggests that part of the previous increase reflected an increased probability of a takeover battle. A stronger reaction to a single event than to the sum of all merger-related events is evidence *against* our first hypothesis and highlights a factor that we omitted when we formulated it. Still, this would be consistent with a weaker hypothesis that single-event studies provide a distorted estimate of value creation. Ruback doesn't report statistical significance of his estimates of value creation for the whole 3-month event period and so doesn't make it possible to pass judgment on our second hypothesis.

The extreme length of the Volvo/Renault case highlights the relevance and validity of the second hypothesis. Even though the five-year event period is divided into five sub periods, they remain too long for the cumulative abnormal returns over these periods to have much connection to the value created in the merger. For example during the first sub period, the sum of abnormal returns from three events related to merger is 11.27% and significant with a t-statistic of 4.27. However, the cumulative abnormal returns over the whole sub period are

-18.15% and insignificant with a t-statistic of -1.06²⁶. The interpretation is straightforward – while the news of the alliance were seen as positive and the alliance as value creating, other events which happened over the ten-month period and were unrelated to the alliance destroyed value. Ascribing all the cumulative abnormal results within this period to the alliance would be misleading not only with respect to the *magnitude* but also to the *direction* of the value effect of the alliance. Furthermore, in none of the sub periods (much less the whole event period) is there an event that would on its own explain all of the event-related abnormal returns within that sub period. This is compatible with the first hypothesis.

In sum, two of the three studies were consistent with our hypotheses while the third provided evidence in favour of a weaker version of the first hypothesis and didn't allow us to pass judgment on the second hypothesis.

5.2. Criteria for the selection of case studies

Choosing case studies to be included in a paper is always somewhat arbitrary. The two mergers analysed in this thesis were selected because of a combination of objective criteria, data availability and, admittedly, the author's personal preferences. While it would be very interesting to dissect a merger involving Czech companies, or at least companies from Central and Eastern Europe, the scarcity of takeovers involving two listed companies, limited availability of data and lack of public information about the mergers led us to abandon this option. Initially, the inability to get access to historical stock market data of delisted companies²⁷ forced us to look for a takeover of a fully-owned subsidiary of a listed company. This enabled us to use the stock market data of the parent company, which were readily available. One such acquisition was South African Breweries' (SAB) takeover of Miller Brewing, a fully owned

²⁶ The abnormal returns for the three events are measured over the three two-day event windows, whereas the whole period over which these events happened lasts about ten months. This is the reason why the absolute value of event-related t-statistic is higher than the t-value for the whole period.

²⁷ See section 6.2 for details on data availability issues.

subsidiary of Philip Morris Companies. This deal has several additional favourable characteristics. First, precise date when the rumors about the takeover started could be identified from the acquirer's annual report. Second, the deal was friendly and executed within just three months from the start of rumors. Third, the brewing industry is rather straightforward, enabling us to better understand the reasons for the merger. Also, there exists a curious link of this merger to the Czech Republic. SAB is the owner of the largest Czech beer producer, Plzeňský Prazdroj, a.s. and Miller's acquisition was in part motivated by the need to secure distribution channels for SAB's flagship product – Pilsner Urquell – in the United States.

The second case study was deliberately selected to contrast with the SABMiller transaction. The author chose the takeover of Peoplesoft, an enterprise software maker, by Oracle, its larger competitor. Whereas the SABMiller deal was friendly and fast, with a limited number of events, Oracle and Peoplesoft were engaged in a protracted takeover battle, featuring offer increases, poison pills and courtroom hearings. This enables us to study a larger number of events over a long period of time and test the limits of our methodology. The high profile of Oracle's acquisition of Peoplesoft also ensured that information about the companies and analysis of the merger was abundant in the financial press.

It is important to point out that both case studies were selected before the author had any hints as to what the results from these case studies would be and also that these are the only case studies the author analyzed during the preparation of the thesis – that is, we didn't carry out more case studies in order to only report those with “nice” results.

5.3. Data sources and availability

This subsection summarizes the data requirements of our case studies, and the availability of the data. For our case studies, we need three categories of

information - general intelligence about the companies, historical stock prices and dates of the relevant events²⁸.

It is difficult to access stock market data of companies no longer listed on any major exchange. This is of special importance to M&A studies, as the target company is delisted upon consummation of the transaction. This problem was not present in the SABMiller case study because Miller Brewing Company was a wholly owned subsidiary of Philip Morris. In 2003 Philip Morris changed its name to Altria but remained a listed public company and its historical stock price data is available from public sources such as Yahoo! Finance²⁹. Note that this comes at a price – a portion of the stock’s movement may be caused by events related to parts of the company other than the subsidiary that is being sold. Also, for any given percentage change in the value of the targeted subsidiary, the stock price of the parent company only changes by a fraction which is inverse to the share of the value of the subsidiary in the value of the whole company. This makes it more difficult to observe statistically significant reactions to merger-related events and can be seen as a special case of the “size effect.”

Data on delisted targets, such as Peoplesoft in our second case study, cannot be obtained from freely accessible sources. They can, however, be acquired through paid-for professional databases, provided by Reuters, Bloomberg or Thomson Financial³⁰. Finally, historical values of indices that we need to estimate the market model are readily available on websites of the relevant stock markets, as well as on Yahoo! Finance.

In case studies of this type, dates and characterizations of relevant events are usually obtained from *The Wall Street Journal* or *The Financial Times*. We follow that convention. The primary source of information about events is the

²⁸ The author had no possibility to access merger databases that would enable him to carry out large-sample or even medium-sample studies.

²⁹ While current stock prices are available at the websites of the stock exchanges where the respective stocks are listed, this is generally not true for historical prices. These can be downloaded in csv format at Yahoo! Finance. Comparing the data from Yahoo! Finance with information available at SABMiller’s website revealed errors in Yahoo’s data on SAB’s dividend payments. Yahoo’s data on stock prices is correct.

³⁰ Here I wish to thank Mr. Robert Kubín and Mr. Tomáš Honěk for providing data on Peoplesoft’s historical share price.

subscriber-only *Financial Times* digital archive, which contains all articles published in the *FT* during the past five years. Where necessary, event dates and characterizations are cross-checked against the U.S. National Newspaper Abstract Database, available to Charles University students through the Proquest 5000 database.

The same digital archives, along with the companies' websites provide general information about the corporations involved and analysis of the motives for the merger. Historical annual reports of delisted companies are accessible in the form of K-10 filings through the *Edgar* database of the U.S. Securities and Exchange Commission. Data availability contributes to our decision to use U.S. and British companies for the case studies.

5.4. The SABMiller case study

5.4.1. General information about the companies

South African Breweries limited

South African Breweries was founded in 1895. Already in 1897 it secured a listing on the Johannesburg Stock Exchange and a year later it became listed on the London Stock Exchange. SAB has a long history of acquisitions and international expansion. Indeed, SAB's strategy states that "*We [SAB] remain alert to opportunities to make further acquisitions wherever they can add value to the group.*" Until the early 1990s, SAB's activities were largely confined to Africa. In addition to having operations across several African countries, SAB attained total dominance of the South African market where it reached a market share of 99% through a string of takeovers at the end of the 1970s. Around 1993, SAB started a massive global growth campaign focused on emerging, transitioning and developing markets. During the 1990s, SAB acquired breweries in Hungary, Poland, Slovakia, Czech Republic and Russia. Also, by 2000 SAB established a presence in China and India.

SAB's entry into the Czech Republic took place in 1999 when the company purchased Plzeňský Prazdroj a.s., Czech Republic's largest brewing group from Nomura, a Japanese investment bank. Apart from improving its

presence in the Central European region, SAB's motivation for the takeover was the acquisition of the Pilsner Urquell brand, around which the company intended to build its international expansion. The purchase of the US based Miller was SAB's first foray into developed markets and was followed by an acquisition of the Italian beer producer Peroni. In 1999 SAB moved its headquarters and primary listing to London in order to better focus on its international expansion. Currently, SABMiller's international strategy is built around four beer brands – Pilsner Urquell, Miller Genuine Draft, Castle and Perroni Nastro Azzurro. SAB's Czech, American and Italian acquisitions can thus be understood as steps towards implementing a strategy of global presence.

In the year to March 2006, 14% of SAB's earnings before interest and taxes came from North America, 16% from Europe and 32% from South African Beverages alone. Apart from brewing, SAB generates revenues through bottling and distributing own and licensed (Coca Cola) soft drinks. In addition to that, SAB operates hotels and casinos. However, in 2005 these only contributed 3% to SAB's EBITA. At present, SABMiller is the world's second largest beer producer by volume behind the Belgian-based InBev and ahead of Anheuser Busch of the US and Heineken of the Netherlands.

Miller

Founded in 1855, Miller Brewing Company is a major US beer producer. Among the US brewers it is second only to Anheuser Busch in size. Before it was acquired by the South African Breweries, Miller was a wholly-owned subsidiary of the Philip Morris Companies Inc. During the period of our interest, Philip Morris Companies' other units included Philip Morris International, Philip Morris USA, Kraft Foods and Philip Morris Capital Corporation. For Philip Morris, the world's largest cigarette manufacturer, its brewing subsidiary was marginal. In 2001 mere 2.8% of the corporation's operating income came from beer, compared to more than 60% from tobacco and about 35% from branded

food and beverages³¹. In the two years prior to the takeover, Miller was rapidly losing market share in the United States. Its shipments fell from 44.2 million barrels in 1999 to 40.6 million in 2001, which corresponds to a fall in market share from 21.6 to 19.7 percent.

On closer inspection of Philip Morris Companies, we discover that share price movements of the company are going to give us very little information about the value created for Philip Morris by the sale of Miller Brewing. This is because the Miller unit (beer) only accounted for about five percent of the company's total revenues and an even lower share of its market capitalization³². Even an increase in Miller's implied market value by 50% would only show up as an almost negligible increase in Philip Morris's market price³³ and would not be distinguishable from the everyday movements in the parent company's price

Selecting a takeover of a subsidiary was motivated by the limited availability of data on delisted companies. However, if the share of value of the subsidiary in the value of the parent company is small, inferring value creation in a merger from share price data turns out to be impossible³⁴.

Table 5.2 Philip Morris sources of revenues

Philip Morris Companies	2001	2000	1999
domestic tobacco	24784	22658	19596
international tobacco	26586	26374	27506
North American food	25106	18461	17897
International food	8769	8071	8900
Beer	4244	4375	4342
Financial Services	435	417	355
operating revenues	89924	80356	78596

Source: Philip Morris Companies 10-K SEC filing

³¹ See Philip Morris Companies' 2002 10-K Securities and Exchange Commission Filing.

³² Using share prices from the 14th March 2002 (the last pre-event day), Philip Morris's market value was 111.5 USD billion. The final price for which SAB purchased Miller was USD 5.6 billion including 2.0 billion of debt. The equity value of 3.6 billion already included any acquisition premium that SAB has paid and so constitutes the upper bound of the Miller equity value. Miller thus accounted for less than 3.23% of Philip Morris's market value.

³³ According to our calculations from the previous footnote an increase of Miller's value by 50% would send Philip Morris's shares up by about 1.5%.

³⁴ The author concedes that this issue could have been anticipated and the share of value of subsidiary in the value of the parent company could have been one of the selection criteria.

Nevertheless, we can still test our methodology and establish whether value was created or destroyed in the merger. To do this, we estimate the value created for the acquirer (SAB) using our event-study methodology. Furthermore, we can assume that Philip Morris would not sell its Miller unit at less than its stand-alone price. Through their informational advantage, Philip Morris managers were in a better position than anyone else to ascertain Miller's true value – both as part of the parent company and as a stand-alone concern. The objective function of managers and boards in the United States is value for shareholders and not maximizing it would constitute a breach of fiduciary duty. We can interpret the sale of Miller to SAB for \$5.6 billion as evidence that Miller would not be worth more than \$5.6 billion when spun off as a stand-alone concern and therefore the deal didn't destroy value for Philip Morris³⁵. If we show that the takeover was beneficial to SAB then we can conclude that the merger created value. However, if our analysis of stock-market data tells us that SAB overpaid for Miller, then we will not be able to say whether the merger created value as we won't be able to ascertain and compare the magnitudes of value creation for the target and the value destruction for the acquirer³⁶. Another approach would be to estimate Miller's stand-alone value using its financial data and multiples (e.g. price to sales, price to earnings) of its competitors.

5.4.2. Rationale for the acquisition

According to the official SAB statement, the SABMiller transaction was expected to deliver annual cost synergies amounting to \$50 million by the end of year three after the takeover. These synergies are relatively modest due to the very limited geographical overlap of the two brewers' operations. More importantly, the deal provided SAB with access to the world's largest beer

³⁵ This line of reasoning is similar to the "revealed preference" theory. We know the objective function and the decision space of the decision maker. By opting for one option over another when both are available, the decision maker signals its superiority with respect to the optimization of the objective function.

³⁶ In the first case, we are adding two positive numbers so the result must be positive as well, in the second case we are adding a positive and a negative number and we do not know the value of the positive number – we thus cannot determine the sign of the outcome.

market and secured international distribution channels for its products³⁷. Another major rationale for the merger was diversification. The deal partly insulated SAB against a downturn in the emerging markets and also provided it with a steady source of dollar-denominated revenues and profits. In 2001, the last year before the merger, SAB's dollar profits were severely hit by a 24.4 percent decrease in the value of the South African Rand as well as other African currencies against the U.S. dollar, a matter of importance for a company whose primary listing is in London. In section 2 we argued that pure diversification doesn't add value to the company but that it can be rational from the point of view of the decision makers and certain stakeholders. The SABMiller deal appears to be such a case. Also, SAB's management, specialized in beer production, marketing and distribution, was in a better position to increase profitability of the battered Miller.

Furthermore, SAB cites improved credit profile with a significantly lower cost of capital and having Philip Morris as a supportive long-term shareholder among the benefits of the transaction. Finally, the management's desire to build the world's second-largest brewing company may also have played a role in the acquisition.

From Philip Morris's point of view, the rationale seems straightforward – selling Miller was an opportunity to dispose of a struggling unit which accounted for only a small fraction of the corporation's revenues and profits. Turning the unit around would require undue attention of the management, whose main specialization was the tobacco business, not brewing.

At the beginning of 2007, the board of directors of Altria Group voted to authorize a spin-off of Kraft Foods³⁸, its food subsidiary. The spin-off was finished at the end of March 2007 and Kraft Foods was listed as an independent company on the New York Stock Exchange on April 2nd 2007. This provides support for the view that Philip Morris's (Altria's) strategic goal was to concentrate on its core tobacco units. Also, it can be seen as evidence in favour

³⁷ Indeed, in 2007 Miller's website lists Pilsner Urquell and Peroni Nastro Azzurro as Miller's flagship products, right next to Miller Lite.

³⁸ See http://www.kraft.com/investors/kraft_spin_off.html for information about the Kraft spin-off, downloaded April 27th 2007.

of the “revealed preference” theory introduced in the previous section as it shows that for Philip Morris, stock market spin-off of a subsidiary was not just a theoretical possibility.

5.4.3. The market model

We now estimate the market model for shares of South African Breweries. The estimation period comprises 200 trading days. It begins on June 1st 2001 and ends on March 3rd 2002, that is right before the beginning of the event period. Within our period a completely exceptional event occurred – the terrorist attacks of September 11th 2001. In reaction to this event, share prices fell steeply, volatility increased and major U.S. exchanges were closed. Non-U.S. stocks suffered as well. It seems reasonable to verify whether the estimates of the market model differ before and after September 11th. We estimate the market model over the whole estimation period and over the pre-9/11 and post-9/11 sub periods separately. We then use the Chow test to verify that the market model coefficients are constant over the duration of the whole estimation period. The estimates are summarized in the table below.

Table 5.3 SAB market model coefficients

SAB	$\hat{\alpha}$	$\hat{\beta}$	R²	SSR	n
All	0.00011 (0.00126)	0.45547 (0.10199)	0.0915	0.06297	200
Pre-9/11	0.00058 (0.00155)	0.48407 (0.15193)	0.1282	0.01133	71
Post-9/11	-0.00013 (0.00178)	0.44979 (0.13235)	0.0834	0.05162	129

Standard errors in parentheses, SSR = sum of squared residuals

Even casual inspection reveals that the coefficients remained stable over both parts of the estimation period. Nevertheless, we test this proposition

formally. The Chow statistic³⁹ equals 0.031136 and is not statistically significant at the 10% significance level. We cannot reject the null hypothesis that the market model coefficients are equal in both sub periods of the estimation period. The beta coefficient is statistically significant (p-value < 0.0001) and the alpha coefficient is not statistically significant at any of the commonly used levels. We shall be using the following model for establishing the normal returns:

$$R_{SAB} = 0.00011 + 0.45547R_{DJIA}$$

The relatively low beta should not come as a surprise. First, brewing is a mature and relatively acyclical sector. Second, as Annema and Goedhart (2003) point out, the bubble in the technology, media and telecommunications (TMT) sector and its burst in the late 1990s and early 2000s increased the volatility of indices but not of non-TMT stocks. This caused the betas on non-TMT stocks to fall sharply. As we estimated our market model in 2002 it is possible that some TMT effect which draws SAB beta downwards is still present.

In section 3, we found that abnormal returns of a single company generally are not normally distributed. This, in turn, would mean that the t-statistic is not t-distributed under the null hypothesis and the critical values are invalid. Fortunately the deviation is small and the approximation reasonable. The 95th percentile of the estimation period abnormal returns (corresponding to the critical value of a 10% significance level two-sided test) has a t-statistic of 1.71 and the 97.5th percentile (critical value of a 5% significance level of a two-sided test) has a t-statistic of 1.81. This is close to the theoretical values of 1.64 and 1.96. Below, basic information on abnormal returns (residuals) from the estimation period for both the market model and the index model is summarized. A corresponding histogram is part of Appendix 1.

³⁹ The Chow statistic has the form $\frac{SSR_R - SSR_{UR} / k}{SSR_{UR} / (n_1 + n_2 - 2k)}$ where SSR_R and SSR_{UR}

denote the sum of squared residuals of the restricted and unrestricted model respectively, n_1 and n_2 stand for the number of observations in the sub periods and k gives the number of restrictions. Under the null hypothesis that all model coefficients are equal in both sub periods, the Chow statistic has $F(k; n_1 + n_2 - 2k)$ distribution.

Table 5.4 Characteristics of SAB estimation period abnormal returns

model	mean	sample sd	percentage positive	90th percentile	95th percentile
market	0	0,01779	49.5	0,0172	0,0305
index	0,00032	0,01903	51	0,0189	0,0296

n=200, *sd*=standard deviation

5.4.4. Reaction of SAB shares to new information

The acquisition of Miller Brewing by the South African Breweries was friendly and fast. The event period consists of mere 54 trading days from March 14th 2002 until May 31st 2002. The first date was identified as “*the last date prior to the market speculation that SAB was in discussion with Philip Morris regarding Miller*” in SAB’s 2002 annual report and the share price from March 14th was also used to calculate the value of the SABMiller shares received by Philip Morris as part of the transaction. March 15th was also the first day for which an article about the prepared merger in the *Financial Times* could be found. May 31st 2002, the last day of the event period, is the first trading day after the official announcement of the deal and its precise conditions on May 30th 2002, when substantially all the uncertainty was resolved.

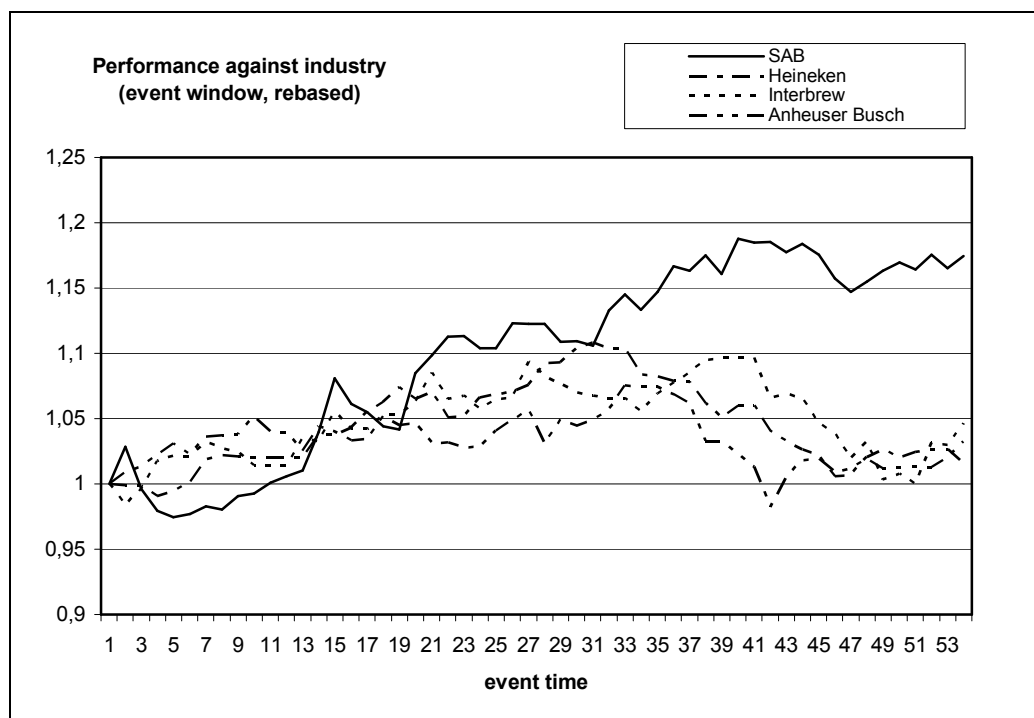
At the end of the event period, SAB’s share price stood at 575.5 pence compared with 490 pence at its beginning. This amounts to an increase in SAB’s value by 17.3% over just 54 trading days. The SAB’s share displayed extraordinary performance even when compared with the general market and the share price of SAB’s peer companies. During the event period, the FTSE 100 index actually fell 3.3% from 5261 to 5085. The stock market performance of the remaining three of the world’s four largest brewers significantly lagged that of SAB over the period under survey – Heineken’s, Interbrew’s and Anheuser Busch’s stock price rose by 1.6%, 4.7% and 1.9% respectively. SAB’s cumulative *abnormal* returns reached 17.63% when the market model is used for normal returns and 20.09% when the index model is used.

The first speculation about SAB’s approach to Miller on didn’t lead to a significant stock market reaction over the 3-day event period. The shares initially

rose about three percent on the information, only to return approximately to its pre-event level as mixed analyst's reports started to pour in. Overall, the first speculation about SAB's interest in Miller doesn't enable us to gauge the market's reaction to the takeover. This should not be too surprising as there was substantial uncertainty about the probability of the deal and its conditions.

Another wave of reports about the deal came almost three weeks after the initial rumours. This means the analysts have had enough time to carry out detailed studies of what the merger would bring to SAB and what price SAB could afford to pay for the US brewer. It is reasonable to believe that by this time the market's estimate of the value impacts of the deal on SAB would be well-informed⁴⁰.

Chart 5.2 SAB stock performance against industry benchmark



⁴⁰ This doesn't imply that the stock market's reaction to completely unexpected events is irrational or that the markets are inefficient. However, developing precise information about the value effects of the merger takes time and it appears reasonable to assume that the information available to traders three weeks after the first speculation about the merger was based on more solid analysis.

First, on April 3rd the Wall Street Journal reported that SAB was in advanced-stage exclusive talks with Philip Morris about buying its Miller subsidiary for approximately \$5 billion. According to the article, the deal was to be closed within a few weeks. With the benefit of the hindsight, the information in the article was very precise. One day later, SAB reacted to the news report by officially confirming that it was in negotiations concerning the takeover of Miller but added that the talks were in early stages and that it was leaving other (unspecified) options open.

Table 5.5 SAB event period three-day abnormal returns

date	event description	3-day CAR	t-statistic
15.3.2002	First speculation about SAB's interest in Miller	-0.59%	-0.19
4.4.2002	SAB confirms talks with Philip Morris	7.43%	2.42
12.4.2002	Interbrew executives say they are not interested in Miller	5.39%	1.75
17.4.2002	Philip Morris says the deal is "not a done thing"	0.24%	0.08
6.5.2002	Interbrew CEO denies interest in Miller in interview	2.29%	0.75
20.5.2002	SAB says it will reveal Miller deal until the end of May	-1.32%	-0.43
24.5.2002	Rumours of advanced-stage talk, SAB confirms again	2.05%	0.67
30.5.2002	Official announcement of the deal and its terms	0.88%	0.29
	<i>All event windows</i>	16.37%	1.91

Source: Financial Times, JSE Market Summary, Modern Brewery Age

The stock-market reaction to the report and subsequent confirmation was unequivocal – the cumulative abnormal returns over the three day period exceeded 7%. On April 4th and April 5th, SAB posted its third- and second-largest one-day return during the event period. Importantly, there were no other news concerning SAB during this period and the peer group's shares haven't shown any strong returns during the three-day window. This gives us confidence that the abnormal returns surrounding April 4th indeed show the stock market's reaction to the merger and this reaction is resoundingly positive.

Another piece of news hit the market on April 12th when executives of Interbrew said that they would not pursue the acquisition of Miller. Three weeks later this was confirmed by Interbrew's CEO in an interview. This was unequivocally good news for SAB – we have seen that shares have reacted very

positively to confirmations of merger talks and Interbrew's announcement further increased the probability that SAB will become the owner of Miller. Also, Interbrew's abstention meant that SAB would not get engaged in a damaging bidding battle. The stock price reacted positively on both dates with the April 12th abnormal returns highly significant.

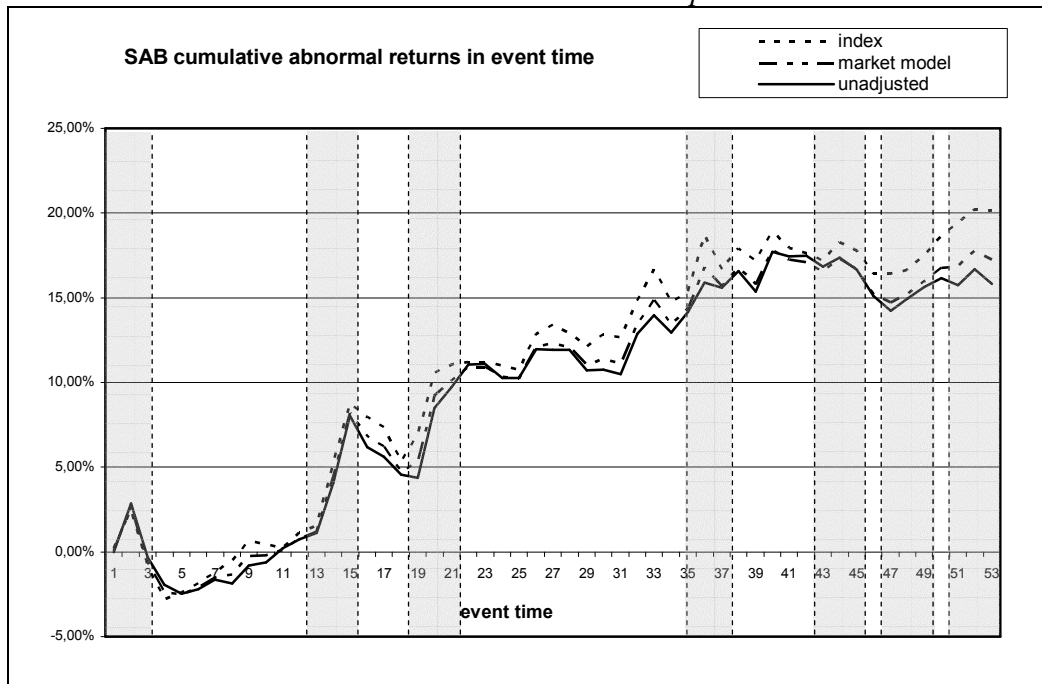
The next event, dated May 20th is something of a puzzle. On this day, the *Financial Times* reported in a press briefing (short summary of news) that SAB has set a target of May 30th to reveal a \$5 billion deal to gain control of Miller. Apart from this short note the author has failed to identify any news about this SAB's statement. Also, the stock-market reaction was opposite to what we would expect based on our analysis so far – SAB's share price fell, albeit not significantly, over the 3-day event window. Nevertheless, for consistency, we include this event in our list.

On May 24th, *Financial Times* issued a report according to which SAB was in advanced stages of finalising the Miller deal and there was growing expectation that the deal would be officially announced on May 30th. In reaction, SAB again confirmed that it was in talks with Philip Morris but said that no conclusions have been reached yet. *FT* also reported that Merrill Lynch increased its SAB target price in response to the announcement. SAB shares gained 2.05% over the three day event-period.

Finally, the full details and agreement on the deal were announced on May 30th 2002. According to the agreement, South African Breweries would issue 430 million shares to Philip Morris and assume \$2.0 billion of Miller's debt. Based on SAB's pre-event share price of 490 pence this implies Miller's enterprise value to be \$4.9 billion. Computed at the May 30th share price of 571 pence Miller's enterprise value was \$5.5 billion⁴¹.

⁴¹ SAB used the exchange rate of 1.4204 \$/£. At the pre-event price Miller's value is $4.9 \times 1.4204 \times 430\,000\,000 = \2.99 billion + \$2.0 billion in assumed debt = \$4.9 billion. At May 30th price of 571 pence, Miller's equity value was $5.71 \times 1.4204 \times 430\,000\,000 = \3.49 billion and total enterprise value with debt \$5.49 billion.

Chart 5.3 SAB cumulative abnormal returns in event period



Philip Morris ended up holding 36% of the new SABMiller entity and committed to holding the shares at least until June 2005. SAB's stock price barely moved in response to the announcement. This suggests that neither the news of the deal nor its terms were a surprise. Indeed, the *Financial Times* commented that the SABMiller merger was "...one of the best-flagged deals of the year. Since leaking started in March, full details of the expected price and benefits of the deal have emerged."⁴² On the same day as the merger, SAB also announced its full-year results for the year ending March 31st 2002. Even though the results were not surprising, this could have influenced the stock-price movement and obscured a reaction to the announcement of the deal. Given that the share price movement around May 30th is small and most of the uncertainty has already been resolved by this date, this doesn't seem to be much of a problem.

⁴² The FT also noted that SAB was issuing the same number of shares as planned in the early stages of the talks despite SAB's significant price rise. According to the newspaper, "this is a tacit admission that the increase is all deal-related, and much of the perceived benefit is already in SAB's price."

5.4.4. Value created in the merger

Over the event period, SAB strongly outperformed the market model, broad stock market and the peer group of world's largest brewers. Confirmations of merger talks and Interbrew's decision not to pursue Miller led to large abnormal returns during short windows around the announcement. The negative returns around the two events which caused SAB's share price to fall are small and insignificant. Overall, the evidence is consistent with the assertion that the merger with Miller Brewing created significant value for the South African Breweries.

To establish value created for SAB's shareholders, we start from the company's pre-event market value of £4.120 billion. We consider several models. Using cumulative abnormal returns as measured by the index model implies a value creation of £828 million. This decreases to £726 million when the market model is used and to £600 million if we look at SAB's outperformance of three other global brewers⁴³. Cumulative abnormal returns around events resulted in value increase of £674 million. The t-value of SAB cumulative abnormal returns over the whole event period is 1.08⁴⁴. This is weak evidence against the null hypothesis that the merger had no effect on the stock's performance over the 54-day period. If we only focus on three day windows around the events, t-statistic rises to 1.91 which already constitutes strong evidence that the increase in share price was related to the merger.

Table 5.6 Value created for SAB

model	Shares outstanding (pre-event)	Share price (pre-event)	Pre-event market value	CAR	Value created for SAB
Market	840.9 million	490 pence	£4.120 billion	17.63%	£726 million
Index	840.9 million	490 pence	£4.120 billion	20.09%	£828 million
Windows	840.9 million	490 pence	£4.120 billion	16.37%	£674 million
Industry	840.9 million	490 pence	£4.120 billion	14.56%	£600 million

⁴³ We are using an equal-weighted index of Anheuser Busch, Interbrew and Heineken.

⁴⁴ The standard error of 54-day market model cumulative abnormal returns is 13.1%.

Based on the evidence presented, we conclude that the Miller transaction did create value for SAB shareholders. We estimate this value to be approximately £700 million. As we assume positive gains to Philip Morris shareholders, this merger is an example of large merger-related gains.

5.4.5. Discussion

The SABMiller case provides support to our two hypotheses. We have established that the transaction created substantial value for SAB shareholders. If we just focused on one of the events, we would underestimate the value created. Considering the abnormal returns around the first rumours and official announcement of the deal (-0.59% and 0.88% respectively) would lead us to believe that the deal has created no value as both are practically indistinguishable from zero (t-values -0.19 and 0.29). In particular, using the official announcement date is not suitable in this case. First, the announcement and its terms were widely expected and the merger effects have already been included in the share price prior to the event. Second, the merger was announced at the same date as the company's result, possibly introducing further bias into the estimate. Incidentally, the merger announcement day was the only event for which any such "contaminating" information could be identified. Choosing April 4th as the single event date would be an improvement. Nevertheless, we would still miss more than half the value created in the merger. Furthermore, choosing "confirmation of rumours" as the single event (rather than the official announcement date) is not customary and identifying this event would require careful analysis of all event-time information anyway.

We would fare better using cumulative abnormal returns over the whole event period. The "bad model" problem is limited due to the very short event period and the CAR approach gives us results very similar to those based on event-windows only. Yet as we have seen in the previous section, even with such a short event period this method's t-value doesn't enable us to resoundingly rule out the possibility that the value creation was unrelated to the merger.

Aggregating abnormal returns from short windows around events is superior to the other two methodologies.

5.5. The Peoplesoft/Oracle Case Study

5.5.1. General information about the companies

Oracle Corporation

Oracle was founded in the 1970s and was the first company to commercialize relational databases, which have since become the standard for storing data in the corporate world. Currently Oracle is the world's number one supplier of enterprise databases and database development tools and also counts among the leaders in enterprise applications and middleware⁴⁵. Its product range in enterprise applications comprises customer relationship management, supply chain management and enterprise resources management software. Apart from new software licenses, Peoplesoft derives revenues from product support and services, which include consulting and education. Oracle doesn't provide a breakdown of revenues by source in its 10-K SEC filing.

Since the Peoplesoft acquisition, which is detailed in our case study, Oracle went on to buy a number of small and mid-sized enterprise software companies, most notably Siebel, the German provider of customer relationship management software. In all, Oracle acquired 27 companies since swallowing Peoplesoft.

Oracle was one of the companies severely hit by the collapse of the dotcom bubble in 2000. Its shares lost 90% of their value between the beginning of 2000 and the middle of 2001. Nevertheless, in 2007 Oracle still occupies rank 167 of Fortune 500, the list of America's largest companies by revenue. With 2007 revenues of \$14.4 billion, Oracle is second only to Microsoft among US software companies. At the end of 2005, Oracle had approximately 50,000 employees.

⁴⁵ Middleware is connectivity software that consists of a set of enabling services that allow multiple processes running on one or more machines to interact across a network.

Source: Software Engineering Institute of the Carnegie Mellon University <http://www.sei.cmu.edu/str/descriptions/middleware.html>, Downloaded April 12th 2007

Oracle's main competitors in its core database market are IBM and Microsoft. In enterprise software, Oracle listed the German software producer SAP, Peoplesoft, Microsoft and Siebel Systems as its principal competitors in its 2003 SEC 10-K filing. Oracle's chief executive officer is Lawrence Ellison, who has held the position since Oracle was established.

Peoplesoft

Peoplesoft, Inc. was incorporated in Delaware in 1987 and agreed to be acquired by the Oracle Corporation in December 2004. Before the acquisition, Peoplesoft was a major provider of enterprise application software for customer relationship management, financial management and supply chain management. Peoplesoft's software could be licensed to work on top of databases provided by Oracle, IBM, Microsoft or Sybase. Apart from selling software licenses, Peoplesoft generated revenues from servicing, supporting and implementing its software as well as providing training to clients' staff. Of Peoplesoft's \$1.948 billion revenues, 26% were generated from the sale of new software licenses and 74% from services. Peoplesoft's business was heavily concentrated in the United States – 76% of its revenues came from Northern America. In its 2003 SEC 10-K filing, Peoplesoft lists SAP and Oracle as its primary competitors in the enterprise software market and Siebel as a major competitor in customer relations management software. At the end of 2002, Peoplesoft employed 8,293 people. Craig Conway was Peoplesoft's CEO during the first 16 months of the Peoplesoft/Oracle takeover battle. Before coming to Peoplesoft, Conway spent eight years in senior executive roles at Oracle.

Table 5.7 Worldwide enterprise application market

SAP	7404
Oracle	2619
Peoplesoft	1988
JD Edwards	911
Best (Sage)	856
others	431

2003 revenues, \$ million; Source: AMR research

5.5.2. Rationale for the acquisition

The rationale for Oracle's takeover of Peoplesoft can be traced back to the view of Oracle CEO Larry Ellison, voiced in an interview in January 2003⁴⁶ that after the collapse of the dotcom bubble the software industry will not return to pre-bubble levels of growth. Software would become a commodity and consumers would prefer to buy software from large firms offering complete product range, rather than from niche, single-product companies. From this perspective, Oracle's bid was motivated by Ellison's belief in the need of consolidation in the industry. The takeover intended to secure Oracle's position as one of the largest software companies, close the gaps in its product offering (especially in enterprise software) and possibly also to prevent a merger of Peoplesoft with JD Edwards. This viewpoint was confirmed by CEO of SAP, Oracle's principal competitor, Henning Kagermann,⁴⁷ who in July 2003 said of Ellison: *"He said that IT is becoming a commodity, which isn't true, but it might be true for databases, and this is his cash cow. He has to go into business applications because they are not a commodity."*

At the time of the offer, analysts believed that Oracle was mainly interested in revenues from providing Peoplesoft's customers with services and cross-selling Oracle's own products to them⁴⁸. Significant cost reductions would be achieved by reducing duplicity between the companies, mainly at the cost of Peoplesoft's staff. This view was further strengthened by Ellison, who initially announced Oracle would discontinue development of Peoplesoft's products and migrate customers to Oracle's software.

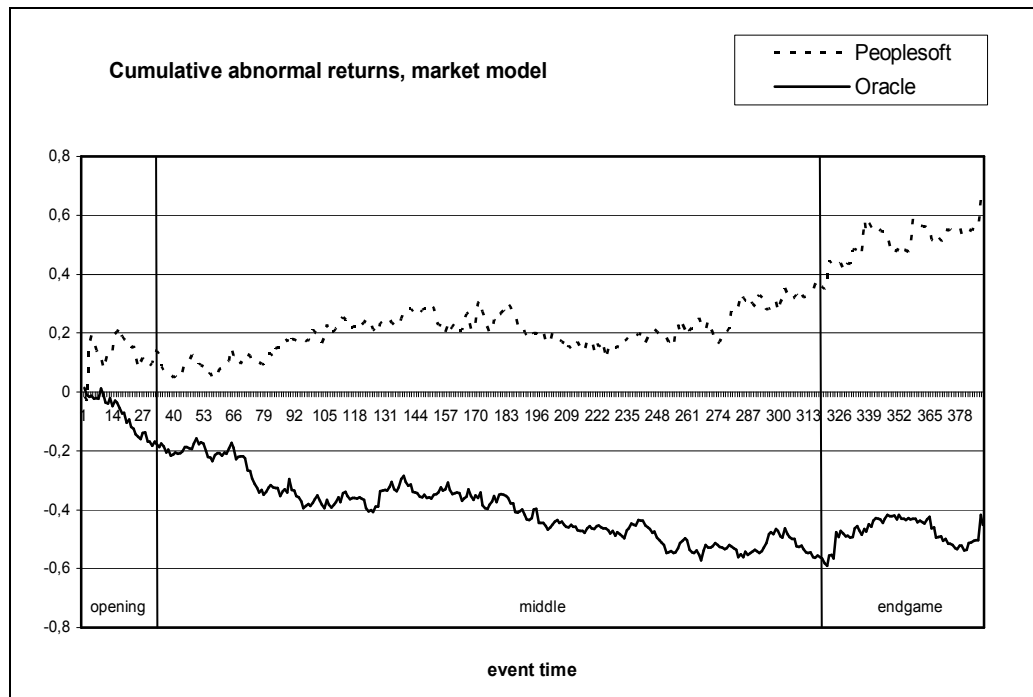
To sum up, Oracle's intention to buy Peoplesoft was motivated by economies of scale, complementarities of the companies' products, preparation for anticipated consolidation of the industry and accessing Peoplesoft's customers.

⁴⁶see <http://www.cnn.com/2003/TECH/biztech/05/06/software.debate.reut/index.html>, downloaded April 21st, 2006 and "The next software battle" in *The Economist*, June 12th 2003

⁴⁷ see http://money.cnn.com/magazines/fortune/fortune_archive/2003/07/07/345541/index.htm, downloaded April 21st, 2006

⁴⁸ see Lex: Oracle, *Financial Times*, June 6th 2003

Chart 5.4 Peoplesoft and Oracle cumulative abnormal returns in event period



5.5.3. The market model

The market model for the Peoplesoft/Oracle case study was estimated over the period of 200 trading days prior to the event period. The estimation period started on August 13th 2002 and lasted until the May 29th 2003. Unlike in the SABMiller case, we had no reason to suspect structural instability of data. As expected for high-technology stocks, their beta is very high (about 1.4 for both companies) – their volatility is higher than that of the NASDAQ Composite index, which we used as the market return⁴⁹. The betas for both companies are highly statistically significant while the alphas are not significant at any of the commonly used significance levels. We will be using the following models to establish the normal returns:

$$R_{ORCL} = 0.00037 + 1.44529 R_{NSDQ}$$

$$R_{PSFT} = -0.00110 + 1.41429 R_{NSDQ}$$

⁴⁹ The rationale for using NASDAQ instead of Dow Jones Industrial Average is that NASDAQ concentrates on technology stocks and the returns on the stocks of the two companies surveyed are likely to be more strongly correlated with NASDAQ. This enables us to reduce the variability of abnormal returns.

On inspecting the models of normal return, the danger of long event periods becomes apparent. If both the market and the two stocks remained flat over the 400-day Peoplesoft/Oracle event period, cumulative abnormal returns would be -14.8% for Oracle and a staggering 44% for Peoplesoft⁵⁰. This is an effect of the nonzero alpha term in the model. Note that this problem, which may account for much of the apparent under-/overperformance in *Chart 5.4*, was much less pronounced in the first case study due to the shorter duration of the event period. This is a manifestation of the “bad model” problem – the limited relevance of surveying long-term abnormal returns when we are not certain as to what the correct market model may be. Using the index model (i.e. $\alpha=0$ and $\beta=1$) would solve the problem of non-zero alpha but could introduce greater distortion into the estimate of beta. This is the rationale for only using very short intervals around events, where we can be reasonably sure that the normal returns are close to zero.

Table 5.8 Oracle and Peoplesoft market model coefficients

	$\hat{\alpha}$	$\hat{\beta}$	R ²	SSR	n
Oracle	0.00037 (0.00150)	1.44529 (0.07850)	0.6313	0.08858	200
Peoplesoft	-0.00110 (0.00194)	1.41429 (0.10159)	0.4946	0.14837	200

Standard errors in parentheses, SSR = sum of squared residuals

Just as in the SABMiller case study, we find that even though the abnormal returns of the companies are not exactly normally distributed, the t-statistic is a reasonable approximation. The empirical 10% and 5% critical t-values are 1.43 and 1.82 for Peoplesoft and 1.65 and 2.06 for Oracle. The basic characteristics of the abnormal returns during the estimation period are summarized below and their histogram is presented in Appendix 1.

⁵⁰ Further bias is introduced by the convention to compute cumulative abnormal returns as the sum of abnormal returns over the period in question. If we used the more precise method of compounding, the abnormal returns would be -15.9% for Oracle and 35.6% for Peoplesoft.

Table 5.9 Characteristics of estimation period abnormal returns

model	mean	sample sd	percentage positive	90th percentile	95th percentile
Psft market	0	0,02731	47	0,02923	0,03905
Psft index	-0,00064	0,02843	43	0,03191	0,04268
Orcl market	0	0,021098	50	0,02566	0,03481
Orcl index	0,00087	0,02275	50	0,03179	0,04037

n=200, sd=standard deviation

5.5.4. Reaction of shares to new information

The Peoplesoft/Oracle merger was one of the most contentious takeover battles of recent years. The events include several bid increases and reductions, Peoplesoft’s rejections, lawsuits, regulatory decisions and even sacking of one of the CEOs⁵¹. The event period is extremely long – 19 months from June 2003 till December 2004. This made it very difficult to analyse the stock market’s reaction to the merger. The usefulness of this case study lies as much in illustrating the methodology’s limitations as it does in arriving at an estimate of value created as a consequence of the takeover.

For transparency, we divide the event period into three sub periods. First is the six-week “opening” period of the initial bid and its rejection. After the opening came a long “middle” period of relative calm during which the probability of the deal decreased, followed by the “endgame” during which regulators cleared the takeover and the merger was agreed. Over the whole event period, Peoplesoft’s share price rose from \$15 to \$26.5, an increase of 74%. On the other hand, Oracle’s shares ended the event period 5% up from their pre-event value. This amounts to a significant underperformance as the NASDAQ Composite index gained 32% over the same time⁵². Peoplesoft’s market model abnormal returns over the event period came to 64.5% whereas Oracle’s were

⁵¹ We report all bid announcements, increases and decreases, reactions to bids, statements involving the transaction by the firms involved, lawsuits and regulatory action with respect to the merger that were covered by the *Financial Times* within the event period. Events not related to the merger (e.g. earnings announcements) are reported where they coincide with merger-related events.

⁵² Equal weighted index of SAP and Sage, two competitors serves as a simple proxy for industry performance. Over the event period it tracked NASDAQ very closely and ended 29% higher than at the beginning of the event period.

negative 45.2%. However, after a careful analysis of the events we shall argue that Oracle's underperformance was *not* caused by investor's perceptions of the value destruction related to the Peoplesoft takeover.

We have to start with an event preceding the actual Peoplesoft-Oracle merger. On June 2nd, Peoplesoft announced an agreement to buy a smaller competitor, JD Edwards⁵³. Upon this announcement, Peoplesoft's shares lost nearly 8%. Just four days later, on June 6th Oracle made an unsolicited bid to buy Peoplesoft in an all cash deal, offering \$16 per share. This amounted to a total offer of \$5.1 billion for all of Peoplesoft's outstanding equity. Given that the average share price of Peoplesoft for the three months preceding this offer was \$15.9, there was no takeover premium. Peoplesoft's share price posted abnormal returns in excess of 20% over the three-day window surrounding the announcement and exceeded the offer price. Our interpretation is that investors expected Oracle to increase the bid in the future.⁵⁴ Oracle's abnormal returns were negative 2.8% over the announcement window.

A quick succession of events followed. On June 12th three important events happened. Peoplesoft's board of directors formally rejected Oracle's bid, Oracle announced profits that exceeded analyst expectations and JD Edwards filed a suit against Oracle, claiming that its offer was insincere and constituted an "*interference with contract and prospective business relations.*" One day later, Peoplesoft sued Oracle as well, claiming that Oracle aimed to disrupt Peoplesoft's business rather than purchase the company.

⁵³ Peoplesoft listed "incremental revenues through cross-selling opportunities, reduction of duplicative facilities, reduction of general and administrative headcount performing duplicative functions, consolidation of marketing programs, elimination of duplicative IT infrastructure, increased consulting utilization and consolidation of sales forces and professional service organization and realignment of the respective management structures " as sources of synergies from the merger. See Peoplesoft's 2003 10-K SEC filing.

⁵⁴Part of the surge in Peoplesoft's share price may have reflected investor's hope that the Oracle offer would derail the value-destroying purchase of JD Edwards. However, the three subsequent events which led to Peoplesoft's JD Edwards takeover only led to a 2.5% Peoplesoft negative abnormal returns. If the value destruction in the JD Edwards purchase amounted to 8% of Peoplesoft's equity and the Oracle offer reduced its probability to zero, we would expect to observe 8% negative Peoplesoft abnormal returns as the JD Edwards takeover gained momentum and was carried out.

Table 5.10 Event period three-day abnormal returns, opening phase

date	event description	Peoplesoft <i>t</i> -statistic	Oracle <i>t</i> -statistic
Opening			
2.6.2003	Peoplesoft announces agreement to buy JD Edwards for \$1.65 billion	-7.99% (-1.68)	-1.22% (-0.33)
6.6.2003	Oracle makes an unsolicited all-cash bid to buy Peoplesoft	20.78% (4.39)	-2.80% (-0.77)
12.6.2003	Peoplesoft formally rejects Oracle bid	-9.54*% (-1.75)	1.12*% (0.27)
12.6.2003	JD Edwards files suit against Oracle, calling the bid insincere		
12.6.2003	Oracle reports earnings ahead of analyst expectations		
13.6.2003	Peoplesoft sues Oracle		
16.6.2003	Peoplesoft adjusts its offer for JD Edwards so that it doesn't have to be approved by the shareholders	-2.19% (-0.46)	-1.27% (-0.35)
18.6.2003	Oracle raises the Peoplesoft offer to \$6.3 billion	11.86**% (1.94)	-1.89**% (-0.40)
20.6.2003	Peoplesoft rejects the improved offer		
30.6.2003	Department of Justice (DoJ) extends probe into the Oracle bid	-1.52% (-0.32)	-2.09% (-0.57)
14.7.2003	DoJ clears Peoplesoft/JD Edwards deal	-3.17% (-0.67)	-2.97% (-0.81)
18.7.2003	Peoplesoft completes the JD Edwards transaction	2.86% (0.60)	-0.47% (-0.13)
Opening total (excluding JD Edwards transaction)		21.58% (2.04)	-5.66% (-0.68)

* denotes 4-day event period ** denotes 5-day event period

Due to an overlap of the event window, we consider these four events collectively over a four-day period. Peoplesoft's abnormal returns reached -9.54% and Oracle's 1.12%. The events meant a reduction in the probability of the event taking place because of the rejection of the bid and hostile actions by Peoplesoft and JD Edwards. Peoplesoft's loss is thus a move in the expected direction. For Oracle, the interpretation is more complicated. Better than expected results would unequivocally lead to positive abnormal returns and two new lawsuits to negative ARs. We are not able to determine the effect of the reduced probability of the merger on Oracle's share price on this date.

Next major development in the case came on June 18th when Oracle announced it would raise the offer to \$19.50 per share and Peoplesoft formally declined the offer two days later. Again, an overlap forces us to use a longer

event window – 5 days in this case. Over these five days, Peoplesoft posted a cumulative abnormal return of nearly 12% while Oracle's CAR was -1.89%. Finally, on June 30th the Justice Department (DoJ) said it would extend its probe into the proposed Peoplesoft / Oracle deal. This can be interpreted as decreasing the probability of the merger because it signaled that obtaining regulatory approval for the transaction will not be easy. Expectedly, Peoplesoft's shares fell on the event. More surprisingly, Oracle also posted negative abnormal returns in reaction to DoJ's announcement. Based on takeover-related events so far we would expect positive ARs. In sum, during the opening period, Peoplesoft's price reaction to merger-related events was consistently positive and statistically significant. On the other hand, we had difficulty interpreting price movements of Oracle's shares. These were ambiguous, the information was contaminated by other events and all abnormal returns were statistically insignificant. Peoplesoft would be a winner in this transaction, whereas we do not have enough information to pass a reliable judgment on the effect of the deal on Oracle's share price.

The middle section already provides some evidence that the investors believed the takeover would create value for Oracle as well. Both companies post moderate negative abnormal returns upon Oracle's announcement that it would not increase the offer price. Both companies also gained when Oracle broke its vow and increased the share price to \$26 per Peoplesoft share. Both stocks then lost when Peoplesoft rejected the offer as inadequate. Finally, on February 26th the Department of Justice decided to block the merger in court, arguing that it would damage competition. Shares of both companies posted large negative abnormal returns after the announcement.

We have seen four events of high importance to the merger. The direction of abnormal returns was identical for both companies over the four event periods and our observation is consistent with the hypothesis that a merger would create value for *both* companies. Peoplesoft's and Oracle's shares rose when the probability of a merger increased and *vice versa*. If Oracle's underperformance apparent on Chart 5.5 had been caused by the proposed merger, Oracle's shares

would react negatively to increased probability of the transaction. This leads us to believe that Oracle's underperformance was caused by other reasons and ascribing it to the merger would yield incorrect results.

There is no pattern recognizable in the companies' reactions to European Commission's antitrust investigation. Furthermore, the information is difficult to interpret – the Commission interrupted the probe several times to gather more information and restarted the investigation later. It is not clear how such events affected the probability of the deal taking place.

Table 5.11 Event period three-day abnormal returns, middle phase

Middle		PSFT	ORCL
8.9.2003	Oracle says it will not raise the bid for Peoplesoft	-2.77% (-0.58)	-2.98% (-0.82)
17.11.2003	European Commission announces a more detailed investigation into the Oracle/Peoplesoft bid	0.67% (0.14)	0.10% (0.03)
12.1.2004	European Commission suspends its case against the takeover to gather more information	-4.04% (-0.86)	1.05% (0.29)
4.2.2004	Oracle raises its offer to \$9.1 billion	9.73% (2.06)	2.49% (0.68)
9.2.2004	Peoplesoft rejects the new offer as inadequate	-9.05% (-1.91)	-5.33% (-1.46)
17.2.2004	European Commission restarts the case	5.10% (1.08)	2.14% (0.58)
26.2.2004	DoJ takes the deal to court on anticompetitive grounds	-3.97% (-0.84)	-4.80% (-1.31)
12.3.2004	European Union introduces its own legal objections, Oracle results meet analyst forecasts	1.11% (0.23)	-4.50% (-1.23)
15.4.2004	Brussels halts Oracle takeover case to gather more information	-3.10% (-0.66)	-0.26% (-0.07)
14.5.2004	Oracle lowers offer for Peoplesoft to 7.7 billion	-0.76% (-0.16)	1.63% (0.45)
Middle (excluding EU case)		-6.82% (-0.64)	-8.99% (-1.10)

Also, the only event which we are able to interpret unambiguously – the introduction of EU legal objections on March 12th 2004 – coincides with Oracle's announcement of results and causes a very weak reaction of Peoplesoft's shares. This suggests that the decisions of the Commission were not

seen as very important for the merger⁵⁵. We do not include the events related to EU competition investigation in the estimate of the value created in the merger.

The late February Department of Justice decision to take legal action against the takeover deserves special attention. For three reasons, we believe that this event drastically reduced the probability of the merger. First, shortly after the announcement, all the gains of Peoplesoft over the NASDAQ index and its competitors not involved in the deal were wiped out. This is apparent from Chart 5.5 where the first vertical line shows the DoJ's decision to block the merger in court and the second vertical line denotes Oracle's court victory against the DoJ. Within these boundaries, Peoplesoft's share price very closely followed the NASDAQ and the benchmark index.

Second, the analysis presented in the FT hinted that the probability of Oracle's success was small: *"And with one bound, he was free. PeopleSoft, it seems, will probably escape Oracle's unwelcome bid, courtesy of the Department of Justice's decision yesterday."*⁵⁶ After Oracle prevailed in court, the newspaper called DoJ's legal defeat *"rare"*⁵⁷.

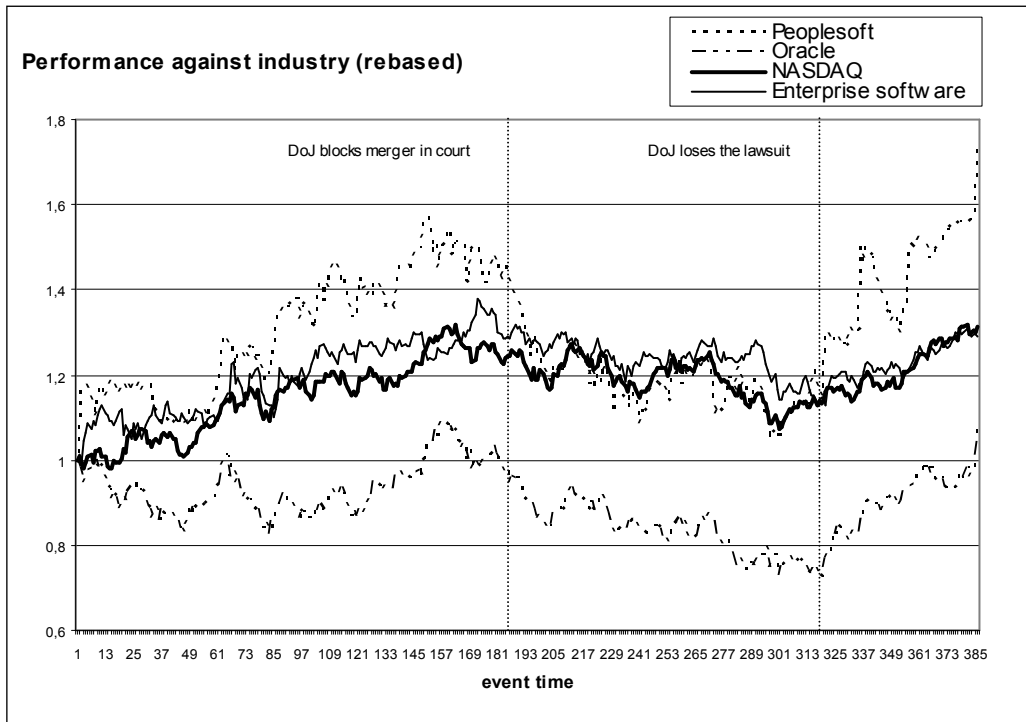
Third, the last event during the middle period provides us with a method of testing the probability of the merger. On May 14th, Oracle decreased its offer from \$26 per share to \$21 per share. If the deal had been certain or near-certain, we would expect to see abnormal returns which would wipe approximately \$5 off the value of each Peoplesoft share. However, the three-day abnormal returns around the decrease of the offer price came to just 0.76% or about 13 cents per share. Finally, during the week before the reduction of the bid, Peoplesoft's shares were trading at around \$17.35. This is just 8% higher than their average price from the month before the beginning of the event period and nearly 9\$ lower than the still-valid 26\$ offer price. Note that in the meanwhile, NASDAQ gained 15%.

⁵⁵ In 2001 the European Commission blocked an all-US merger between Honeywell and GE which had already been approved by the US regulators. This, however, caused heavy attacks from US businessmen and politicians against the EU. See "Court uphold EU ban on GE-Honeywell merger," Financial Times, December 14th 2005.

⁵⁶ Lex: Oracle/Peoplesoft, Financial Times February 27th 2004

⁵⁷ Financial Times, September 10th 2004

Chart 5.5 Stock performance against industry benchmark



Enterprise software is equal-weighted index of SAP and Sage stock price

While insufficient separately, together these three pieces of evidence paint a consistent and compelling picture – at the end of the middle period, the market saw the probability of the merger to be extremely low. This is very convenient for us as it enables us to judge the value effects of the merger based exclusively on the endgame period with little bias. Furthermore, the stock-price reaction to events in the middle period is difficult to interpret and the cumulative abnormal event-related loss of Peoplesoft’s value of just 7% suggests that we have either missed some relevant events or that there was a gradual loss of investor’s belief in the successful consummation of the transaction, which was not related to any specific event. We would expect Peoplesoft’s event-associated abnormal returns from the opening period to be completely wiped out by the beginning of the endgame.

Table 5.12 Event period three-day abnormal returns, endgame phase

<i>Endgame</i>		PSFT	ORCL
9.9.2004	Oracle wins lawsuit against DoJ, merger is approved	9.20% (1.94)	0.98% (0.26)
20.9.2004	Peoplesoft approves golden parachutes to improve poison pill	-1.73% (-0.37)	0.22% (0.05)
1.10.2004	Craig Conway, Peoplesoft CEO opposed to the bid is sacked. DoJ says it will not appeal court decision	7.89% (1.66)	-0.61% (-0.16)
3.10.2004	Microsoft denies interest in Peoplesoft		
7.10.2004	Brussels restarts Oracle/Peoplesoft investigation	-1.00% (-0.21)	2.18% (0.59)
26.10.2004	European Commission clears the Oracle/Peoplesoft takeover	-1.43% (-0.30)	-1.93% (-0.52)
1.11.2004	Oracle raises its offer	10.29% (2.17)	-0.30% (-0.08)
11.11.2004	Peoplesoft rejects the improved offer	-4.17% (-0.88)	-2.74% (-0.75)
13.12.2004	Oracle agrees with Peoplesoft on takeover, price is increased to \$10.3 billion, Oracle announces good results	8.59% (1.81)	5.16% (1.41)
	endgame	27.64% (1.95)	2.96% (0.27)

The endgame began with Oracle's courtroom victory over the Justice Department on September 9th 2004. The judge decided that the argument put forward by the DoJ was not sufficient to warrant blocking the takeover. Peoplesoft reiterated its commitment to remaining independent and Oracle immediately called on Peoplesoft to start a negotiation about the transaction. Peoplesoft's share price shot up 11.6% over the three-day event period (the abnormal returns being 9.2%), while Oracle's rose 3.9% (AR 1.0%). Given that the verdict was surprising, this is solid evidence that a deal would create value for Peoplesoft and not harm Oracle's shareholders.

Another major event came on October 1st when Peoplesoft unexpectedly dismissed its chief executive, Craig Conway. The company denied that Conway's departure was related to Oracle's takeover and maintained its opposition to the deal. The departure of Ellison's personal foe Conway was nevertheless seen to increase the probability of the takeover taking place. On the same day the Justice Department announced that it would not appeal the court's decision in the Oracle/Peoplesoft takeover case and a day later, Microsoft denied any interest in purchasing Peoplesoft. Peoplesoft posted abnormal returns of

nearly 8% on the news; Oracle's abnormal returns were slightly negative. The abnormal returns associated with the European Commission investigation are again small and in unexpected direction.

At the beginning of November, Oracle raised its offer to \$24 per share. This led to large Peoplesoft abnormal returns and essentially no abnormal reaction of the Oracle stock. When the offer was formally rejected ten days later, both stocks suffered.

A breakthrough came on December 13th 2004. On this day the companies announced that they have agreed a takeover for an improved price of \$26.50 a share. Oracle pledged to continue developing Peoplesoft's products and Peoplesoft agreed to dissolve its poison pills. Peoplesoft's shares immediately jumped to \$26.40 which corresponds to abnormal returns of 8.6%. Oracle posted abnormal returns of 5% which however cannot be fully ascribed to the deal as the company announced results that beat expectations on the same day.

5.5.4. Value created in the merger

Over the endgame period, we have seen large and significant increases in Peoplesoft share price as a reaction to news increasing the probability of the merger. Oracle's shares generally moved in the same direction, even though these movements were much smaller. This confirms the trends from the middle period and constitutes very strong evidence that

- i) The takeover created value for Peoplesoft's shareholders.
- ii) The large Oracle's abnormal negative returns over the event period were not caused by the takeover.

The endgame event-related cumulative abnormal returns for Peoplesoft are 27.64% with a t-value of 1.94. This is very close to the cumulative abnormal returns over the whole endgame period.⁵⁸ These were 28.9% for the market model.

Oracle's event-related abnormal returns were a modest 2.96%. The low t-value means that we cannot confidently ascribe these gains to the takeover. Over

⁵⁸ That is on all trading days between September 8th 2004 and December 14th

the whole endgame period, Oracle posted market-model cumulative abnormal returns of 11.44%. Chart 5.6 reveals that these are nearly completely explained by two events - September 15th and December 13th. On both dates Oracle announced excellent results that exceeded market expectations. The abnormal return associated with the September 15th announcement is the single largest abnormal return over the whole event period of 18 months. We are not able to separate the effect of the December 13th announcement of the takeover agreement from the effect of better-than-expected results. Given that all the previous reactions to takeover-related events were much smaller, we have reasons to believe that a significant part of the abnormal returns is related to the announcement of the results.

All this evidence supports the explanation that the takeover created substantial value for Peoplesoft shareholders and was approximately value-neutral for the Oracle shareholders. The initial Oracle share underperformance and the overperformance in the endgame period appears to be connected to results of Oracle's own business rather than to the value created or destroyed in the takeover of Peoplesoft. The below calculations of value created rest on the assumption that prior to the DoJ defeat in court the probability of takeover was zero. In section 5.5.3. we have shown that such assumption is reasonable.

Table 5.13 Value created for Peoplesoft and Oracle

company	Shares outstanding (Sept 8, 2004)	Share price (Sept 8, 2004)	Market value (Sept 8, 2004)	Event-related CAR (endgame)	Value created
Peoplesoft	363.9 million	\$17.49	\$6.36 billion	27.64%	\$1.759 billion
Oracle	5.170 billion	\$9.86	\$50.97 billion	2.96%	\$1.508 billion

By this measure, the dollar amount of value created for Oracle nearly matches Peoplesoft's. Due to Oracle's large market capitalization, the dollar value of benefits to its shareholders is very sensitive even to very small percentage movements in its share price. This is the size effect in action. As noted earlier in this section, we do not have sufficient evidence that the Oracle's abnormal returns were a result of the takeover. In particular, if we assume that

half of the December 13th abnormal returns were due to positive business results, value effect of the merger for Oracle falls almost to zero. Ascribing all of the December 13th abnormal returns to the results announcement would result in *negative* value effect of the merger on Oracle.

Whereas we have a high degree of confidence in the dollar value of Peoplesoft's gains, we have almost none in Oracle's. Our conclusion has to be that the deal created substantial value for Peoplesoft's shareholders and that we are not able to reliably judge the effect of the takeover on Oracle's value. Oracle's consistent, if small and statistically insignificant, positive reactions to events increasing the probability of the merger in the middle and endgame periods suggest that the deal did not destroy value of Oracle. This would imply positive total value creation in the merger.

5.5.5. Discussion

The Oracle/Peoplesoft takeover confirmed the common wisdom – the takeover target is the big winner of the transaction and the deal most likely created value overall. This case study has shown that to arrive at a story consistent with the data it is necessary to create a balanced picture using a combination of stock reaction to known events, event-period stock performance relative to the stock market and peer companies as well as media and analyst reports. In event studies, interpretation and judgment is necessary.

Using the traditional event study methods would yield inferior results. Choosing the abnormal returns around the official deal announcement on December 13th 2004 (8.59% for Peoplesoft and 5.16% for Oracle) would greatly underestimate Peoplesoft's gain from the transaction because large part of the benefits was already included in Peoplesoft's price and overestimate Oracle's gain because it would ascribe all of the reaction to excellent business results to the takeover. We would fare somewhat better if we considered the abnormal returns during the three-day window around the first Oracle's bid for Peoplesoft on June 6th 2003. Still the abnormal returns of 20.78% and -2.80% miss a large

part of the value created in the merger and are not consistent with the reaction of Oracle's share price to the subsequent merger-related events.

Relying on the cumulative abnormal returns over the whole 18-month period of the merger would yield grossly misleading results. Peoplesoft's cumulative abnormal returns over this period reached 64.5% while Oracle's were -45%. Using the index model would result in cumulative abnormal returns of 27.7% and -16.4% respectively. This illustrates that over such a long event period the results are extremely sensitive to the model of normal returns. This is a good illustration of the "bad model" problem – we are not able to distinguish even large merger-related gains and losses when we aren't sure whether the normal returns over the period in question should be 30% or 65%.

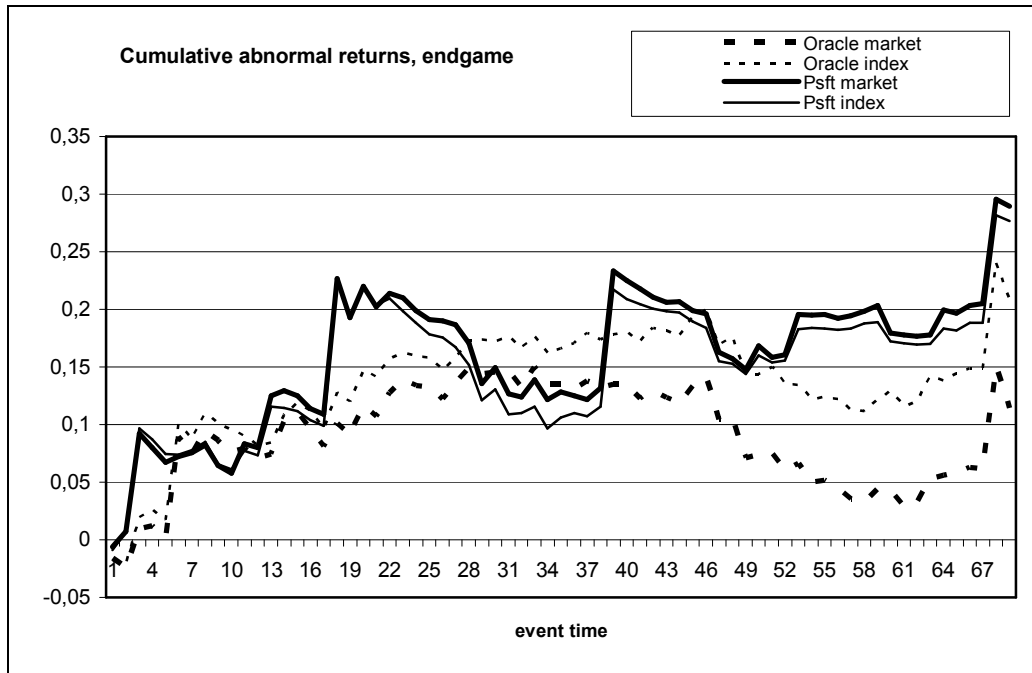
Ascribing all the event-period abnormal returns to the event under investigation would be another grave error. Concluding that Oracle lost 45% of its value as a consequence of the transaction is absolutely inconsistent with the positive, if small, general reactions of the company's stock price to new information increasing the probability of the deal. This is especially visible in the middle and endgame period. Rather, we conjecture that the underperformance of Oracle was caused by the bad fortunes of its core business.

Even Peoplesoft's huge cumulative abnormal returns of 65% are not statistically significant (t-value 1.20) because they are spread over a very long period of time. The same goes for Oracle (t-value -1.10). We are not able to reject the null hypothesis that the gains are unrelated to the takeover. That is, even if all these abnormal returns were indeed caused by the merger alone, we couldn't confidently ascribe them to the transaction.

5.6 Implications for the large-sample studies

In our two case studies we have seen our two hypotheses confirmed. Both commonly used event-study methodologies are indeed seriously flawed – short event windows miss a large part of the event-related abnormal returns while long

Chart 5.6 Oracle and Peoplesoft CAR in the endgame phase



periods are extremely sensitive to the “bad model” problem and contaminating events. Our results have squarely confirmed Jensen and Ruback’s (1983) assertion that *“For many purposes, the relatively crude characterization of an event as the [Wall Street Journal] announcement date or the company’s formal announcement date is satisfactory. However, for many events there is literally no single event day, only a series of occurrences that increase or decrease the probability of a takeover.”*

In the case studies we have seen that the size effect is an important hindrance in establishing the value created for acquirer’s shareholders. Acquirers’ large size compared to their targets makes it difficult to discern value gains to acquirers even when the synergies amount to a large share of the target’s value.

Our case studies are consistent with the results of the large-sample studies: mergers can create value and in the case study where we were able to observe abnormal returns to the target, the acquired company was the big winner of the transaction.

Our findings do not mean we should discard the results of the large sample studies; rather they set these results into perspective. A short-window event study may miss large parts of the event-related value effects but the *direction* of the value effect we observe is correct⁵⁹. From short-window studies we *are* able to determine whether the market believes that the transaction will create value for the acquirer or the target. What we are not able to find out precisely is *how large* such value effects are. Long-window event studies are more dangerous. In the Oracle case we have seen that they can be misleading in *direction* as well as *magnitude*. Because the abnormal returns over long periods of time can be quite substantial, even a few companies with important contaminating events can gravely distort the results. We therefore recommend extreme caution when using and interpreting the results of studies with long event windows.

A reasonable compromise would be to conduct medium-sample studies with careful control and interpretation of all the event-related mergers. These studies could be used to answer more specific questions such as how much value is created by mergers in a particular industry under particular conditions. An examination of value creation of acquisitions of biotech start-ups by large pharmaceutical companies would be an example of such a study.

Estimating three-day abnormal returns around the official merger announcement date for a large and heterogeneous sample of companies is an exercise that has been carried out many times over the past 30 years. Its further replications are unlikely to provide any new insights into *whether* and most importantly *why* mergers create value.

⁵⁹ The large-sample studies have the additional advantage that the contaminating events are likely to cancel each other out over a large number of companies.

6. Conclusion

In this thesis, we examined the question whether mergers and acquisitions create value. We introduced the reasons why one big company might be worth more than two smaller ones and investigated the shortcomings of the most widely used tool for ascertaining the value created in mergers. Finally, in our two case studies and reviews of published research we concluded that mergers most likely do create value on average.

However, it is important not to let the average overshadow the individual events. For every firm a takeover is a major event. For the target company it means the end of its stand-alone existence and for the acquirer it is an investment of unparalleled size, connected to large changes in the way the company operates. For the shareholders of these companies, mergers can mean a large windfall or a destruction of a big portion of their wealth. It therefore appears more important to understand *which* mergers create value and *why*. Answering the question *whether* mergers create value on aggregate is only the first step on the road there. This is not to say that reliable methods of measuring value creation in mergers are inutile. Whether a merger creates value in the end is a result of concrete decisions of managers and financiers. They have their own biases and limitations, can be greedy or have big egos to satisfy. Measuring whether they deliver on their merger promises is important – not least for setting incentives best suited to overcome the principal – agent problem inherent in today’s large corporations.

In this thesis we concentrated purely on the effect of mergers on the wealth of shareholders of the participating companies. However, a merger of two large companies also affects the employees, competitors, consumers, communities, government and the environment. In searching the literature, the author discovered very little analysis of these effects. The easy availability of stock market data made measuring returns to investors a natural choice for researchers. However, we have now reached the point when conducting further large-sample studies aimed exclusively at the question of value for shareholders will not contribute much to our knowledge. In the meanwhile, we hope that this thesis helped a little to understand the relevance of past research.

Appendix 1: Plots of estimation-period abnormal returns

Chart A1 SAB abnormal returns in estimation period

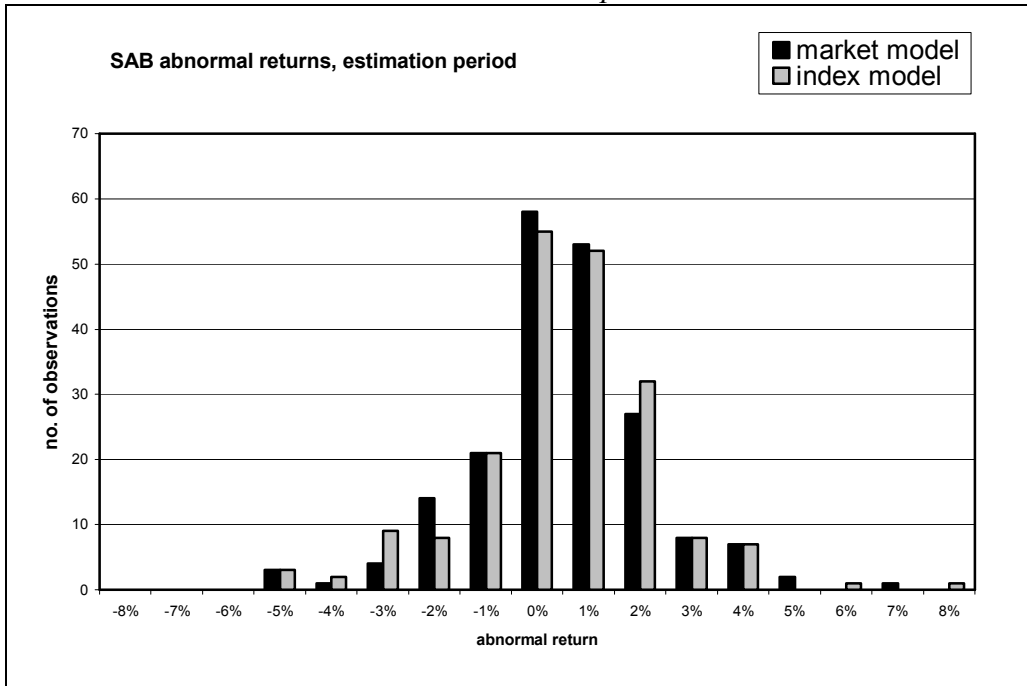
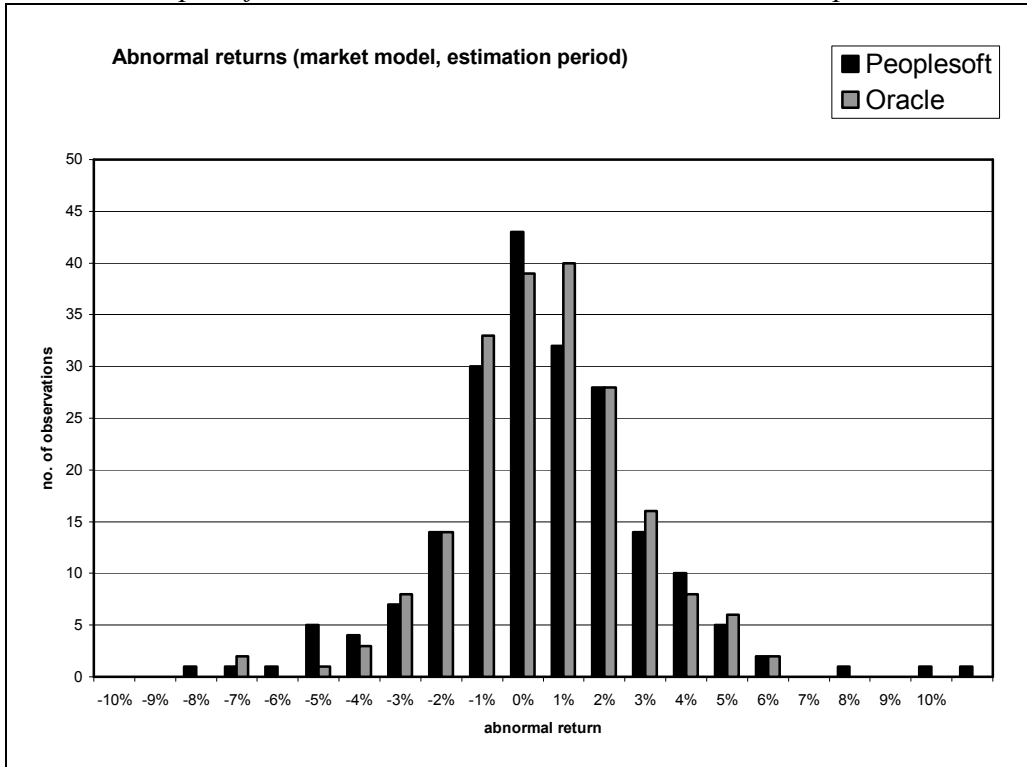


Chart A2 Peoplesoft and Oracle abnormal returns in estimation period



Appendix 2: Project of the thesis

Projekt diplomové práce

Termín státní zkoušky: letní semestr 2007

Autor diplomové práce: Bc. Viktor Hanzlík

Vedoucí diplomové práce: Doc. Ing. Oldřich Dědek, CSc.

Téma: Mergers and Acquisitions – Do They Create Value?

Charakterizace tématu: Hlavním zdůvodněním fúzí a převzetí (M&A) je předpoklad, že firma vzniklá fúzí dvou společností bude mít větší hodnotu než je součet hodnot těchto společností, zůstanou-li samostatné. Cílem této práce je poskytnout přehled teoretických důvodů pro M&A (včetně ilustrací na konkrétních případech), přehled historické M&A aktivity, definovat korektní způsob ocenění hodnoty vzniklé fúzemi a akvizicemi a na vzorku firem ověřit, zda v reálném světě fúze a akvizice skutečně vedou ke vzniku ekonomické hodnoty, případně jak je tato hodnota rozdělena mezi jednotlivé aktéry M&A.

Hypotézy:

- 1) Fúze a akvizice vedou ke vzniku ekonomické hodnoty
- 2) Při akvizicích připadá nadproporcionální část vytvořené hodnoty akcionářům kupované společnosti.

Metodika: případové studie, statistická analýza

Struktura práce:

- 1) Úvod
- 2) Přehled literatury
- 3) Teoretické základy M&A
- 4) Přehled historické M&A aktivity a významných příkladů M&A
- 5) Analýza výkonnosti firem zapojených do M&A aktivity
- 6) Závěr

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