



**SCHOOL OF ECONOMICS
AND MANAGEMENT**
Lund University

2nd Year Master Thesis in Finance

Creation of post-M&A performance:
Similarities versus dissimilarities in
resource allocations

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December 2014

ABSTRACT

Title	Creation of post-M&A performance: Similarities versus dissimilarities in resource allocation
Seminar date	August 28 th 2014 (15 ECTS)
Course	BUSP69 Degree Project II in Finance
Author	Elisa Hrund Gunnarsdottir
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Keywords	Mergers, acquisitions, M&A, resource allocation, resource based view, strategic fit, synergy, merger waves, corporate governance, multiple linear regression
Purpose	The main purpose of the thesis is to increase support with either of earlier made arguments of resource allocation and post-M&A performance, that is whether similarities or dissimilarities in resource allocation between an acquiring company and a target rather increase performance.
Theoretical framework	The thesis is based on the idea of resource based view (RBV), that is that firm's competitive advantages lie in its resources. However, there are contradicting notions regarding resource allocation in M&A's, that is whether similarities or dissimilarities in resource allocation between the acquirer and target rather create synergies and therefore increase post-M&A performance.
Methodology	The dataset consists of longitudinal data, that is for each set of companies, their performance is measured at two points in time; before and after the M&A. Deductive approach is used to test the contradicting arguments from previous studies. Using a multiple linear regression analysis determines the exact relationship between the explanatory variables chosen and post-M&A performance.
Empirical foundation	This study is based on chosen numbers from annual statements of companies involved in 86 M&A transactions, 55 from the US and 31 from Europe, taking place in the sixth merger wave, from 2003 to 2007.
Conclusion	The larger part of the explanatory variables chosen is found statistically insignificant, resulting from the small dataset at hand. Due to an apparent problem of multicollinearity the results of this study need to be taken with caution. However, the results indicate that for the US, dissimilarities in resource allocation rather increase post-M&A performance whereas the results are not as clear for Europe. The results make it difficult to state anything about the influence of different governance systems on M&A performance whilst different time periods, in regards of merger activity, do not seem to have any influence.

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1. Introduction

1.1 Background

During the 1970s and 1980s mergers and acquisitions (M&A) increased drastically in popularity (Lamont and Anderson, 1985; Porter, 1987). Since then a pattern of M&A waves has been observed where in certain time periods M&A transactions increase significantly over a relatively short period of time with intense activity. During the last century more than half of all M&A transactions has clustered within those waves (Kolev, Haleblan and McNamara, 2012). For example, during the dot-com bubble in the 1990s dollars spent in M&A was five times higher than ten years earlier and close to fifty times higher than twenty years earlier (Koller, Goedhart and Wessels, 2010).

As a result, the topic of M&A has been widely researched and is still a very frequent topic in both research and academic discussion. But even though there has been a significant amount of research on M&A's there is still need for even more research to gain a better understanding and provide recommendation that will enhance the success of M&A's (Hitt, King, Krishnan, Makri, Schijven, Shimizu and Zhu, 2009). Even though previous researches on M&A's are diverse there is one notion that is the most commonly debated one, that is whether a merged company is better off than the two companies separately (see e.g. Jensen, 1988). The answer to this, as well as to other notions in M&A research, has been in many cases inconsistent (Das and Kapil, 2012).

Even though M&A's are conducted in order to pursue different benefits evidence shows that in general the main rationale for the transactions is to maximize a firm's value (Salter and Weinhold, 1979). The dominant argument is that to create value firms should acquire somehow related firms which through synergies increases efficiency, either based on economies of scale or scope or skill transfer of some kind (Harrison, Hitt, Hoskisson and Ireland, 1991). However, studies have shown that M&A transactions create little or no value on average and often firms fail to achieve a significant success. In some cases M&A's generate negative value since they create problems that managers fail to solve (Cartwright and Schoenberg, 2006; Hitt, King, Krishnan, Makri, Schijven, Shimizu and Zhu, 2012; King, Dalton, Daily and Covin, 2004).

Value is a function of a cash flow so for strategy to create value cash flow or expected future cash flows must increase (Schweiger and Lippert, 2005). In management, such as marketing,

operations, human resources and strategy, organizational performance is commonly the dependent variable of interest when it comes to value creation. Performance is one type of effectiveness indicator and includes three areas of company outcomes (Richard, Yip and Johnson, 2009). The most common measure of performance in M&A's is shareholder return. When maximizing M&A's success in terms of shareholder value there are two groups needed to be considered; the shareholders of the acquiring company and the shareholders of the target company. Empirical studies have shown that on average some value is created for the shareholders of the target company, whilst the same is not true for the shareholders of the acquiring company (see e.g. Bruner, 2001). Other areas of company outcomes included in performance are financial performance, e.g. profits, return on equity and return on assets, and product market performance, e.g. sales and market share, which as the shareholder value is easily observed (Campa and Hernando, 2004; Richard, Yip and Johnson, 2009). M&A's can also affect social value which includes effects on other economic agents, such as employees, suppliers and communities. Those effects however are not as easily measured (Campa and Hernando, 2004).

1.2 Problem discussion

As mentioned before, scholars and the academic world don't agree on whether merged companies are better off than the two companies separately. There is also a debate about which factors rather increase the possibility of a successful merger. According to Porter (1987), for M&A's to be successful companies should focus on its core competences and stick to their set strategy and thus the acquiring company and the target company should have strategies that are alike or similar. Porter's idea of strategic fit is supported by many others (see e.g. Chatterjee, 1986; Salter and Weinhold, 1979; Singh and Montgomery, 1987). Fewer have contradicted the idea of strategic fit. Harrison et.al (1991) suggest that dissimilarities between the acquiring company and the target company allows the companies to learn from each other and therefore create greater synergies and better performance compared to similarities. To get by the problem that companies' strategies are not always easily accessible to outsiders Harrison et.al focused on resource allocation rather than strategy since some scholars have suggested that similarities in strategy may indicate similarities in resource allocation (Beard and Dess, 1981; Galbraith and Kazanjian, 1986).

In their research, Harrison et.al. (1991) concluded that for M&A's in the US in the 70's and 80's dissimilarities in resource allocation may provide unique and valuable synergy and thus

increase performance. A similar study was conducted for M&A's in the EU in the 90's where it was found that dissimilarities in some resource allocations have positive effect on performance whilst for other resource allocations similarities increase performance (Ritterfeldt and Trygg, 2008). Differences in those two researches could be explained by different time periods or different corporate governance systems between the US and EU. The 70s and the 80s can be considered as a rather conservative time in M&A activity whilst during the 90s an M&A wave was peaking, especially in certain industries like banking, health care and technology (University of Torino, 2012). In regards of corporate governance systems, the market oriented shareholder perspective is dominant in the US where the focus is on short-term returns, whereas in the EU the market is network oriented and focuses on long-term investment perspective (Ritterfeldt and Trygg, 2008). Others have also found contradictive results, especially in the financial sector which is the largest acquiring sector (Buelens, 2008). Ramaswamy (1997) concluded that strategic similarities in the US banking industry in the 80s had positive influence on post-M&A performance, which is in line with Porter's idea. Altunbas and Marqués (2008) based their research on Ramaswamy's model but used data for the banking industry in the EU in the 90s. Their results were more in line with the results of Ritterfeldt and Trygg, that is they concluded that for some factors in resource allocation similarities have positive influence on post-M&A performance whilst for other factors dissimilarities are found to improve performance.

Previous empirical results on resource allocation and M&A performance therefore support the debate on which factors rather increase the possibility of a successful merger. It seems to be that both different time periods and different geographical locations give contradicting results on whether companies should focus on similarities or dissimilarities in resource allocation to increase post-M&A performance. To the author's knowledge there has never been conducted a study using a sample from different geographical areas so there is a lack of comparison of results in different areas. There have also not been conducted studies, to the author's notice, which use data from the latest merger wave, which took place from 2003 till 2007. These contradicting results of previous empirical studies and a lack of comparable studies, both in regards of geographical areas and time periods, are the foundation for the purpose of this thesis.

1.3 Purpose

The main purpose of this thesis is to increase support with either of the earlier made arguments of resource allocations and post-M&A performance by analyzing whether similarities or dissimilarities in resource allocations between an acquiring company and a target company rather increase performance, using a replication of a study by Harrison et.al (1991) and an extension by Ritterfeldt and Trygg (2008). Since previous studies have been conducted for different geographical areas and different time periods there is a lack of comparability between those studies. Therefore, the second purpose of this thesis is to compare the results of US and Europe using data from the same time period to see whether the contradicting results of previous studies can be explained by different time periods or differences in corporate governance structure.

To fulfil these purposes the thesis will answer the following research questions:

- Do similarities or dissimilarities in resource allocations between an acquirer and a target rather increase post-M&A performance?
- Do different time periods support different arguments of resource allocations and post-M&A performance?
- Do different governance structures support different arguments of resource allocations and post-M&A performance?

1.4 Limitations of the study

The thesis focuses on the effects on performance change from similarities and dissimilarities in pre-M&A resource allocations between the acquiring company and the target. Therefore the explanatory variables used only explain potential synergies from economies of scope and not from economies of scale.

Also, the thesis focuses on manager's point of view and not on the shareholders by looking at the companies' financial performance and not the value creation through increased stock prices. However, no M&A would be interesting unless it increases the owners' value in terms of stock price improvements, which can be considered as more of a short-term perspective, looking at immediate changes in stock prices. Thus, the focal point of the thesis is the long-term perspective where future profits are more important. Finally, the dataset only includes companies involved in M&A transactions that were carried out in the sixth merger wave, between 2003 and 2007, and where the acquirer is registered in either the US or in Europe,

with some further restrictions. That results in a rather small dataset which can cause empirical problems and lessens the credibility of the study.

1.5 Thesis outline

The remaining of the thesis is structured as follows: Chapter 2 presents the theoretical framework as well as some of the relevant previous literature. Chapter 3 presents the methodology of the analysis, the data collection as well as the variables included in the study. The empirical results are presented in Chapter 4, followed by analysis of the results. Finally Chapter 5 includes some concluding remarks and recommendations for further studies.

2. Theoretical framework

The efficient market hypothesis (EMH) states that, given no asymmetric information, markets are efficient and all assets are priced at its true value given all available information. According to the EMH M&A's should not be driven by speculations but rather by expected synergies (Fama, 1970). According to theory, synergy is the most important factor for value creation in M&A transactions (Harrison et.al., 1991). However, scholars disagree on whether synergies are created through similarities or dissimilarities in resource allocation between an acquirer and a target (see e.g. Harrison et.al., 1991; Porter, 1996). This chapter covers the theory of value creation through synergies and performance measures as well as the different arguments for synergy creation in similarities and dissimilarities in resource allocations. Finally, merger waves and institutional theory of different corporate governance systems is discussed to try to explain the contradictive results of previous studies.

2.1 Value creation through synergies

The term *synergy* is more commonly associated with physical sciences rather than with economics and finance, where it refers to the reactions occurring when two factors are combined to yield greater effect together than the sum of the two independently (Gaughan, 2002). In economics and finance most scholars agree that a success of M&A transactions can be defined as the creation of synergies, i.e. that the merged company has greater value than the two companies separately, where the synergies are created through either economies of scale or scope or skill transfer of some kind (Ansoff, 1965; Cording, Christmann and Bourgeois III, 2002). Synergies can be divided into operating synergies and financial synergies, where operating synergies can be further divided into revenue enhancers and cost reductions and financial synergies can be divided into risk and value (Gaughan, 2002; Ritterfeldt and Trygg, 2008).

Even though synergies are the expected outcome from M&A's, value creation through synergies rarely a fact since 70% of all M&A's generate a negative net present value (NPV). The reason that M&A tend to be unsuccessful in creating synergies can be divided into subgroups; the winners curse, hubris and the free rider problem. The winners curse arises when several companies believe that acquiring a certain target will generate synergies and hence enter into a price bidding war where the highest bidder estimates the greatest potential synergies and is likely to overpay for the transaction, resulting in a negative NPV. Hubris

appears when the management of the acquiring company overestimates their expertise and skills and therefore expects greater synergies than then are achieved. When the minority shareholders of the target company are difficult to get rid of after the merger the free rider problem arises. These shareholders tend to free ride on the expected synergies and the price for getting rid of them is higher than for other shareholders and thus takes up a large portion of the expected synergies which can then result in negative NPV (Johnson, Scholes and Whittington, 2008). According to Lubatkin (1983) the reason for previous empirical studies showing unsuccessful value creations in M&A transactions might also be due to methodical problems in quantifying synergies.

2.2 Measuring M&A performance

As mentioned earlier the most common measures of performance in M&A are shareholder return, financial performance and product market performance (Campa and Hernando, 2004; Richard, Yip and Johnson, 2009). According to Gates and Very (2003) there is no one way better than other to measure M&A performance, the appropriate measure depends on the acquisition strategy and the expected synergies. Although, the most common measure of M&A performance is shareholder return that may not necessarily be the best measure as it is driven by many factors that are not controllable by the firm and its managers. Instead financial performance is often used as a measure for M&A performance (Meglio and Risberg, 2011). The rationale behind using financial performance, measured by different accounting-based measures, to evaluate the success of M&A's is that the strategic aim of a business is to earn adequate return on capital and the synergies obtained from M&A transactions are best reflected in accounting measures (Papadakis and Thanos, 2010).

2.2.1 Accounting-based measures

Management scholars and others have mainly relied on accounting-based measures for M&A performance for three reasons. First, accounting-based measures measure actual, realized M&A performance as reported in annual financial statements, which is an advantage over other measures of M&A performance which measure investors' expectations for the future. Second, accounting-based measures can measure different features of M&A performance so by combining multiple accounting-based measures within a single study a more integrated view of M&A performance can be obtained. Third, synergies created in M&A's are reflected in long-term accounting performance improvements and therefore researchers can evaluate the realization of synergies using accounting-based measures (Thanos and Papadakis, 2012).

In M&A literature and empirical research return on assets (ROA) appears to be the most commonly used accounting-based ratio, as a measure of performance. One of the reasons for that is that ROA is less influenced by biases that other ratios, such as return on equity (ROE) and return on sales (ROS) can suffer from (Meeks and Meeks, 1981; Thanos and Papadakis, 2012).

When using ROA as measure of M&A performance scholars most commonly compare ROA before the M&A transaction, of either the acquiring firm or combination of the target and the acquirer, with ROA of the merged firm after some time. However, this method has received some criticism since the calculation overlooks industry influences. To overcome this criticism some scholars have used industry adjusted ROA where the average industry ROA is subtracted from the firm's ROA (Thanos and Papadakis, 2012).

Although accounting-based measures have their advantages, there are also some limitations to relying only on accounting-based measures for determining the success of M&A's. First, non-financial performance can't be captured using accounting-based measures. Second, accounting-based measures cannot evaluate other M&A motives than economic motives, e.g. personal motives. Third, accounting-based measures measure the overall firm performance, not the performance of single acquisitions. This becomes a notable drawback when firms are involved in more than one M&A transaction in a short period of time. Fourth, since there are many different accounting-based measures used in literature and empirical research, comparison among studies can be difficult. Fifth, the reliability of accounting-based measures is conditional on the quality of the annual financial statements of the firms, which in certain emerging markets can be considered unreliable. Finally, accounting standards may be different from country to country which raises concerns over the comparability of accounting data in cross-national studies (Brouthers, van Hastenburg and van den Ven, 1998; Chang, Witteloostuijn and Eden, 2010; Hayward and Hambrick, 1997; Hult et.al, 2008; Thanos and Papadakis, 2012; Tuch and O'Sullivan, 2007).

2.3 Resource based view and strategic fit

The general hypothesis of M&A success comes from Porter's (1987) idea of strategic fit, that is the acquirer and the target should have similar strategies. However, Porter (1996) has also argued that since strategic position, which is all about diversifying the business strategy from the rivals, can easily be imitated by competitors strategic positioning may no longer be sufficient for competitive advantage but the key rather lies in operational strategic fit. The

strategic fit describes the importance of all activities inside the company matching the overall corporate strategy.

According to resource based view (RBV), introduced by Barney (1991), firm's competitive advantage lies in its resources. The RBV motivation for M&A's is somewhat different from the classical synergy arguments. According to RBV some resources are more valuable to the company due to the fact that it can be difficult or impossible to imitate them, which creates competitive advantage. It has also been shown that similarities in resource allocations indicate similarities in strategies, hence resource allocations provide a rich base for the study of strategic fit between acquiring company and the target and the post-M&A performance outcomes (Beard and Dess, 1981; Galbraith and Kazanjian, 1986).

2.3.1 Synergy and similarities in resource allocations

A common argument is that synergies are achieved through similarities in the business level operations of the target and the acquiring company (Ansoff, 1965). These similarities generate greater economies of both scale and scope and therefore acquisitions of companies with strategies similar to the ones of the acquirer are expected to create significant synergies and thus increase post-M&A performance (Harrison et.al., 1991).

According to Wernerfelt (1984), RBV of company strategy suggests that merged firms with similar levels of resource allocations to certain areas can expect greater post-M&A performance in comparison to merged companies that are broadly different in resource allocation. Similar resource allocations may indicate similar distinctive competencies and/or similar dominant managerial logics (see e.g. Hitt and Ireland, 1985; Grant, 1988)

Regardless of the popularity of the theory of strategic fit empirical evidence concerning relatedness and post-M&A performance is inconsistent. Several studies conclude that M&A's completed to achieve relatedness between acquirer and target leads to higher performance. Kusewitt (1985) concluded that there exists a connection between similarities in industry and financial performance growth. Singh and Montgomery (1987) found that M&A's that are related in terms of product, market and technique generate higher stock returns than unrelated M&A's. According to Ramaswamy (1997) similarities in strategic characteristics, demonstrated by consistency in resource allocation patterns, have positive effect on post-M&A performance. Others have reported different results. Elgers and Clark (1980) concluded that unrelated M&A's generate higher stock returns, for both the acquiring company and the target, compared to related M&A's. According to Swaminathan, Murshed, and Hulland

(2008) both similarities and dissimilarities in strategic emphasis can increase value creation, but under varying M&A motives. Lubatkin (1987) and Lubatkin and O'Neill (1987) found that no particular form of relatedness generated greater financial post-M&A performance. Ritterfeldt and Trygg (2008) and Altunbas and Marqués (2008) both concluded that for some resource allocation factors similarities between the target and the acquirer generate increased post-M&A performance whilst for other factors dissimilarities increased performance. Finally, Harrison et.al. (1991) totally contradict the general hypothesis and propose that dissimilarities in resource allocation generate successful M&A's in terms of post-M&A performance.

2.3.2 Synergy and dissimilarities in resource allocations

According to Barney (1988) synergies might be a necessary condition, but not a sufficient one, to increase value for the acquiring firm. He therefore proposes that unique and private dissimilarities between the target and the acquiring company may create more value than similarities. Unique means that the acquiring company will gain more from the synergies created through the transaction than other bidding companies and private means that the this advantage may only be known by the acquiring firm. In a bidding process the price of the target is based on publicly available information, but to one bidder, where unique dissimilarities are involved, the target is more valuable than to other bidders.

Harrison et.al (1991) claim that uniquely valuable synergy is more likely to appear under dissimilarities than similarities in resource allocation, which is supported by the theory that dissimilarities in strategic characteristics or resource allocation suggest more value increase than by similarities (Barney, 1986).

Due to similar strengths of the bidding companies they acquire similar targets (Porter, 1985). Therefore, similarities of the acquirer and the target imply common knowledge among potential bidders, created through competition. This common knowledge increases the chances of an auction and a bidding war. Dissimilarities in resource allocation however do not imply such common knowledge and thus a bid for a target that has different resource allocations than the bidder may not stir rivals to offer a similar bid and can therefore help avoidance of the winners curse problem (Harrison et.al., 1991; Varaiya, 1988). According to Barney (1988) dissimilarities in resource allocation may increase value creation through either information asymmetry between potential bidders or through uniquely valuable synergy that cannot be imitated by competitors of the bidder. Value creation from resource allocation

dissimilarities may also be associated with complementary competencies of the acquirer and the target, which enhances both learning and development of new capabilities (Harrison et.al, 1991; 2001).

Thus, there are contradicting arguments with respect to synergy creation through M&A's, that is whether similarities or dissimilarities in resource allocation between the target and the acquirer are more appropriate for value creation and post-M&A performance. In this thesis these contradicting arguments are examined.

2.4 Merger waves

Merger waves are characterized as periods of high levels of merger activity followed by periods of relatively fewer transactions. According to research a combination of factors are considered to cause those waves, namely economic, regulatory and technological shocks. Economic growth stimulates companies to expand to meet the quickly increasing demand in the economy and M&A's enables companies to grow faster than with internal, organic growth. Removal of regulatory barriers that might have prevented mergers can induce merger waves. Technological shocks can lead to changes in existing industries or even create new ones, which then again can trigger merger waves (Gaughan, 2002).

According to economists and others five merger waves have taken place in the US since the 1890s. However, there are different opinions about the exact start of the waves and their duration. The first wave is considered to have started sometime between 1893 and 1897 and then came to an end in 1904 with an introduction of antitrust laws. The second merger wave started between 1916 and 1919 and ended in 1929 with the stock market crash and the Great Depression. The main difference between the first and the second merger waves is considered to be that in the first wave the mergers were resulting in monopoly versus in the second wave they were resulting in oligopoly. The third merger wave, often called the conglomerate merger period, does not have as clear ending point as the first two waves. It is considered to have started somewhere between 1955 and 1965 and ended between 1969 and 1973, after the Tax Reform Act in 1969 followed by a crash of conglomerate stocks. The starting point of the fourth merger wave is, as of the third wave, not very exact. Commonly, it is considered to have started in 1984 although its antecedents are believed to stretch back to 1974. The fourth wave was characterized by hostile mergers and takeovers. The wave ended in 1989 when the expansion of the 1980s came to an end with collapse of the junk bond market, savings and loan banks and commercial banks' loan portfolio and capital problems. The starting point of

the fifth wave is clearer than of the waves before where the numbers of M&A transactions started to rise again in 1992 starting a period of strategic mega-mergers that focused on more than quick financial gains. The fifth wave then came to an end in 2000 with the burst of the dot-com bubble (Gaughan, 2002; Lipton, 2006).

In Europe M&A's were not as common until in the 60's with increased independence of economies. However the first truly European wave took place at a similar time as the fourth wave in the US, starting in 1987 with the number of domestic transactions tripling from 1986 to 1989. The wave ended in 1991 with a recession in most European countries decreasing the volume of transactions considerably (Mariana, 2013). The next M&A wave in Europe started a little bit later than the fifth wave in the US, but in that wave M&A activity in Europe was on similar level as in the US. This was also the first truly global wave. The main drivers behind the increase in M&A's in Europe in the 1990s are believed to be the adoption of the Euro, the globalization process, technological innovation, deregulation and privatization, and the boom in financial markets (Mariana, 2013; Martynova and Renneboog, 2006).

Gaughan (2011) and others have claimed that the relatively short but intensive period of 2003-2007 can be considered as the sixth merger wave, which was truly globalized. This period is characterized by low interest rates which fuelled international speculative bubble in real estate and stock markets. Due to the low interest rates leveraged acquisitions became less expensive which expanded the activities of private equity firms which fuelled the demand for M&A targets. The sixth wave then came to a rapid end when the subprime crisis started in 2007.

In M&A waves there is a tendency for companies to overinvest in M&A's since it is important to not fall behind and possibly be overtaken. That can lead to bad investments that do not generate synergies. As a result, studies done using a sample in M&A waves might be biased by those inefficient investments, compared to studies that use samples from conservative time periods (Ritterfeldt and Trygg, 2008).

2.5 Corporate governance systems

Corporate governance is a relatively new term, first used approximately twenty years ago. However, the theories underlying the concept of corporate governance and the areas it involves are much older and come from different fields of studies, including finance, economics, accounting, law, management and organizational behavior. The main theories that

have been associated with the development of corporate governance are; agency theory, separation of ownership and control, transaction cost economics and stewardship theory. The development of corporate governance is global and is therefore an intricate area including structural differences such as legal, cultural and ownership. Consequently, some theories underlying corporate governance may be more relevant in some countries than others, depending on what stage of the development a country, or group of countries, is at (Mallin, 2013).

There is a disagreement on which corporate governance mechanisms are good and which are bad. By many, US and UK, along with Germany and Japan, are considered to have the best corporate governance systems in the world and the differences between them are believed to be relatively small compared to their differences from other countries (Shleifer and Vishny, 1997).

Corporate governance is often divided into the Anglo-American model and the Continental European model. The Anglo-American model is characterized by financing through equity, dispersed ownership, active markets for corporate control, and flexible labor markets whereas the Continental European model is defined by long-term debt financing, large blockholders' ownership, usually an individual or a family, weak markets for corporate control and stiff labor markets (Becht and Röell, 1999; Berglöf, 1991; Hall and Soskice, 2001; La Porta, Lopez-de-Silanes, Shleifer and Vishny, 1998).

US markets are well developed and have a diversified shareholder base that includes both institutional investors and individuals. But US also suffers from many of the agency problems associated with the separation of ownership and control. Not having a specific governance code as many other countries makes the US unusual to some extent. Over the years there have been various state and federal developments in corporate governance. However, some developments have indicated national developments (Mallin, 2013).

Corporate governance in the UK is more related to the US than to the rest of Europe. Markets in the UK are, like in the US, well developed and with a diversified shareholder base (Mallin, 2013). Although corporate governance structure in the UK and the US are similar in many ways there are also some differences, e.g. ownership is less engaged in the US than in the UK, dual leadership is common in the UK and rare in the US and there are stronger regulations in the US, like hostile takeover regulation (Aguilera, Williams, Conley and Rupp, 2006; Toms and Wright, 2005). Compared to US and UK, companies in Continental Europe are

characterized by weaker investor protection, less developed capital markets and more concentrated ownership structure where owners are more able to exercise direct control and can thus operate in context with fewer market-oriented rules for disclosure (Aguilera and Jackson, 2003; Faccio and Lang, 2002; La Porta et.al, 1998).

The main difference between corporate governance systems in the US and Europe, especially continental Europe, is that in the US the market oriented shareholder perspective is dominant whereas the market is network oriented in Europe. In US the focus is on short-term returns and maximization of shareholder value where the ownership is dispersed. In Europe on the other hand there are few controlling owners, often a family, that focus more on a long-term investment perspective (Clarke, 2007; Ritterfeldt and Trygg, 2008). On average, firms with few controlling owners are better managed than firms with dispersed ownership since concentrated ownership lessens the chance of agency problem because the controlling owner and the manager are often the same person, especially in family-controlled firms (Enriques and Volpin, 2007).

The influence of corporate governance on M&A performance has not received a great deal of academic research (Hagendorff, Collins and Keasey, 2007). To the author's notice no theoretical papers, on the effects of different corporate governance structures on M&A performance, have been published. However, empirical studies on M&A performance have found different results depending on the geographical area the studies are conducted in, which could, at least partly, be attributable to different corporate governance systems. Harrison et.al (1991) and Ritterfeldt and Trygg (2008) conducted a similar study in the US and Europe, respectively, where Harrison et.al found that dissimilarities in resource allocation have positive effect on post-M&A performance but Ritterfeldt and Trygg found more mixed results, where depending on the resources either similarities or dissimilarities in resource allocation positively affect M&A performance. Trying to explain these inconsistent results Ritterfeldt and Trygg suggested that it might be more difficult in Europe, than in the US, to merge with a company with different resource allocations since resource allocation difference might be larger in Europe, even too large, creating dis-synergies which can prevent the possible skill and efficiency transfer. Further, Ritterfeldt and Trygg suggest that differences in resource allocation rather have positive effect on M&A performance in the US whilst the effects are negative in Europe suggesting that similarities, rather than dissimilarities, increase post-M&A performance in Europe. However, not all previous empirical studies support the idea of Ritterfeldt and Trygg, that different corporate governance systems have different

effects on post-M&A performance. Ramaswamy (1997) and Altunbas and Marqués (2008) studied post-M&A performance of banks in the US and Europe, respectively where Ramaswamy concluded that similarities in resource allocation increase post-M&A performance whilst the results of Altunbas and Marqués were in line with the results of Ritterfeldt and Trygg, that is mixed results.

Thus, giving the lack of academic research on corporate governance and M&A performance and inconsistent results of empirical results under same corporate governance it is difficult to conclude what effects corporate governance structure has on post-M&A performance. This gives an opportunity for further research in the future to gain a better understanding of M&A performance and what enhances the possibility of successful M&A's.

3. Methodology

The methodology of this thesis is based on a study by Harrison et.al. (1991) and a thesis by Ritterfeldt and Trygg (2008). The dataset consists of longitudinal data, that is for each set of companies the performance is measured at two points in time; the combined performance of the acquirer and the target before the M&A transaction, and then again the performance of the merged company after the transaction.

The thesis uses deductive approach to tests some contradicting arguments from previous studies of resource allocation and post-M&A performance. Multiple linear regression analysis is then used to determine the exact relationship between the explanatory variables chosen and post-M&A performance.

3.1 Multiple linear regression

Classical linear regression (CLR) describes the relationship between a dependent variable and one or more explanatory variables and an error term, that is the CLR explains how movements in variables affect movements in another variable. The multiple linear regression (MLR), shown in equation 3.1, is an extension of the CLR, where changes in the dependent variable are explained by two or more explanatory variables (Brooks, 2008).

Equation 3.1: Multiple linear regression

$$y = \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k + \varepsilon$$

The most commonly used method to estimate linear regressions is ordinary least squares (OLS) which fits a line through the regression points so that that the sum of squared error terms is minimized. However, for the OLS estimator to be the best linear unbiased estimator (BLUE) the assumptions of the Gauss-Markov theorem, presented below, need to hold (Brooks, 2008; Cameron and Trivedi, 2005; Thomas, 1997).

Assumption I - Error terms have zero mean. The average value of the error terms is assumed to be zero, $E[\varepsilon_i] = 0$. However, this assumption is never violated as long there is a constant included in the regression model.

Assumption II - Homoscedasticity. The variance of the error terms is assumed to be constant and finite for all sets of explanatory variables, $\text{var}(\varepsilon_i) = \sigma^2$. If the error terms do not have constant variance, it is said that they are heteroscedastic. A common test for heteroscedasticity

is White's test. If heteroscedasticity is present in the error terms the standard errors of the coefficient estimates will be wrong and hence statistical inferences based on those standard errors will be wrong. To correct for heteroscedasticity it is common to use White's robust standard errors, which for errors that are positively related to the squares of the explanatory variables the standard errors are increased which requires more evidence against the null hypothesis before it can be rejected.

Assumption III - No autocorrelation. The covariance between error terms is assumed to be zero, $\text{cov}(\varepsilon_i, \varepsilon_j) = 0$. For cross-sectional data there is usually no autocorrelation present, whilst autocorrelation is quite common problem in time series analysis. A commonly used test for detecting autocorrelation is the Breusch-Godfrey test that tests jointly for up to r^{th} order autocorrelation. If autocorrelation is present Newey-West standard errors can be used, but they correct for both autocorrelation and heteroscedasticity by adjusting the standard errors in a similar way as the White's robust standard errors. **Assumption IV - Non-stochastic explanatory variables.** The explanatory variables and the error terms are assumed to be independent, or exogenous, $\text{cov}(\varepsilon_i, x_i) = 0$. If the explanatory variables are correlated with the error term, the OLS estimates will be biased and inconsistent. This results from the estimator assigning explanatory power to the variables when actually the explanatory power arises from the correlation between the error term and the dependent variable. When the problem of endogeneity is present the regression estimates only measure the magnitude of the relationship between the variables but not the direction of causation. The use of instrumental variables provides a way to obtain consistent parameter estimates when dealing with the endogeneity problem.

To be able to make valid inferences about the population parameters from the sample parameters a fifth assumption is required.

Assumption V - Normality. The error terms are normally distributed, $\varepsilon \sim N(0, \sigma^2)$. Even though economic and financial data is often non-normally distributed this assumption generally holds for sufficiently large samples. The most common test for normality is the Bera-Jarque (BJ) test which determines the skewness and excess kurtosis of the distribution, whereas the normal distribution has no skewness and kurtosis of three. For large data samples, the violation of this assumption has insignificant effect due to Central Limit Theorem which states that test statistics asymptotically follow the appropriate distribution, even if the error

terms are not normally distributed. However, if the error terms do not follow a normal distribution in small samples the estimated parameters will not follow a normal distribution which complicates the parameter interpretation (Brooks, 2008).

Finally, when estimating a regression using OLS an assumption about no multicollinearity has to be made. This assumption indicates that none of the explanatory variables are perfectly correlated with one another. However, this assumption does not imply that the explanatory variables can't be correlated in any way, just that they can't be in an exact relationship with one another. If the explanatory variables are highly correlated it is not possible to estimate all of the model's coefficients separately and the regression estimation yields a high R^2 value, even when the explanatory variables are not statistically significant. Another problem that appears in the presence of multicollinearity, is that when adding or removing variables from the regression model causes the coefficient estimates to change intensely. A way to detect multicollinearity is to conduct a correlation matrix of the explanatory variables and check whether there is a high correlation between any of them. A number of estimation techniques have been proposed that are valid in the presence of multicollinearity, e.g. principal components. Many researchers have however argued against those techniques as they can be complex and their properties are not as well understood as those of the OLS estimator. Further, many econometrics have argued that multicollinearity is more of a problem with the data than the model or estimation method and have thus proposed more ad hoc methods, such as ignoring the problem, drop one of the collinear variables, transform the correlated variables into a ratio to use instead of the variables separately or try to increase the size of the dataset by collecting more data (Brooks, 2008; Wooldridge, 2003).

3.2 Data collection

The data on M&A transactions is collected through the *Thomson Reuters Eikon* database, for the time period 2003-2007, which is the latest merger wave. Then the dataset is further restricted by implantation of the following restrictions:

1. To make the results comparable to the contradicting results of previous studies only transactions where the acquirer is registered in the United States (US) or Europe is chosen.
2. Only M&A's where the acquirer obtained majority of the control, that is 50% or more, are taken into account. Transactions where only minority of the control is

acquired are not assumed to have significant effect on performance and are therefore ignored.

3. To eliminate small targets and transactions both acquiring and target companies are restricted to public companies since those companies are believed to be of significant size and importance and thus having influence on the post performance. Since annual reports of public companies are supposed to be publicly available this restriction should ensure availability of the variables needed.
4. M&A transactions that were classified as investments or reorganizations are excluded from the sample since the goals of these transactions are in a way different, that is no significant synergy effects are expected.
5. To be able to allocate the performance change to a specific M&A transaction both acquirers and targets involved in more than one transaction during the study period are eliminated from the sample. Companies that engaged in any other M&A transactions three years before and/or after the transaction are eliminated for the same reason. It can be claimed that three years is not enough time for synergies to fully emerge but the time frame had to be limited to get large enough sample size since a relative amount of the companies were involved in other transactions beyond the three year time frame (Ramaswamy, 1997; Ritterfeldt and Trygg, 2008).

After those restrictions have been implemented the data sample consists of 186 M&A transactions, 128 from the US and 58 from Europe. For the companies involved in those transactions the income statements and balance sheets, available from *S&P Capital IQ*, are gathered. Although the dataset is restricted to only public companies the finance statements were not available for all the 128 transactions. In some cases the merged company went bankrupt shortly after the merger whilst in other cases the finance statements were not available due to unknown reasons. As a result, the final sample consists of 86 M&A transactions, 55 from the US and 31 from Europe. List of the companies that compose the final sample can be found in Appendix A. *Microsoft Office Excel* is then used to calculate the dependent and explanatory variables, described below, using the relevant numbers from the companies' annual statements.

3.3 Dependent variable

Like discussed earlier M&A performance can be evaluated using number of measures which can be divided in to three groups; shareholder return, financial performance, or accounting-

based measures, and product market performance. The almost endless possibilities to measure M&A performance have been mentioned as a factor for inconsistencies in results of empirical researches of M&A's. Comparison of studies that use different measures has also been found difficult (Meglio and Risberg, 2011).

Previous studies of M&A and resource allocation have used different accounting-based ratios as a measure of performance. However it seems that ROA is the most commonly used accounting-based measure where Harrison et.al (1991), Ritterfeldt and Trygg (2008) and Ramaswamy (1997) all used ROA as performance measure whilst Altunbas and Marqués (2008) used ROE. Since this study is a replication of previous studies by Harrison et.al and Ritterfeldt and Trygg, this study uses the same dependent variable as those replicated studies, namely, the change in ROA. This will also make it more appropriate to compare the results of the study to those of the replicated ones.

The change in ROA is calculated according to Equation 3.2 below.

Equation 3.2: Calculation of dependent variable, ΔROA

$$\Delta ROA = ROA_{t+5}^{merged} - (ROA_{t-1}^{Acquirer} + ROA_{t-1}^{Target})$$

Following Harrison's et.al. (1991) assumptions, it is suggested that up to five years is a reasonable time for the M&A transaction to become successful and create synergies. Therefore the post-M&A performance is measured five years after the M&A transaction, using the merged company's ROA. The pre-M&A performance is based on the combined ROA from the acquiring company and the target company from the companies' last annual report before the M&A announcement. The use of last annual report before M&A announcement instead of before the transaction itself can be explained by an argument from Coffee, Lowenstein, and Rose-Ackerman (1988) that the companies might take on some defensive actions, especially for hostile takeovers, after the announcement that can affect the annual reports.

3.4 Explanatory variables and hypotheses

In their study, Harrison et.al. (1991) use resource allocation on capital intensity, administrative intensity, interest intensity, and R&D intensity as explanatory variables. Those variables are chosen due to the fact that they refer to allocations that strategic managers can significantly influence and that each resource has strategic implications. Ritterfeldt and Trygg

(2008) further extended the set of explanatory variables, using variables that, at least in some way, reflect management strategic intention. These variables are; cost of goods sold, financial items, inventories, current assets, working capital, property, plant and equipment, long-term debt and employees. Out of those explanatory variables, financial items and employees were found to be statistically insignificant. To test whether there is a relationship between resource allocation, corporate culture and post-M&A performance they also added the control variables, industry and country as corporate culture measurements (van Oudenhoven and van der Zee, 2002; Teerikangas and Very, 2006). Based on those previous studies and their results the following variables are chosen as explanatory variables for this study:

- Capital intensity
- Cost of goods sold
- Current assets
- Interest expense
- Inventories
- Long-term debt
- Property, plant and equipment
- Selling, general and administrative expenses
- Working capital
- Industry
- Country

Below, definitions of the variables are given as well as motivations for their use together with their related hypotheses tested.

Capital intensity (CI) refers to the assets needed to keep the current revenue, where assets are the economic resources owned and controlled by the company that will generate future revenue (Palepu, Healy, Bernandr and Peek, 2007). CI is heavily related with the company's industry (Bartels et.al, 2006). According to Ritterfeldt and Trygg (2008) dissimilarities in CI between the acquiring company and the target company allow for efficiency improvements with better utilization of assets. On the other hand, Porter's (1987) of strategic fit indicates that similarities in CI should create better synergies and thus increase post-M&A performance. Weiguo and Ming (2008) also argue that dissimilarities could result in inefficiency transfer and thus decrease performance.

Equation 3.3: CI
$$CI = \frac{Assets}{Revenue}$$

CI H₀: Dissimilarities in CI values of the acquiring company and the target company have positive effect on post-M&A performance (ROA)

CI H₁: Similarities in CI values of the acquiring company and the target company have positive effect on post-M&A performance (ROA)

Cost of goods sold (COGS) refers to costs related to the production of goods (and/or service) sold and measures the company's production efficiency (Palepu et.al, 2007). According to Chandler (1990) dissimilarities between the acquirer's and the target's COGS values increases the bargain power for one company, if the companies offer similar products or services. Even though the companies offer different products or services synergies can be expected through economies of scope. However, according to Altunbas and Marqués (2008) integrating companies with different cost structures can be difficult, especially in the short term, resulting in negative effects on post-M&A performance.

Equation 3.4: COGS
$$COGS = \frac{Revenue - GrossProfit}{Revenue}$$

COGS H₀: Dissimilarities in COGS values of the acquiring company and the target company have positive effect on post-M&A performance (ROA)

COGS H₁: Similarities in COGS values of the acquiring company and the target company have positive effect on post-M&A performance (ROA)

Current assets (CA) refers to short term assets that are expected to be liquidated within a year, e.g. cash holdings, accounts receivable and inventory (Palepu et.al, 2007). Ritterfeldt and Trygg (2008) state that dissimilarities in CA, between the acquiring company and the target company, indicate that either of the companies is more efficient than the other and due to skill and efficiency transfer positive effects on post-M&A transfer should be expected. On the other hand, the more efficient company could in the same way adopt the inefficiency from the less efficient firm, resulting in negative effects on post-M&A performance, indicating that similarities in CA would rather increase performance (Weiguo and Ming, 2008).

Equation 3.5: CA
$$CA = \frac{CurrentAssets}{Assets}$$

CA H₀: Dissimilarities in CA values of the acquiring company and the target company have positive effect on post-M&A performance (ROA)

CA H₁: Similarities in CA values of the acquiring company and the target company have positive effect on post-M&A performance (ROA)

Interest expense (IE) can be defined as the cost of debt and defines by a large extent the debt capacity (Harrison et.al., 1991). Both the companies' use of debt and unused debt capacity can be defined as resource (Modigliani and Miller, 1958; Donaldson, 1961). According to Harrison et.al (1991) dissimilarities in interest expense are positively related to post-M&A performance due to complementary synergies. On the other hand, according to Porter's (1987) idea of strategic fit and Weiguo and Ming's (2008) argument of inefficiency transfer, similarities in IE should rather increase post-M&A performance.

Equation 3.6: IE
$$IE = \frac{InterestExpense}{Revenue}$$

IE H₀: Dissimilarities in IE values of the acquiring company and the target company have positive effect on post-M&A performance (ROA)

IE H₁: Similarities in IE values of the acquiring company and the target company have positive effect on post-M&A performance (ROA)

Inventories (INV) is the combined value of raw materials, work in progress and finished goods that the possessed by the company (Palepu, et.al). This value, the amount of capital tied up in inventories, should be minimal (Stevenson, 2006). As for CA it can be argued that dissimilarities result in skill and efficiency transfer and therefore positive effects on post-M&A performance (Ritterfeldt and Trygg, 2008) or in the same way, inefficiency transfer resulting in negative effects on performance (Weiguo and Ming, 2008).

Equation 3.7: INV
$$INV = \frac{Inventories}{Assets}$$

INV H₀: Dissimilarities in INV values of the acquiring company and the target company have positive effect on post-M&A performance (ROA)

INV H₁: Similarities in INV values of the acquiring company and the target company have positive effect on post-M&A performance (ROA)

Long-term debt (LTD), which often is secured with long-term assets like PPE, refers to the company's leverage and to what extent the company finances its operations (Palepu et.al, 2007). In most cases LTD is cheapest way for a company to finance its operations (Pike and Neale, 1993). Ritterfeldt and Trygg (2008) state that if there are dissimilarities in LTD of the acquirer and the target company the merged company can allocate the debt in the most favorable way, due to efficiency transfer. However, according to Porter's (1987) idea of strategic fit and Weiguo and Ming (2008) argument of inefficiency transfer, similarities in LTD should rather increase post-M&A performance.

Equation 3.8: LTD
$$LTD = \frac{LongTermDebt}{Assets}$$

LTD H₀: Dissimilarities in LTD values of the acquiring company and the target company have positive effect on post-M&A performance (ROA)

LTD H₁: Similarities in LTD values of the acquiring company and the target company have positive effect on post-M&A performance (ROA)

Property, plant and equipment (PPE) refers to fixed long-term assets that are illiquid. Those assets are associated with low risk but due to large amount of tied up capital they should be minimized to achieve the highest ROA (Palepu et.al, 2007). According to Ritterfeldt and Trygg (2008) dissimilarities in PPE indicate that the less efficient company can adopt practices from the more efficient company and thus downsize its assets having positive effect on post-M&A performance. On the contrary, transfer of inefficiency could have negative effect on performance indicating that similarities would rather increase post-M&A performance (Weiguo and Ming, 2008).

Equation 3.9: PPE
$$PPE = \frac{Property, Plant \& Equipment}{Assets}$$

PPE H₀: Dissimilarities in PPE values of the acquiring company and the target company have positive effect on post-M&A performance (ROA)

PPE H₁: Similarities in PPE values of the acquiring company and the target company have positive effect on post-M&A performance (ROA)

Selling, general and administrative expenses (SGA) (or overhead) refers to costs related to overhead activities such as marketing and administrative work. According to Harrison et.al (1991) dissimilarities in SGA values of the acquirer and the target have positive effect on

post-M&A performance due to complementary competencies. On the other hand, according to Ramaswamy (1997) dissimilarities in operational efficiency (measured by overheads to revenues) have negative effect on post-M&A performance.

Equation 3.10 SGA $SGA = \frac{SGAexpenses}{Revenue}$

SGA H₀: Dissimilarities in SGA values of the acquiring company and the target company have positive effect on post-M&A performance (ROA)

SGA H₁: Similarities in SGA values of the acquiring company and the target company have positive effect on post-M&A performance (ROA)

Working capital (WC) represents the liquidity of the company, that is, current assets exceeding current liabilities. For companies to be able to operate they need to invest a certain amount in working capital (Palepu et.al, 2007). The same arguments can be asserted for WC as for CA and INV, whereas dissimilarities in WC can result in either efficiency transfer (Ritterfeldt and Trygg, 2008) or inefficiency transfer (Weiguo and Ming, 2008).

Equation 3.11: WC $WC = \frac{CurrentAssets - CurrentLiabilities}{Assets}$

WC H₀: Dissimilarities in WC values of the acquiring company and the target company have positive effect on post-M&A performance (ROA)

WC H₁: Similarities in WC values of the acquiring company and the target company have positive effect on post-M&A performance (ROA)

According to van Oudenhoven and van der Zee (2002) dissimilarities in corporate culture, between the target and the acquirer, result in increase in post-M&A performance. That is, amongst other, based on Barney's (1988) notion that cross border M&A's allows companies to access new strategic resources and should therefore be successful. Others have blamed cultural differences for the high failure rate of M&A's (see e.g. Chatterjee, Lubatkin, Schweiger and Weber, 1992; Nahavandi and Makekzadeh, 1988; Weber 1996). Following Ritterfeldt and Trygg (2008), the control variables industry and country, are used as proxies for corporate culture to allow for quantification and measure.

Industry (IND) is a dummy variable taking the value 1 if the acquiring company and the target company operate in different industries and 0 if they are in similar industries.

IND H₀: Acquiring company and target company belonging to different industries increases post-M&A performance

IND H₁: Acquiring company and target company belonging to similar industries increases post-M&A performance

Country (COU) is a dummy variable taking the value 1 if the acquirer and the target are registered in different countries and 0 if they are registered in the same country.

IND H₀: Acquiring company and target company registered in different countries increases post-M&A performance

IND H₁: Acquiring company and target company registered in the same country increases post-M&A performance

Geographical Area (AREA) is a dummy variable used to separate the total sample into two subsamples, the US and Europe. The variable takes the value 1 if the acquiring company is registered in the US and 0 if the acquirer is located in Europe.

All the explanatory variables, except the three dummy variables, are in the absolute difference between the acquiring company and the target, based on the companies' last annual report before the M&A announcement. Equation 3.12 gives an example of how the variables are calculated and CI is then replaced for the other explanatory variables.

Equation 3.12: Calculation of explanatory variables

$$|CI| = \left| CI_{t-1}^{acquirer} - CI_{t-1}^{target} \right| = \left| \left(\frac{Assets}{Revenue} \right)^{acquirer} - \left(\frac{Assets}{Revenue} \right)^{target} \right|$$

Finally, the study's regression equation, defined in Equation 3.13, is estimated using *Eviews*.

Equation 3.13: Regression equation

$$\begin{aligned} \Delta ROA = & \beta_0 + \beta_1 |CI| + \beta_2 |COGS| + \beta_3 |CA| + \beta_4 |IE| + \beta_5 |INV| + \beta_6 |LTD| \\ & + \beta_7 |PPE| + \beta_8 |SGA| + \beta_9 |WC| + \beta_{10} |IND| + \beta_{11} |COU| + \varepsilon \end{aligned}$$

3.5 Methodology criticism

Firstly, the data sample at hand is rather small since it only includes companies that were involved in an M&A transaction in the sixth merger wave, from 2003 to 2007, and the acquirer is registered in either the US or Europe. Since the data is solely gathered from *S&P*

Capital IQ the sample size is further decreased due to unavailability of the annual statements for part of the companies involved, for unknown reasons. Unfortunately a small dataset can cause some empirical problems and diminishes the validity of the results.

Secondly, since some restrictions were applied on the dataset the results may be affected by sample selection bias which occurs when non-randomly selected samples, where subsets of the data are systematically excluded, are used in a study. When sample selection bias is present it can distort the results and affect the statistical significance of tests (Heckman, 1979).

Finally, the explanatory variables CI and PPE only consider assets that are owned and controlled by the firm and does not include any off-balance financing such as leasing. Companies' preference for off-balance has a large impact on these variables, but it also affects ROA. Therefore it can be argued to be questionable to use ROA as a performance measure when it can be increased by choosing to use off-balance financing. However, it is unlikely that the studied companies would change their financing strategy dramatically during the years between the performance measurements and thus the impacts on change in ROA should not be significant (Ritterfeldt and Trygg, 2008).

4. Empirical Results and Analysis

4.1 Descriptive statistics

Table 4.1: Descriptive statistics of variables

	Mean	Median	Std. dev.
Dependent variable			
<i>ΔROA</i>	0.13458	-0.01736	1.14905
Explanatory variables			
<i>CI</i>	12.11829	0.96979	72.81668
<i>COGS</i>	0.20431	0.03466	0.74157
<i>CA</i>	0.18233	0.07068	0.31713
<i>IE</i>	0.33433	0.00900	1.86965
<i>INV</i>	0.03416	0.00263	0.07847
<i>LTD</i>	0.60745	0.10046	3.51774
<i>PPE</i>	0.14174	0.03758	0.31709
<i>SGA</i>	0.73768	0.10471	3.89958
<i>WC</i>	0.43555	0.12096	1.63246

Table 4.1 shows the descriptive statistics of both the dependent variable and the explanatory variables, except for the dummy variables¹. As can be seen, the variables are different in size, where especially CI is a great deal larger than the other variables. When variables differ much in size it is often preferred to standardize the variables to make their scale irrelevant and make the interpretation of the coefficient slopes easier. Using standardized variables does not however affect the regression's statistical significance and probabilities which makes the results comparable with studies that use unstandardized variables (Woolridge, 2005). Therefore, all the dependent variables are standardized according to Equation 4.1.

Equation 4.1: Standardized variables

$$y^* = \frac{y_i - \bar{y}}{\hat{\sigma}_y}$$

The data is also tested for the assumptions of the Gauss-Markov theorem. Like stated in Chapter 3.1 the assumption of the error terms having a zero mean is never violated as long as there is a constant included in the regression model, as is the case in this study. The second assumption, the assumption of homoscedasticity, is tested using a White's test. According to the results of the White's test, found in Appendix B, the H_0 of homoscedasticity cannot be rejected, indicating that the problem of heteroscedasticity is not present. Even though autocorrelation is usually not present in cross-sectional data the assumption of no

¹ The dummy variables are IND, COU and AREA.

autocorrelation, up to the 10th order, is tested using Breusch-Godfrey test. Appendix C shows the results of the Breusch-Godfrey test, where it can be seen that the H_0 of no autocorrelation cannot be rejected which indicates that the error terms are not correlated. To test the fourth assumption, the assumption of non-stochastic explanatory variables, it is tested whether the covariance between the error term and each of the dependent variables is equal to zero. In Table 4.2 it can be seen that the covariance between the error term (e) and each of the explanatory variables is equal to zero, indicating that all the explanatory variables are exogenous or stochastic.

Table 4.2: Covariance between error term (e) and explanatory variables

Covariance		
$cov(e, CI)$	=	0.00
$cov(e, COGS)$	=	0.00
$cov(e, CA)$	=	0.00
$cov(e, IE)$	=	0.00
$cov(e, INV)$	=	0.00
$cov(e, LTD)$	=	0.00
$cov(e, PPE)$	=	0.00
$cov(e, SGA)$	=	0.00
$cov(e, WC)$	=	0.00

The last assumption, the assumption of normality is tested using a Bera-Jarque test. The test's results are shown in Appendix D. It can be seen from the results that we reject the H_0 of normally distributed error terms. As mentioned earlier this can complicate the parameter inference since the data sample is relatively small and therefore the parameters have to be interpreted with caution.

Table 4.3: Correlation matrix

	CI	COGS	CA	IE	INV	LTD	PPE	SGA	WC	IND	COU	AREA
CI	1											
COGS	0.010	1										
CA	-0.039	0.105	1									
IE	0.980	0.056	-0.004	1								
INV	-0.055	-0.026	0.054	-0.054	1							
LTD	-0.019	-0.005	0.789	-0.002	-0.042	1						
PPE	-0.041	0.102	0.671	-0.021	-0.062	0.800	1					
SGA	0.982	0.070	-0.021	0.965	-0.040	-0.015	-0.025	1				
WC	-0.012	0.034	0.859	0.015	-0.043	0.973	0.807	-0.004	1			
IND	-0.091	-0.057	0.241	-0.056	0.114	0.130	0.224	-0.072	0.160	1		
COU	-0.036	-0.010	0.047	-0.015	0.094	-0.050	-0.008	-0.050	-0.054	0.125	1	
AREA	0.081	0.045	-0.108	0.074	0.028	0.075	-0.035	0.081	0.082	-0.228	-0.327	1

Highly correlated variables are marked in bold

A correlation matrix of the explanatory variables is used to determine whether the assumption of no multicollinearity holds. The correlation matrix is shown in Table 4.3. It can be seen

that none of the explanatory variables are perfectly correlated². However, some of the variables are highly correlated (marked in bold), with correlation coefficient higher than 0.8 which indicated a problem of near multicollinearity. Like mentioned in Chapter 3.1, near multicollinearity is often said to be more of a problem with the data than with the model, that is the data set contains insufficient information to obtain estimates for all the coefficients separately (Brooks, 2008). Due to the limited data set at hand the possibility of collecting more data is not available in this case. Even though near multicollinearity is present the BLUE properties of the OLS estimator are not affected, that is it will still be consistent, unbiased and efficient. However, near multicollinearity makes the confidence intervals for the parameters very wide and significance tests might therefore give inappropriate conclusions and thus, make it difficult to make sharp inferences (Brooks, 2008).

4.2 Empirical results

The empirical results of this study are presented in Table 4.4. In the first column all 86 observations, from both the US and Europe, are used. Out of the explanatory variables, none are statistically significant at the 1% significance level, although Capital intensity (CI) and Property, plant and equipment (PPE) are statistically significant at the 5% significance level, and Interest expense (IE) and Working capital (WC) are statistically significant at the 10% significance level. Other explanatory variables do not have significant effect on the change in Return on assets (ROA).

The dummy variable AREA, which takes the value 1 if the acquirer is located in the US and 0 if the acquirer is located in Europe, is not statistically significant. That indicates that there is no difference between the samples from the US and Europe. Even so, the two samples, the 55 observations from the US and the 31 observations from Europe, are also estimated separately. The second column of Table 4.4 shows the empirical results for US whilst the empirical results for Europe can be found in the third column of the same table. As can be seen, the results for the US and Europe are somewhat different in regards of significance and signs, even though the insignificance of the AREA variable indicates that there is no difference.

² Variables are perfectly correlated if the correlation coefficient is equal to one.

Table 4.4: Empirical results

	All	US	Europe
<i>C</i>	0.0585	0.2062 ***	0.0894
<i>CI</i>	-0.8830 **	0.3264	-1.6833
<i>COGS</i>	-0.0453	0.0318	-1.3192 ***
<i>CA</i>	0.0214	0.0542	0.1369
<i>IE</i>	0.4665 *	0.6390 **	1.5837 *
<i>INV</i>	-0.0633	-0.0508	0.0135
<i>LTD</i>	0.3148	0.0252	-0.0405
<i>PPE</i>	0.1898 **	0.3115 ***	0.0785
<i>SGA</i>	0.4463	-0.9513 *	1.3653 ***
<i>WC</i>	0.5634 *	0.7244 **	-0.6291
<i>IND</i>	-0.0339	0.0194	-0.2651
<i>COU</i>	0.0068	-0.2585	-0.0735
<i>AREA</i>	0.1403		
<i>R²</i>	0.8778	0.9533	0.5871

*** Significant at 1% significance level
 ** Significant at 5% significance level
 * Significant at 10% significance level

For the US, only Property, plant and equipment (PPE) is significant at the 1% significance level, Interest expense (IE) and Working capital (WC) are significant at the 5% significance level and Selling, general and administrative expenses (SGA) is significant at the 10% significance level. For Europe on the other hand Cost of goods sold (COGS) and Selling, general and administrative expenses (SGA) are significant at the 1% significance level and Interest expense is significant at the 10% significance level. In Chapter 4.3 the statistically significant explanatory variables are analyzed further in regards of theory and previous researches. Since the other variables do not provide statistical evidence of their influence on the change on return on assets (ROA) they cannot be analyzed any further. However, due to the apparent problem of multicollinearity the following analysis must be taken with caution since the significance test might give inappropriate results which then makes it harder to draw firm conclusions.

4.3 Analysis

The signs of the coefficients of the explanatory variables indicate whether similarities or dissimilarities in resource allocation, in the given variable, generate a positive effect on the post-M&A performance, ROA. Negative coefficients imply that similarities generate positive change in ROA whilst positive coefficients imply that dissimilarities in resource allocation positively affect post-M&A ROA.

Capital intensity (CI) is statistically insignificant for both the US and Europe separately. However, for the whole sample CI is statistically significant at the 5% significance level. The coefficient is -0.8830 for each standard deviation difference in CI which implies that one standard deviation in difference between the acquirer and the target CI increases post-M&A performance by 0.8830 standard deviations of ROA. This supports the H_0 hypothesis that dissimilarities in CI values of the acquiring company and the target company have positive effect on post-M&A performance. This result is in line with Harrison et.al. (1991) which concluded that uniquely valuable synergy is more likely to appear under dissimilarities in resource allocation.

Cost of goods sold (COGS) is not statistically significant for the US, but significant at the 1% significance level for Europe. The slope of the coefficient is -1.3192 for each standard deviation difference in COGS. This implies that one standard deviation in difference between the acquirer and the target COGS generates a negative effect on the post-M&A ROA by 1.3192 standard deviations of ROA. This supports the H_1 hypothesis that similarities in COGS values of the acquiring company and the target company have positive effect on post-M&A performance, which is further supported by results of Altunbas and Marqués (2008). They concluded that different cost structures could induce difficulties in mergers, especially in the short-term, that could cause post-M&A performance to drop. Even though the dummy variable, AREA, is found insignificant there is a difference in the results between the US and Europe, when estimated separately. Despite the fact that the results have to be taken with caution these results might be associated with the difference in corporate governance systems. As Ritterfeldt and Trygg (2008) argued, corporate governance systems in Europe are more heterogeneous than in the US, which might make it more difficult to merge with a company with different resource allocations and thus differences in COGS are more likely have negative effect on post-M&A performance in Europe.

Current assets (CA) is statistically insignificant for both the US and Europe, as well as the whole sample. The effects of CA on change in ROA can therefore not be analyzed further. However, according to these results, it seems reasonable to assume that neither similarities nor dissimilarities in CA, between acquirer and target, affect post-M&A performance. However, Ramaswamy (1997), Ritterfeldt and Trygg (2008) and others have found that similarities in CA have a positive effect on post-M&A performance.

Interest expense (IE) is statistically significant at the 5% significance level for the US and at the 10% level for Europe. For both samples the coefficient is positive, 0.6390 for the US and 1.5837 for Europe. This indicates that for the US each standard deviation in the difference between IE of the acquirer and the target increases post-M&A performance by 0.6390 standard deviations of ROA whilst the increase is higher for Europe where post-M&A ROA increases by 1.5837 standard deviations of ROA for each standard deviation in the difference between the acquirer and the target. The positive coefficients for both samples supports the H_0 hypothesis that dissimilarities in IE values of the acquiring company and the target company have positive effect on post-M&A performance. This result is further supported by the theory of complementary synergies and previous research by Harrison et.al (1991).

Both Inventories (INV) and Long-term debt (LTD) are statistically insignificant for both the US and Europe, as well as for the whole sample. As for CA, the effects of INV and LTD cannot be analyzed further although it seems reasonable to conclude that neither similarities nor dissimilarities in acquirer's and target's INV and LTD values has any effect on post-M&A performance. In previous research by Ritterfeldt and Trygg (2008), dissimilarities were found to have positive effect on post-M&A ROA, for both INV and LTD.

Property, plant and equipment (PPE) is statistically significant at the 1% significance level for the US but not statistically significant for Europe. The coefficient is positive, taking a value of 0.3115 for each standard deviation difference in PPE, implying that for each standard deviation in the difference between the companies' PPE increases post-M&A ROA by 0.3115 standard deviations of ROA. This supports the H_0 hypothesis that dissimilarities in PPE values of the acquiring company and the target company have positive effect on post-M&A performance, which results from efficiency transfer. This result is not found to have support from previous researches. Different results for the US and Europe can possibly be attributable to different governance structures. As mentioned earlier it might induce more difficulties for companies in Europe to merge with a company with different resource allocations than for US companies and thus dissimilarities in resource allocation might presumably create larger economies of scope in the US and therefore have a positive effect on post-M&A ROA.

Selling, general and administrative expenses (SGA) is statistically significant for both samples, at the 10% significance level for the US but at the 10% level for Europe. Not only are the significance levels different but the signs of the coefficients are also opposite. For the US the coefficient is -0.9513 which indicates that for each standard deviation difference

between the SGA of the acquirer and the target the post-M&A performance is decreased by 0.9513 standard deviations of ROA. That supports the H_1 hypothesis that similarities in SGA values of the acquiring company and the target company have positive effect on post-M&A performance. For Europe, on the other hand, the coefficient is positive and taking a value of 1.3653 implying that for each standard deviation difference between the SGA of the acquirer and the target the post-M&A ROA increases by 1.3653 standard deviations of ROA. That supports the opposite hypothesis, H_0 , that dissimilarities in SGA values of the acquiring company and the target company have positive effect on post-M&A performance. Both of those results are further supported by previous researches. Ramaswamy (1997) supports the result of similarities having a positive effect on post-M&A performance, whereas the result of dissimilarities having a positive effect is supported by Harrison et.al. (1991). Although the results are different for the US and Europe the difference is opposite of the difference between the samples for other variables, that is here similarities in SGA increase post-M&A performance for the US whereas dissimilarities increase the post-performance for Europe. The reasoning mentioned before, that there might be more difficult in Europe to merge with a firm with different resource allocation does not seem to apply in the case of SGA. This is a surprising result that does not have any support from either theory or previous studies.

Working capital (WC) is statistically significant for the US, at the 5% significance level, but statistically insignificant for Europe. The slope of the coefficient is 0.7244 for the US which indicates that for each standard deviation difference between the companies' WC the post-M&A performance increases by 0.7244 standard deviations of ROA. This result supports the H_0 hypothesis that dissimilarities in WC values of the acquiring company and the target company have positive effect on post-M&A performance. Ritterfeldt and Trygg (2008) further support this result which is based on efficiency transfer. Again, different results for the US and Europe can presumably be attributed to different governance structures and the reasoning that it might be more difficult for companies in Europe to merge with a company with different resource allocations, compared to the US and dissimilarities might more likely have a positive effect on post-M&A performance in the US.

Both of the dummy variables used as proxies for corporate culture, Industry (IND) and Country (COU), are statistically insignificant for both the US and Europe as well as the whole sample. As for the other insignificant explanatory variables, even though they cannot be analyzed further, it seems reasonable to assume that neither similarities nor dissimilarities in corporate culture have any effect on post-M&A performance. A reasoning for these

insignificant results can in some way come from van Oudenhoven and van Der Zee's (2002) contradicting suggestion that it can be harder to obtain synergies in cross border M&A's and the positive effects might be cancelled out by cultural integration problems leading to statistical insignificance.

As can be seen in the bottom line of Table 4.4, R^2 is relatively high, especially for the whole sample and the US, which indicates that a large part of the variability in the change in ROA is explained by the variability in the explanatory variables, making the regression look good as a whole. However, a large part of the explanatory variables are found insignificant. These results, high R^2 and insignificant explanatory variables are attributable to the problem of near multicollinearity since some of the explanatory variables are found highly correlated.

However, it is worth mentioning again that the results analyzed above have to be taken with caution due to the apparent problem of multicollinearity, which can distort the results and make it harder to draw firm conclusions.

4.4 Discussion

Out of the explanatory variables chosen in this study, more variables than anticipated were found to have insignificant effect on the change in ROA and others were only statistically significant for either the US or Europe. Since most testing procedures in econometrics rely on asymptotic theory, meaning that in theory results only hold if there are an infinite number of observations, this can be attributed to the small data sample (Brooks, 2008).

For hypothesis testing it is common to use 5% significance level. However, some econometricians have suggested that a lower significance level, e.g. 1%, is more appropriate for large samples because if the sample size is sufficiently large, any null hypothesis can be rejected and thus all explanatory variables will be statistically significant (Brooks, 2008). It could therefore probably also be argued that for smaller samples a higher significance level should be used, maybe even higher than 10%. Since this study suffers from a small dataset the use of a higher significance level would find more variables to have a statistically significant impact on the change in ROA.

5. Conclusion

Unexpectedly, out of the eleven explanatory variables chosen for this study only four are found statistically significant for the US; Interest expense, Property, plant and equipment, Selling, general and administrative expenses, and Working capital, and three for Europe; Cost of goods sold, Interest expense, and Selling, general and administrative expenses. Therefore, this study does not provide the same statistical evidence on a strong relationship between pre-M&A resource allocation and post-M&A performance as previous empirical studies. This lack of statistical evidence is most likely attributable to the small dataset at hand.

However, if looked past the fact that the dummy variable used to divide the whole sample into an US sample and a European sample is found insignificant, the variables that are found to have statistical significance show that in the US dissimilarities in resource allocation, between the acquirer and the target, have positive effect on post-M&A ROA, rather than similarities. In Europe on the other hand it is not as clear whether similarities or dissimilarities are superior when it comes to increase in post-M&A performance. This is somewhat in line with previous studies on resource allocation and M&A performance, which however have not all gotten identical results. This indicates that some other factors than only similarities or dissimilarities in resource allocation affect post-M&A performance. Here, two factors are discussed as having possible influence on M&A performance.

This study uses data on M&A transactions conducted in the sixth merger wave, from 2003 to 2007. Compared to the results of previous studies, conducted in calmer periods, this study does not indicate that different time periods, in regards of merger activity, support different arguments of resource allocation and post-M&A performance. On the other hand, in regards of corporate governance systems this study supports the results of some previous researches, e.g. Harrison et.al (1991) that dissimilarities in resource allocation, between the acquiring company and the target, have positive effect on post-M&A performance in the US. For Europe however the results are not as clear, as mentioned before. This might indicate that different governance structures support different arguments of resource allocations and post-M&A performance. However, in light of the lack of research on the connection between corporate governance structure and M&A performance it is not less likely that some other factor causes the different results or even that there is no actual difference between different geographical areas.

As has been mentioned earlier the results of this research have to be taken with caution due to three problems. First, as a result of a small dataset a large part of the explanatory variables are found having insignificant effect on post-M&A performance. Second, since the error terms are found to be non-normally distributed the parameters have to be interpreted with caution. The third and largest problem, is the problem of multicollinearity which causes distortion in the estimates and in the significance tests which makes it harder to draw reliable conclusion from the results. Nevertheless the results found indicate that there are probably more important factors than resource allocation that are determining when it comes to post-M&A performance and successfulness of M&A transactions.

5.1 Recommendations for further studies

It would be interesting for further studies to examine the effects of similarities and dissimilarities in resource allocation on post-M&A performance using other performance measures, e.g. return on equity (ROE) and profit margin.

Although the insignificance of several of the explanatory variables is likely attributable to the small sample size it is interesting to see if other estimators would give more significant results than the OLS. The most commonly used estimators, except for OLS, are the maximum likelihood (ML) estimator and the (general) method of moments ((G)MM) estimator.

Using other ways to gather the data, e.g. using other databases, might also increase the significance of the results. Since the annual statements for several of the companies involved were unavailable, for some unapparent reason, in the *S&P Capital IQ* database other ways of obtaining the data might increase the sample size and therefore enhance the credibility of the study.

Given the difference in results, both in this research and previous studies, for the US and Europe and the lack of academic research on the influence of corporate governance on M&A performance gives an interesting foundation for extensive research on the connection between corporate governance systems and M&A performance, as well as other factors that might explain these different results.

Finally, like mentioned earlier, increase in performance is not the only factor that makes an M&A transaction successful. Successful M&A transaction also adds value to the owners by stock price improvements. A study similar to this one, that focuses on post-M&A value

instead of performance would help gaining a better knowledge and understanding of which strategies are most likely to result in a successful M&A.

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Appendices

Appendix A – M&A observations

List of the US M&A observations, alphabetically ordered by acquirer

Acquirer	Target
ACM Income Fund Inc	ACM Government Opportunity Fund Inc
Allegheny Valley Bancorp Inc	RSV Bancorp Inc
Allied Motion Technologies Inc	Owosso Corp
American National Bankshares Inc	Community First Financial Corp
American Tower Corp	SpectraSite Inc
Axonyx Inc	OXIS International Inc
Benchmark Electronics Inc	Pemstar Inc
BNC Bancorp	SterlingSouth Bank & Trust Co
Bourbon Bancshares Inc	Kentucky First Bancorp Inc
Capital Bank Corp	1 st State Bancorp Inc
Carter's Inc	Oshkosh B Gosh Inc
Center Bancorp Inc	Red Oak Bank
Citizens Bancshares Corp	CFS Bancshares Inc
Consolidated Communications Holdings Inc	North Pittsburgh Systems Inc
CPB Inc	CB Bancshares Inc
Darden Restaurants Inc	RARE Hospitality International Inc
Dendreon Corp	Corvas International Inc
EpiCept Corp	Maxim Pharmaceuticals Inc
ESB Financial Corp	PHSB Financial Corp
Fairchild Semiconductor International Inc	System General Corp
First National Lincoln Corp	FNB Bankshares
Flexsteel Industries Inc	DMI Furniture Inc
Flushing Financial Corp	Atlantic Liberty Financial Corp
Franklin Financial Services Corp	Fulton Bancshares Corp
Freeport-McMoRan Copper & Gold Inc	Phelps Dodge Corp
Gartner Inc	META Group Inc
Greene County Bancshares Inc	Civitas BankGroup Inc
Heritage Commerce Corp	Diablo Valley Bank
Hudson City Bancorp Inc	Sound Federal Bancorp Inc
Hyseq Pharmaceuticals Inc	Variagenics Inc
Latinocare Management Corp	Warp 9 Inc
Levcor International Inc	Carlyle Industries Inc
Liberty Property Trust	Republic Property Trust
Limited Brands Inc	La Senza Corp
LoJack Corp	Boomerang Tracking Inc
LSB Bancshares Inc	FNB Financial Services Corp
Lyondell Chemical Co	Millennium Chemicals Inc

MGM Mirage Inc	Mandalay Resort Group
Monarch Community Bancorp Inc	MSB Financial Inc
Monmouth Community Bancorp	Allaire Community Bank
Monmouth Real Estate Investment Corp	Monmouth Capital Corp
National Mercantile Bancorp	FCB Bancorp
Nektar Therapeutics	AeroGen Inc
NL Industries Inc	CompX International Inc
Olin Corp	Pioneer Cos Inc
PFSweb Inc	eCOST Com Inc
Plug Power Inc	H Power Corp
PMC Commercial Trust Inc	PMC Capital Inc
Primedex Health Systems Inc	Radiologix Inc
Provident Financial Services Inc	First Sentinel Bancorp Inc
Riverwood Holding Inc	Graphic Packaging International Corp
Robcor Properties Inc	Redpoint Bio Corp
Salisbury Bancorp Inc	Canaan National Bancorp Inc
TriCo Bancshares	North State National Bank
Whirlpool Corp	Maytag Corp

List of the European M&A observations, alphabetically ordered by acquirer

Acquirer	Target
A/S Schouw & Co	Biomar Holding A/S
Actelion Pharmaceuticals Ltd	CoTherix Inc
Aixtron AG	Genus Inc
Aker ASA	Aker Philadelphia Shipyard ASA
Algo Vision PLC	MySparta AG
B&N Nordsjofrakt AB	Gorthon Lines AB
Banche Popolari Unite Scrl	Banca Lombarda e Piemontese SpA
Boiron SA	Laboratoires Dolisos
Bowleven PLC	FirstAfrica Oil PLC
BVZ Holding AG	Gornergrat Bahn AG
ComputerLand Poland SA	Emax SA
CoolGuard AB	Iniris AB
Derwent Valley Holdings PLC	London Merchant Securities PLC
Edinburgh UK Tracker Trust PLC	Tribune UK Tracker PLC
Exploration Co PLC	El Oro Mining & Exploration Co
Groupe Air France SA	Koninklijke Luchtvaart Maatschappij
Helgeland Sparebank	Sparebanken Rana
Hellenic Investment Co SA	Piraeus Investments SA
Hydrobudowa Polska SA	Hydrobudowa Slask SA
Kulmbacher Brauerei AG	Wuerzburger Hofbraeu AG
Liechtensteinische Landesbank AG	Bank Linth

Nireus Aquaculture SA	Kego AE
Pirelli & C SpA	Pirelli SpA
PSP Swiss Property AG	REG Real Estate Group
Steria SA	Xansa PLC
Stockmann Oyj	Lindex AB
Straumann Holding AG	Biora AB
Swiss Prime Site AG	Maag Holding AG
Vectura Group Plc	Innovata PLC
Wienerberger Finance Service B.V.	Baggeridge Brick PLC

Appendix B – White’s test for heteroscedasticity

F-statistic	1.658019	Prob. F(12,73)	0.0945
Obs*R-squared	18.41921	Prob. Chi-Square(12)	0.1035
Scaled explained SS	106.7682	Prob. Chi-Square(12)	0.0000

Test Equation:
 Dependent Variable: RESID^2
 Method: Least Squares
 Date: 07/20/14 Time: 13:31
 Sample: 1 86
 Included observations: 86

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.131339	0.164108	0.800322	0.4261
CI_^2	0.065478	0.589791	0.111019	0.9119
COGS_^2	0.001044	0.008862	0.117809	0.9065
CA_^2	-0.094217	0.082269	-1.145235	0.2559
IE_^2	-0.323265	0.279247	-1.157631	0.2508
INV_^2	0.000192	0.014101	0.013639	0.9892
LTD_^2	-1.804950	0.506978	-3.560216	0.0007
PPE_^2	0.023420	0.065134	0.359574	0.7202
SGA_^2	0.249021	0.507109	0.491061	0.6249
WC_^2	1.927881	0.548139	3.517139	0.0008
IND^2	0.254697	0.145007	1.756444	0.0832
COU^2	-0.115785	0.211979	-0.546209	0.5866
AREA^2	-0.171064	0.162137	-1.055061	0.2949

R-squared	0.214177	Mean dependent var	0.159447
Adjusted R-squared	0.085000	S.D. dependent var	0.643326
S.E. of regression	0.615377	Akaike info criterion	2.005275
Sum squared resid	27.64431	Schwarz criterion	2.376281
Log likelihood	-73.22683	Hannan-Quinn criter.	2.154588
F-statistic	1.658019	Durbin-Watson stat	1.994329
Prob(F-statistic)	0.094548		

Appendix C – Breusch-Godfrey test for autocorrelation

F-statistic	1.517111	Prob. F(10,63)	0.1544
Obs*R-squared	16.69051	Prob. Chi-Square(10)	0.0815

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 07/20/14 Time: 13:39

Sample: 1 86

Included observations: 86

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.067676	0.111181	-0.608702	0.5449
CI_	-0.296996	0.394524	-0.752795	0.4544
COGS_	-0.024305	0.061522	-0.395056	0.6941
CA_	-0.050477	0.117307	-0.430294	0.6685
IE_	0.099741	0.270255	0.369064	0.7133
INV_	-0.067301	0.053853	-1.249713	0.2160
LTD_	0.131264	0.231775	0.566343	0.5732
PPE_	0.020727	0.087963	0.235633	0.8145
SGA_	0.177735	0.269645	0.659144	0.5122
WC_	-0.079465	0.288221	-0.275708	0.7837
IND	0.085994	0.111898	0.768508	0.4451
COU	0.072648	0.179620	0.404454	0.6872
AREA	0.032650	0.117763	0.277253	0.7825
RESID(-1)	-0.053385	0.153478	-0.347837	0.7291
RESID(-2)	-0.065149	0.128364	-0.507535	0.6136
RESID(-3)	0.210069	0.168364	1.247708	0.2168
RESID(-4)	-0.346354	0.140828	-2.459407	0.0167
RESID(-5)	-0.208350	0.129507	-1.608789	0.1127
RESID(-6)	-0.266952	0.143171	-1.864572	0.0669
RESID(-7)	0.033778	0.139694	0.241800	0.8097
RESID(-8)	0.104479	0.138342	0.755228	0.4529
RESID(-9)	-0.118449	0.124418	-0.952020	0.3447
RESID(-10)	-0.172135	0.134424	-1.280534	0.2051
R-squared	0.194076	Mean dependent var	-1.15E-17	
Adjusted R-squared	-0.087358	S.D. dependent var	0.401650	
S.E. of regression	0.418826	Akaike info criterion	1.320949	
Sum squared resid	11.05116	Schwarz criterion	1.977344	
Log likelihood	-33.80080	Hannan-Quinn criter.	1.585118	
F-statistic	0.689596	Durbin-Watson stat	2.034228	
Prob(F-statistic)	0.832741			

Appendix D – Bera-Jarque test for normality

