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Market Perception of Consolidations
In the European Defense Industry from 2001 to 2009
A Case of Event Studies

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June 2009

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The purpose of this research is to examine and analyze whether or not there was a statistically significant reaction in financial markets to the announcements of European defense manufacturers' consolidations for the time period from 2001 to 2009. The research focuses on the top four European contractors which are BAE Systems, EADS, THALES and Finmeccanica. The analysis will be accomplished with the use of a series of event studies, using the arithmetic stock returns of the companies' against the index of the intimate stock exchange market.
The project will also examine whether the financial markets responded in the same manner in different consolidations and in different stock markets.

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EXECUTIVE SUMMARY

This project examines whether there was a statistically significant reaction in the stock price of the four major European aerospace and defense firms to the announcement of consolidations (mergers or acquisitions). The companies BAE Systems, EADS, Thales and Finmeccanica were chosen for the time frame between 2001 and 2009.

A great number of event studies were executed and in some cases were executed for the same company in different stock markets, in order to examine the reaction of different stock markets to the same announcement.

According to the data analysis there was moderate statistically significant reaction of the financial markets to the announcements of consolidation. Specifically, the markets responded only twenty-nine percent of the time and showed no response in the remaining seventy-one percent of announcements. BAE Systems seems to have triggered the financial markets most, with Finmeccanica following in the second place and EADS and Thales taking the third and fourth place respectively. As for the reaction of different markets to the same announcements the results showed that different markets responded nearly with the same manner.

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I. INTRODUCTION

A. BACKGROUND

The end of the Cold War led to a fall in defense expenditure worldwide, forcing global defense industries to make significant changes to their corporate strategy in order to overcome the loss in profits. Three broad strategies were implemented (Smith & Smith, 1992). The first is termed "consolidation," where a company stays in the defense sector and strengthens its position in key market segments. The second is called "diversification," under which a company reduces its defense dependence through organic growth or acquisition of civilian activities. The third strategy is "conversion," a wholesale switch of existing defense plants to civilian production.

U.S. defense companies led the way by adopting these strategies, triggering a mass wave of consolidations (mergers and acquisitions) between 1990 and 2000. The European defense firms found themselves under political and economic pressure to follow the example of their U.S. counterparts and began a great number of mergers and acquisitions that continue to the present (2009).

B. OBJECTIVE OF STUDY

This research examines whether there was a statistically significant reaction in the stock markets to the defense companies' announcements of consolidations. The reaction of financial markets is a way to evaluate whether a consolidation would result in added value to the company or not, since most of the time markets are a subjective judge of the effectiveness of any company's strategic movements.

The top four European defense companies, which according to their 2004 financial statements are British Aerospace (BAE Systems), European Aeronautic Defence and Space Company N.V. (EADS), Thales and Finmeccanica, were chosen for evaluation. Table 1 presents useful information for each company.

EU Rank	World Rank	Company	Country	2007 Defense Revenue
1	3	BAE Systems	U.K.	29,800.00
2	7	EADS	Multiple	12,239.20
3	9	Finmeccanica	Italy	10,601.60
4	11	Thales	France	7,246.40
Source: www.defensenews.com				

Table 1. Top Four European Defense Companies(After Defense News Research)

BAE seems to be the dominant European defense industry, with EADS following with half BAE's defense revenue. Thales and Finmeccanica come in third and fourth, respectively. The time period between 2001 and 2009 was chosen for this study.

The statistical significance of the stock price arithmetic returns against the relative stock market's index return was used to evaluate every announcement of consolidation.

The dominance of the examined firms in the defense market is related to the number of the consolidations that each company executed. This event study examined 80 announcements of consolidations, as shown in Table 2

Contractor	Number of Announcements	Stock Market Index
BAE Systems	21	FTSE 100
EADS	18	EURONEXT 100
EADS	21	CAC 40
Thales	8	EURONEXT 100
Thales	8	CAC 40
Finmeccanica	4	MIBTEL
Total	80	

Table 2. Summary of Contractor Examined Consolidation Announcements in the Relative Stock Markets

In some cases, the same announcement was studied across different stock markets in order to examine the various reactions to the same announcement. Eighty regression analyses were executed and Microsoft's "Excel" program used to determine the results. All regressions were executed twice for robustness in order to minimize any accidental mistakes.

Most of the data concerning the prices of the stocks and indexes were collected from the website of "Yahoo Finance" and the Bloomberg database. The data concerning the announcements' dates were found in the website of each company and were corroborated by other available press releases, also found on the web.

Although the four companies carried out more than the examined consolidations during the examined period of time, the lack of verifiable data led the authors to exclude from the study any consolidations with poor or unconfirmed data.

C. RESEARCH QUESTIONS

This research paper will try to answer a number of questions concerning the top four European defense contractors' policies relative to consolidations.

1. Primary Question

- How did the financial markets respond to the announcement of consolidations made by the European defense industry?
- How did different financial markets respond to the same announcement of a European defense firm?

2. Secondary Questions

- Did the financial markets respond to the announcement of consolidation in the same manner for each of the four examined firms?
- Which strategy seems to be preferred by the financial markets?

D. ORGANIZATION OF STUDY

This research paper is organized into six chapters. The first chapter is an introduction to the research.

Chapter II provides mainly the background information and the literature review. It is divided into three sections. Section A briefly presents the history of the European defense industry and each one of the examined firms. Section B explains the terms and types of mergers. Finally, Section C introduces the current European situation relative to defense policy.

Chapter III is divided into two sections, with Section A providing useful information concerning the terminology and Section B demonstrating the methodology used for the research.

Chapter IV presents in detail the data analysis, which includes the results from the event studies in the form of statistical significance, and makes a quantitative analysis of the results.

Chapter V exhibits the derived conclusions, based on the results of Chapter IV, and answers the primary and secondary questions that were posed to define the research.

Finally, Chapter VI presents the recommendations for future research.

II. LITERATURE REVIEW

A. THE EUROPEAN DEFENSE INDUSTRY

1. Introduction

The defense industry plays a significant role in national defense and grabs a large slice of the whole industrial pie. Since the end of Cold War, the global defense industry has experienced a wave of mass restructuring, with the United States' industry leading in time and volume. The European defense industry, although falling behind initially, eventually responded with restructuring, through a wave of mergers, acquisitions and consolidations.

The term "European," which is used throughout this thesis, refers to the European Union (E.U.) and not the continent of Europe, since many countries that geographically belong to Europe are not part of the European Union. It is in the authors' interest to examine the European Defense Industry, which at the moment is the second largest defense industry after that of the United States (Coonen, 2006).

The European defense industry consists of a large number of companies varying in size and products, with some diversified into civil production as well. Nowadays more than 300 defense companies exist in 14 of the E.U.'s states. Almost every state has a defense industry but most of the companies are small or medium size, and mostly build components for other major manufacturers or provide support services to the armed forces of their respective states (European Defence, n.d.) This paper examines only those major European firms that are dominant in the European and global military market, taking into consideration their revenues and business turnover. These firms are British Aerospace (BAE Systems), European Aeronautic Defense and Space Company N.V. (EADS), THALES and Finmeccanica; all were formed recently after mergers, acquisitions and consolidations of major European defense firms (Mawdsley, 2003).

2. History and Business of the Protagonists

a. BAE Systems

British Aerospace (BAE) is a British defense and aerospace company. It was first formed in April 1977 by the merger of the British Aircraft Corporation, Hawker Siddeley Aviation, Hawker Siddeley Dynamics and Scottish Aviation. The company was under national control, but in 1981 it went public after the Thatcher Government sold 51.57% of its shares in BAE. In 1985 the UK Government sold its remaining shares of the company and BAE became an entirely privately-owned company. Nevertheless, for national defense issues, according to British law, the foreign ownership in the company is limited to 15% and the CEO and the Chairman should be British nationals.

In 1988, BAE acquired the Rover group, in a trial to diversify its products. In 1991, Heckler & Koch Gmbh joined the company as well. In October 1993 BAE formed a joined venture company with Marconi Electronic Systems (MES), the defense electronics business of the British General Electric Company, in order to develop the naval principal anti-air missile system guided weapons project. In July 1998 a merger of British Aerospace and DaimlerChrysler Aerospace AG (DASA) was consummated. In November 1999, despite prior agreements and the reluctance of the British Government, the company merged with the arms dealing side of General Electric Company (GEC) Marconi Electronic Systems and a new corporate entity was formed, BAE SYSTEMS (Corporate Watch UK, 2002). This new entity divides its business into the areas of Electronics, Intelligence and Support, Land and Armaments, Programs and Support, International Businesses, and other businesses (Investis, 2007).

After the formation of BAE Systems various other acquisitions mergers and sales took place. Some of the most interesting are the following: in June 2004 Alvis Vickers merged with BAE and formed BAE Systems and Land. In March 2005 BAE Systems acquired United Defense Industries (UDI), a U.S. defense company that manufactures land systems. The new BAE Systems Land and Armaments is a major manufacturer of combat vehicles, artillery systems, naval guns, missile launchers and guided munitions. In December 2005 BAE sold its subsidiary Atlas Electronic to

ThyssenKrupp and EADS. In July 2007 Armor Holdings, a manufacturer of tactical wheeled vehicles, merged with BAE Systems. In June 2008 BAE acquired the major Australian defense company Tenix Defense and formed BAE Systems Australia, the largest defense contractor in the country. In April 2008 BAE also acquired the South African company IST Dynamics. Finally, in 2008 BAE Systems merged its surface shipbuilding operations with the Vosper Thornycroft (VT) Group, forming BVT Surface Fleet. As for the company's activity in civil production, in October 2006 the company sold its share in Airbus to EADS, ending its involvement in civil airliner production.

b. European Aeronautic Defense and Space Company N.V. (EADS)

The European Aeronautic Defense and Space Company (EADS) is a European aerospace corporation. It was formed in July 2000 by the merger of Daimler Chrysler Aerospace AG (DASA) of Germany, Aerospatiale-Matra of France and Construcciones Aeronauticas SA (CASA) of Spain. First came the merger between the DASA and CASA in June 1999; the three companies further consolidated in October 1999 to create EADS. EADS became the second largest aerospace company in the world and the second largest arms manufacturer in Europe. The company does business in the areas of military aircraft, missiles, space rockets, satellites and related systems (EADS, 2008).

After its creation, the new company made the following acquisitions and mergers: in April 2001 its missile business (Aérospatiale-Matra Missiles) merged with the respective arm of BAE Systems and Alenia Marconi Systems, Matra BAe Dynamics (MBD), and formed MBDA. In June 2003 EADS acquired total ownership of Astrium, a space and satellite manufacturer, to create EADS Astrium. In October 2006 EADS acquired BAE's share in Airbus and became the sole owner of the company. In December 2005 EADS joined with Northrop Grumman (NG) to bid for the U.S. Air Force's KC-30 tanker program. Although in February 2008 the NG-EADS team was awarded the contract for the new tanker, on July 9, 2008 the Pentagon announced the re-opening of the contract.

c. THALES

THALES is a French company which began in 1893, when the Compagnie Francaise Thomson Houston (CFTH) was established. In 1968, Thomson-Brandt (the renamed CFTH) merged its electronic arm with Compagnie de Telegraphie Sans Fil creating Thomson-CSF. In June 2001 Thomson-CSF formed a joint venture with Raytheon and formed the Thales Raytheon Systems, with the parent companies owning fifty percent of the new firm. The company focuses its business on electronics, information systems and services, aerospace and security (THALES Group, 2008).

The new firm won in 2003 the design competition for the Royal Navy Future Carrier; the company will participate in building the ship together with BAE Systems. In 2006 Thales acquired a major Australian military manufacturer, the Australian Defense Industries and the Bushmaster IMV.

d. Finmeccanica

Finmeccanica is an Italian conglomerate. The company's main businesses focus on aeronautics, helicopters, space, defense electronics, information technology, and energy and transportation. The company's history starts in 1948. In 1992 Augusta, the company's subsidiary, participated as a partner in NMIndustries, which is the prime manufacturer of the NH90 helicopter. In July 2000, Augusta merged with the British GKN-Westland Helicopters and formed the Augusta Westland. In December 2001 a joint venture of Finmeccanica/BAE Systems named Alenia Marconi Systems (AMS) merged with other European missile contractors and formed MBDA, the second largest missile manufacturer in the world. In March 2007 Finmeccanica acquired from BAE Systems a 25% share of SELEX Sensors and Airborne Systems. In October 2008 the company bought the U.S. defense company DRS Technologies.

3. Current Situation

In 2006, global arms production increased by 9% in nominal terms, amounting to $315 billion. Among the Top 100 firms, 41 U.S.-based companies accounted for 63% of the combined arms sales, while 34 West European companies accounted for 29%. The

biggest increases in arms sales were achieved by companies specializing in armored vehicles due to the U.S. demand arising from the conflicts in Iraq and Afghanistan, and in other expanding sectors like communications and high technology electronics (SIPRI, 2009). Tables 3 and 4 present the worlds and European major defense firms.

Rank	Company	Country	Last Year's Rank	2007 Defense Revenue	2006 Defense Revenue	2007 Total Revenue	% of Revenue from Defense
1	Lockheed Martin	U.S.	1	$38,513.00	$36,090.00	$41,862.00	92.00%
2	Boeing	U.S.	2	32,080.00	32,439.00	66,387.00	48
3	BAE Systems	U.K.	3	29,800.00	25,070.60	31,400.00	95
4	Northrop Grumman	U.S.	4	24,597.00	23,649.00	32,018.00	77
5	General Dynamics	U.S.	6	21,520.00	18,769.00	27,240.00	79
6	Raytheon 1	U.S.	5	19,800.00	19,500.00	21,300.00	93
7	EADS	Netherlands	7	12,239.20	13,202.70	57,600.00	21.3
8	L-3 Communications	U.S.	8	11,239.70	9,989.60	13,960.50	81
9	Finmeccanica	Italy	9	10,601.60	9,057.10	19,778.90	53.6
10	United Technologies	U.S.	10	8,761.40	7,652.60	54,759.00	16
Source: www.defensenews.com							

Table 3. World's major defense firms (After Defense News Research)

Rank	Company	Country	2007 Defense Revenue	2006 Defense Revenue	2007 Total Revenue	% of Revenue from Defense
1	BAE Systems	U.K.	29,800.00	25,070.60	31,400.00	95
2	EADS	Netherlands	12,239.20	13,202.70	57,600.00	21.3
3	Finmeccanica	Italy	10,601.60	9,057.10	19,778.90	53.6
4	Thales	France	7,246.40	6,997.40	18,116.10	40
5	Rolls-Royce	UK	4,392.60	4,062.30	14,840.00	29.6
Source: www.defensenews.com						

Table 4. Five European defense firms (After Defense News Research)

B. MERGERS

1. Introduction

Mergers and acquisitions have been a quite popular strategy in the corporate world. North America led the way with five major merger waves through the last century. Europe, Asia and Latin America followed aggressively only after the fifth merger wave (Carbonara, 2008).

2. Terms and Definitions

Throughout this thesis, the terms *Merger, Acquisition* and *Consolidation* are widely used. Their definitions provide useful information for the reader, since the terms are often confused or used interchangeably. A technical definition of the terms is the following:

Merger is a combination of two or more companies in which the assets and liabilities of the selling firm(s) are absorbed by the buying firm. Although the buying firm may be a considerably different organization after the merger, it retains its original identity (Sherman & Hart, 2006). There are four broad types of mergers:

- The *horizontal merger* is when the involved firms belong in the same line of business. An example of horizontal merger is AT&T's acquisition of Bell South.
- The *vertical merger* involves firms at different stages of production but in the same supply chain. An illustrative case of vertical merger is eBay's acquisition of PayPal. The customers use PayPal's secure payment system to purchase goods from eBay.
- The *circular merger* is the type of merger that involves companies with different products but similar distribution channels. A circular merger example is the Foster's Group of Australia, a large Australian brewer that purchased Beringer's Wine Estates of California in order to penetrate the U.S. market through Beringer's existing distribution channel (Roberto, 2005).
- The *conglomerate merger* involves companies with few similarities in production or marketing, but who seek to create a bigger economic base and greater profits. Most of the mergers of the 1960s and 1970s were conglomerate mergers and are less popular in developed economies. A recent example is the acquisition of Time Warner by AOL, with the goal of creating a comprehensive package of media and information products for the customers of both companies.

Acquisition is the purchase of an asset such as a plant, a division, or even an entire company (Sherman & Hart, 2006). A recent example is the acquisition of Gillette Company by Procter & Gamble which allowed that conglomerate to extend its reach in the market. Finally, *consolidation* is the combination of separate companies or product lines, into a single one. Consolidation differs from a merger, in that a new entity is created (BNET, 2009).

3. Motives of Mergers

The following are the principal motives that drive corporate mergers (Breadley, Myers, & Allen, 2008):

a. Economies of Scale

Many mergers seek to reduce the cost of the merged companies and so achieve economies of scale. It is anticipated that the merger will lead to shared services and technology, or a reduction in the overall staff. Economies of scale are the natural goal of horizontal mergers. The architects of these mergers look to consolidate central services such as management, financial control, executive development and top-level management.

b. Economies of Vertical Integration

In a vertical merger, the companies merge either with a supplier or with a customer in order to achieve better coordination and administration. By merging, they gain better control of the production process by expanding toward the output of the raw material or forward toward the end user.

c. Complementary Resources

Complementary resources are a strong motive for two companies to merge. In cases where a company specializes in a product or service and lacks the means or talent to promote it in the market, it may find a solution through another company that specializes in this area. The merger opens up opportunities for both companies that neither firm could achieve otherwise.

d. Surplus Funds

Surplus cash or funds lead companies to mergers *financed by cash* as a way to redeploy their capital. This way the company expands itself and creates viable investments for its shareholders.

e. Eliminating Inefficiencies

There are mergers that seek to eliminate the inefficiencies of a company, which the management is reluctant to face either due to lack of determination or fear that the changes will affect the management itself in an unfortunate way. Such inefficiencies may be excess personnel or unnecessary expenses that have to be reduced and lead to the company's bad performance. After a merger the new, more determined management can easily take the painful measures that could eliminate the existing inefficiencies.

f. Industry Consolidation

In situations where there are too many firms and too much capacity in an industry, consolidation leads to a cut in capacity, reduction of cost and release of capital that can be reinvested elsewhere in the economy. A relevant example is the creation of EADS from the merger of the Daimler Chrysler Aerospace AG (DASA) of Germany, Aerospatiale-Matra of France and Construcciones Aeronauticas SA (CASA) of Spain.

4. History of Mergers and Merger Waves

According to economists, merger and acquisition (M&A) specialists and historians, five major merger waves have been observed in the history of mergers and acquisitions, especially in the United States of America (Gaughan, 2007).

The *first merger wave* lasted from 1893 to 1904. This wave was characterized by the great numbers of horizontal mergers and focused on the industries of steel, telephone, oil, mining, and railroads that formed famous industrial giants of the era.

The *second merger wave* began in 1919 and lasted until 1929. This merger wave was characterized by vertical consolidations such as the formation of major automobile manufacturers. The wave was ended due to the economic crash of 1929 and the Great Depression.

The *third merger wave* started in 1955 and ended in 1969-73. During this wave conglomerate companies were formed such as ITT (led by Harold Geneen), LTV (led by

Jimmy Ling), Teledyne (led by Henry Singleton) and Litton (led by Tex Thornton). The oil crisis of 1973 and the worldwide weakening economy led to the end of the third merger wave.

The *fourth merger wave* lasted from 1984 to 1989 and was characterized as the takeover wave and by the size and prominence of the acquired companies. In Europe cross-border horizontal mergers emerged in order to prepare the companies for the new demands of the Common Market, while in the U.S. corporate raiders fought for the acquisition of several companies. The fourth merger wave ended in 1989 due to the end of the economic expansion, the collapse of the junk bond market, the collapse of the savings and loan banks and the serious problems of the commercial banks.

The *fifth merger wave* started in 1992 and ended in 2000. It was characterized as the era of the mega deal since companies of unprecedented size and global sweep were formed. Some examples are the mergers of Citibank and Travelers, Chrysler and Daimler Benz, Exxon and Mobil, Boeing and McDonnell Douglas, AOL and Time Warner, and Vodafone and Mannesmann. In 2000 the amount of money spent on mergers reached the $3.3 trillion. Another major merger sector was telecommunications media and technology (TMT), which experienced a five-year boom and then a dramatic slowdown with the bursting of the Internet bubble in March 2000, which led to the end of the fifth merger wave.

5. Mergers and Acquisitions in the European and Transatlantic Defense Market

During the 1980s, the European defense industry was fragmented. Too many small firms specialized in certain kinds of weapons. They were mainly dependent on their government for business and in many cases they were owned by these governments. Meanwhile, the U.S. defense industry was consolidating at a fast pace. In the late 80s and early 90s consolidations took the form of large defense national champions like Germany's Daimler-Benz acquiring small domestic firms[1] or large companies acquiring minor target defense industries in other E.U. countries (one example is the French firm Thomson-CSF acquiring the defense electronics division of The Dutch firm Philips and the UK based Pilkington electronics) (Guay & Callum, 2002).

[1] Daimler-Benz acquired AEG, Dornier Aerospace, Krauss-Maffei and Messerschmidt.

It was difficult for a foreign company to acquire a domestic one. The national firms tried to maintain their independence through joint ventures (for products like missiles) or multinational consortia (Eurofighter jet).

In the late 1990s European defense firms, under political and economic pressure, started to consolidate. This second and more important wave of mergers and multinational collaborative programs were supported by governments with significant defense industry for many reasons, such as (Darnis et al., 2007):

- These programs guarantee large orders and thus economies of scale. That means cost savings. Finally, the states can meet a required capability at a lower and affordable price. Table 5 shows the inefficiencies of the European defense industry due to the duplication of procurement programs—some 89 programs compared to 27 U.S., on much lower defense budgets.
- E.U. member states are co-operating in common military operations around the world. They need common equipment in order to achieve interoperability. This was an important lesson learned during operations in the former Yugoslavia.
- International security is one of the most important concerns of the E.U. Member states have to gain political benefits if they actively engage in the process of building a common European strategic culture.
- Strong European defense companies and multinational collaborative programs ensure the security of the supply and maintenance of the European defense industrial and technology base.
- There are some significant positive side effects, such as common standards and specifications, technology sharing and development, integrated logistics and successful exports.

System	Europe	USA
Land systems		
-Main battle tanks	4	1
-Armored fighting vehicles	16	3
-155 mm Howitzer	3	1
Air systems		
-Fighter-strike	7	5
-Ground attack trainer	6	1
-Attack helicopter	7	5

System	Europe	USA
-Anti-ship missiles	9	3
-Air-to-air missiles	8	4
Naval systems		
-Main surface combatant ship	11	2
-Diesel submarine	7	0
-Anti-submarine torpedo	9	2
-Nuclear submarine	2	1
Total	**89**	**27**

Source: European Commission, UNISYS, Final report of the study: Evaluation of the common Initiative in the context of the Intra-EU Transfers of Defense Goods, Brussels, February 2005.

Table 5. Defense Programs in Europe and U.S. (From Darnis et al, 2007)

In January 1999, BAE Systems was created after the acquisition of Marconi Electronic Systems (defense sector of GEC) by British Aerospace for more than £7.7 billion. Although British Aerospace was negotiating a (horizontal) merger with Daimler Chrysler Aerospace AG (DASA- aerospace unit of Germany's Daimler-Chrysler), it finally proceeded to a vertical integration with Marconi. After this acquisition British Aerospace was transformed from a military aerospace platform builder to a systems manufacturer with increased capabilities in defense electronics (Schmitt, 2000). In response to this merger, EADS (European Aeronautic Defense and Space Company) was also formed in 1999. This European structure came from the mergers of France's Aerospatiale and Matra with DASA and Spain's CASA (Neal & Taylor, 2001). This transnational European giant was able to challenge U.S. firms like Boeing and Lockheed Martin and could produce a wide variety of defense products such as the Eurofighter combat aircraft, A400M transport aircraft, Eurocopter and other strategic weapons (Jones, 2006).

Similar consolidations took place in other defense sectors. Thomson-CSF acquired Racal Electronics (UK) in June 2000 to create Thales. In 2001 AgustaWestland was formed after the merger of Italy's Agusta (owned by Finmeccanica) and the UK's Westland. It is the world's second largest helicopter producer after Boeing. Finally, in

2001 came the formation of MBDA, the world's second larger missile producer (behind Raytheon), after the merger of the missile sectors of BAE Systems, EADS and Finmeccanica (Vlachos-Dengler, 2002).

As a result of these developments, the European defense market is dominated by the giants of BAE Systems and EADS, followed by Finmeccanica and Thales. It is possible to identify two different consolidation strategies. BAE Systems was formed after the consolidation of many smaller UK firms, but EADS was the result of many transnational mergers within similar sectors of the defense industry.

After 2000, the European firms tried to increase their ''footprint'' in the U.S. market through the acquisitions of minor U.S. firms. Between 2001 and 2005 European companies acquired 67 U.S. companies for more than seven billion Euros (Aalto et al., 2008). BAE Systems is a classical example. Its U.S. subsidiary is the sixth largest U.S. defense company; in FY2007 BAE earned 44.3% of its revenues from this subsidiary. In fact, BAE does more business with DoD than with the British Ministry of Defense. BAE has consolidated its presence in this area with the $4 billion strategic acquisition of the U.S. company Armor Holdings (maker of Humvees) in 2007. BAE Systems is taking advantage of the U.S.-UK treaty signed in June 2007. This treaty is lifting the barriers imposed by U.S. security concerns and making it easier for British firms to penetrate the U.S. market. Additionally, EADS has manufacturing sites in Texas, Mississippi and Alabama making helicopters for the U.S. law enforcement agencies.

The recent developments in the mergers and acquisition field include major naval consolidation deals in France and the UK, actively encouraged by the respective governments. The French state-owned shipbuilder Direction des Constructions Navales (DCN) took over the naval operations of Thales in a deal worth $714 million, while in the UK BAE Systems and Vosper Thornycroft (VT) Group agreed on a joint venture combining their surface shipbuilding and service operations.

C. EUROPEAN DEFENSE POLICY

1. Introduction

The European Union took several measures to improve its defense capabilities and to strengthen the position of its defense industry in the global market. Several organizations and associations were formed, either from the states' side or from the defense industries' side, to support their interests. Also, various agreements and laws were established to reinforce E.U. policy. It is quite interesting to examine this framework since it could justify the reasons that either led to or forced the formation of the contemporary European defense industry, through consolidations, mergers and acquisitions.

2. Legislation

Article 296 of the European Treaty allows members to protect their domestic defense industry for national security, strategic, economic and supply security reasons. However, in 2006 the states agreed to create a genuine European defense market where the states can purchase according to the best offer without being obliged to contract with the national suppliers (Hartley, 2008).

In July 2000, an agreement concerning the Measures to Facilitate the Restructuring and Operation of the European Defense Industry was signed by Britain, France, Germany, Italy and Spain for cooperation on defense industrial issues (Mawdsley, 2003). The key areas of the agreement cover:

- Security and Supply: The agreement states that the nations must not hinder the supply of defense materials to the other participants and must consult on any consolidation in defense industry that may threaten their security of supply.
- Exports Procedures: The nations commit to simplifying the procedures for transfers among themselves and developing lists of permitted destinations to export military products that were produced jointly.
- Security of Classified Information: It focuses and enhances the exchange of classified defense industry information among the nations.

- Treatment of Technical Information: The nations are obliged to harmonize the contracting procedures to accommodate the reforming and operation of their defense industries.
- Research and Technology: The agreement focuses on the coordination of the joint R&D activities.
- Harmonization of Military Requirements: It emphasizes early planning and programming for military projects.

The United States established the "Declaration of Principles on defense equipment and industrial cooperation," which they endorsed through bilateral negotiations with some of the nations of the above agreement. The agreement intended to create cooperation on security of supply, Research and Development, exports, market access, handling of classified information and military requirements. This declaration favored both parties since every state's industry would be treated equally to those of the other states in terms of procurement.

3. European Organizations

a. The Western European Armaments Group (WEAG)

The WEAG was formed in Rome in May 1993. Armament cooperation is based on some basic principles, the most important of which are (Western European Union, n.d.):

- All 13 nations should be entitled to participate fully, and with the same rights and responsibilities, in any European armaments cooperation forum.
- There should be a single European armaments cooperation forum.
- Armaments cooperation in Europe should be managed by the National Armaments Directors of all the 13 nations, who will be accountable to the Ministers of Defense of those governments.
- The existing links with NATO and the European Defence Industries Group (EDIG) should be maintained.
- WEAG has the following objectives:
- Efficient use of resources through, inter alia, increased harmonization of requirements.
- The opening up of national defense markets to cross-border competition.

- Strong European defense technological and industrial base.
- Cooperation in research and development.

b. The European Defence Agency (EDA)

The EDA was established in July 2004 from the European Council of Ministers of Defense as an organization to improve the European defense capabilities in crisis management, promote research and development, promote armaments cooperation, strengthen the technological and industrial base and create a competitive European Defense Market. The Agency has developed relations with the respective elements of other European defense organizations such as the Organisation Conjointe de Coopération en matière d'Armement (OCCAR). After the closing of WEAG, the Agency took over a part of its work (European Defence Agency, 2009).

c. The Aero Space and Defence Industries Association of Europe (ASD)

The ASD was formed from European aeronautics, space, defense and security industries to promote and support the competitive development of the sector. To understand the magnitude of the association, ASD has 30 member associations in 20 countries across Europe and represents 2,000 companies and 80,000 suppliers. Also, its companies employ around 634,600 employees. In 2007 the industry did €132.2 billion in business (Aero Space and Defence Industries Association of Europe, 2005).

d. The Organisation Conjointe de Coopération en matière d'Armement (OCCAR)

The OCCAR was established in 1996 by the Defense Ministers of France, Germany, Italy and the U.K. as a treaty to provide effective and efficient management to collaborative armament programs (Organisation for Joint Armament Cooperation, n.d.). In contradiction to the WEAG, the OCCAR seeks progress through a narrower band of partners. In 2001 OCCAR became a legal entity, with the authority to sign contracts with industry on behalf of its members. Belgium and Spain became members of OCCAR in 2003 and 2005, respectively. In addition, the Netherlands, Luxemburg and Turkey participate in the treaty as observers. It is worth mentioning that the four charter member

states account for two-thirds of European defense production. Some of the projects managed by OCCAR are the Counter Battery Radar (COBRA), A400M, Future Surface to Air Missiles Family (FSAF), Multi-Role Armored Vehicle (GTK/MRAV/PWV), HOT/MILAN Anti-Tank Weapon Systems and the TIGER and Helicopter programs (Kenny, 2006).

4. European and World's Defense Spending

This section provides information and background data and analysis of the economies and defense spending of 15 E.U. countries.[2] The data show that there are great differences among the 15 states in terms of military expenditures and economic situations, as shown in Table 6.

[2] The section's data are for the 'core' 15 E.U. countries (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the UK) and does not look at the 12 new members that joined the E.U. either in 2004 (Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia) or in 2007 (Bulgaria, Romania).

	In constant (2005) U.S.$ bn.	as % of GDP
Austria	3.1	0.8
Belgium	4.3	1.1
Denmark	3.6	1.4
Finland	2.6	1.4
France	53.5	2.4
Germany	36	1.3
Greece	9.3	3.8
Ireland	1.2	0.5
Italy	33	1.8
Luxembourg	0.3	0.8
The Netherlands	9.8	1.5
Portugal	3.3	1.9
Spain	14.6	1.2
Sweden	5.2	1.5
UK	59.7	2.6
E.U. 15 (average)	15.9	1.6
E.U. 15 total	239.5	
U.S.	711	4
Source: SIPRI 2008 Yearbook		

Table 6. Defense spending in E.U. (After SIPRI)

Each country's economic situation plays an important role in defense spending, but there are also other political and strategic factors that affect affordability.

The following major categories of countries can be identified:

- Economically weak countries that spend a lot (Greece, Portugal)
- Wealthy countries that spend a lot (UK, France, Germany, Sweden, The Netherlands and Italy)
- Wealthy countries that are low spenders (Luxemburg, Austria, Denmark, and Belgium)

The end of the Cold War and the 1990s saw a rapid decline in defense spending and procurement purchases, especially for those E.U. countries that were large contributors to the total E.U. defense spending, as shown in Table 7. On the other hand,

defense spending began showing a positive trend just after the 2001 terrorist attacks, but has remained relative static over the last years, as depicted in Figure 1.

	1991	2000	% Difference
UK	62.3	47.7	-23.4
GERMANY	55	41.1	-25.2
FRANCE	57.7	50	-13.3
Source: SIPRI various Yearbooks			

Table 7. Defense spending 1991-2000 (In constant (2005) U.S. $ bn) (After SIPRI)

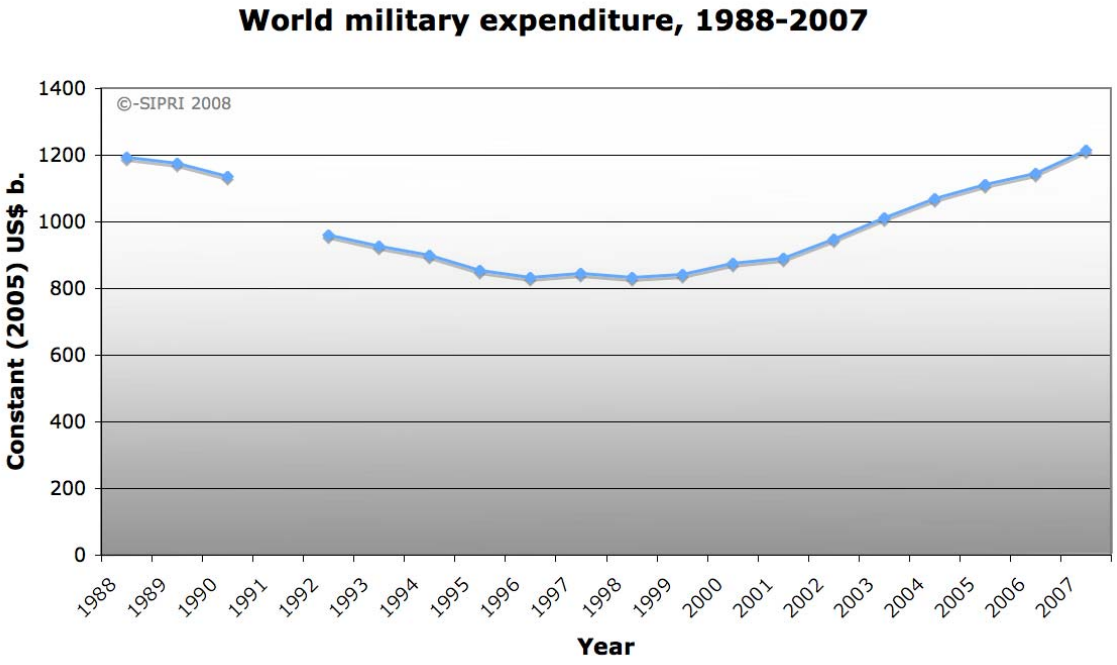


Figure 1. World Military Expenditure 1988-2007 (From SIPRI, 2008)

Other important facts concerning European and world defense spending are:

- U.S. military spending accounts for 45% of the world's 2007 total, followed by the UK, China, France and Japan, with 4–5% each.
- U.S. military spending has increased by 59% in real terms since 2001.
- The E.U.'s 15 core states' spending accounts for less than 40% of U.S. spending.

- The E.U. budgets have halved over the last 20 years, from 3.5% of GDP to an average of 1.6%.
- World military expenditures for 2007 are estimated at $1339 billion. That represents a six % increase over 2006, and a 45% increase since 1998 (SIPRI, 2007).

III. METHODOLOGY

A. EVENT STUDIES

1. Introduction

Event studies are an important, and the predominant, methodological approach to market based empirical research in the areas of finance and accounting. This methodology was first introduced in the late 1960s in the studies of Ray Ball and Philip Brown (1968) and Eugene Fama et al. (1969), who tried to determine the effects of specific information, like earnings announcements and stock splits in firms' security prices.

Since then, event studies, also known as residual analysis and abnormal performance index tests (Bowman, 1983), have been used in numerous studies in order to analyze the security price behavior around the time of an information announcement, called an event. Event studies have been applied to study a variety of firm-specific and economy-wide events like the announcement of annual accounting earnings, mergers and acquisitions, accounting principle changes, issues of new debt or equity and changes in macro-economic factors or the regulatory environment.

In conclusion, an event study is an analysis using financial market data, to determine if there is a statistically significant reaction to a particular event that is assumed to have an impact on the market value of a public firm. A. Craig MacKinlay, author of the study ''Event Studies in Economics and Finance,'' claims that such studies are useful, taking into consideration that:

> …given rationality in the market place, the effects of an event will be reflected immediately in security prices. Thus a measure of an event's economic impact can be constructed using security prices observed over a relatively short period of time. (1997, March, p.13)

In this report the authors use statistical inference to determine if there was a statistically significant reaction in the stock price of the four major European aerospace and defense firms to the announcement of a merger or acquisition.

2. Event Study Structure

In the years since the first seminal event studies, certain modifications have been developed in order to deal with complications with statistical assumptions used in the early work and to accommodate more specific hypotheses. Although the event study literature is diverse because of the range of topics covered and the available techniques, the structure of the event studies is rather simple and straightforward. In other words, while the structure is not unique, there is a common general flow of analysis.

The first step in conducting the event study is to identify the event of interest and to determine the time period over which the security prices of the firm involved will be examined. This is the **event window**. In this report the event window is defined as the announcement date of a merger/acquisition plus one trading day after the announcement. It is common to set the event window as larger than the specific event because the effects may be obvious days after the release of the information. The precise identification of the event date is crucial for the power of the tests (Brown and Warner, 1985). The researchers collected announcement dates and target firms for each one of the four contractors (BAE, EADS, Finmecanicca, and Thales) and then verified these dates with the respective corporate press releases found on the corporate websites.

At this point it is essential to mention that the researchers decided to use the **daily** arithmetic stock and index returns methodology instead of several other options like monthly or quarterly returns. The daily arithmetic stock and index returns are the percentage change from day to day. The use of daily stock price data is supported in the event studies literature (Brown & Warner, 1985; MacKinlay, 1997) as most appropriate, given the frequency of the consolidation announcements.

The next and most important step is the measurement of the **abnormal return**. The abnormal return is defined as the difference between the actual (or realized) ex post security return over the event window and the normal (or expected) return of the firm's security over the event window. The normal return can be defined as the security return if the event had not taken place. Thus, for firm *i* and event date *t*, the abnormal return is:

$AR_{it} = R_{it} - ER_{it}$

where AR_{it} , R_{it} and ER_{it} are the abnormal, actual and normal returns, respectively.

There are many estimation models available for determining the abnormal returns. One of the most popular is the **market model**, which assumes a stable linear relation between the security return and the market portfolio index return.

Using the market model to calculate the normal return, the abnormal return is:

$AR_{it} = R_{it} - (a_i + \beta_i R_{mt})$

where, R_{mt} is the market portfolio index return and a_i , b_i are constants (coefficients) for security *i* , calculated from the **estimation window** returns. These constants can either be calculated using the appropriate formulae or can be directly derived from the MS Excel Data Analysis regression tool.

In this report, the estimation window is defined as the timeframe of 120 days prior to the event <u>but not</u> including the announcement date. The event date was not included in the estimation window in order not to influence the normal performance estimates (Bowman, 1983; McKinlay, 1997). Otherwise the event impact would be captured by both the normal and abnormal returns, violating the main assumption that the event impact is captured by the abnormal returns only.

These are the formulae for calculating the a_i , b_i constants (coefficients):

$$b_i = \frac{\sum_{i=1}^{120}(R_{it} - \mu_t)(R_{mt} - \mu_m)}{\sum_{i=1}^{120}(R_{mt} - \mu_m)^2}$$

$$a_i = \mu_i - b_i \mu_m$$

Where μ_i , μ_m are the mean values of the stock and index return, respectively, calculated as follows:

$$\mu_i = \frac{1}{120}\sum_{i=1}^{120} R_{it} \qquad\qquad \mu_m = \frac{1}{120}\sum_{i=1}^{120} R_{mt}$$

The following example is provided in order to illustrate the methodology of calculating the abnormal return based on the daily arithmetic returns and the market model.

On January 30, 2003, EADS announced the acquisition of the 25% stake of ASTRIUM from BAE Systems. The first step is to calculate the daily arithmetic returns for both the stock price of EADS and the EURONEXT 100 index for the 120 days preceding the announcement, the announcement day and the day after. Next, the daily arithmetic stock returns are regressed against the daily arithmetic index returns using the MS Excel Data Analysis regression tool for the period of 120 days prior to the announcement but not the announcement date itself—thus the estimation window.

Table 8 is an Excel Data Analysis regression tool output:

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.00255888	0.00283946	-0.901183942	0.369326
X Variable 1	1.0325034	0.12471144	8.279139556	2.19E-13

Table 8. EADS and EURONEXT 100 (Market index) Regression Data

According to the market model, the normal (predicted) EADS stock return for the announcement date is calculated such that:

EADS normal (predicted) return =

Intercept + X Variable * (Actual index return on date of announcement)

The coefficient values are substituted from Table 8 and the normal EADS stock return is calculated:

ADS normal (predicted) return = -0.00255888 +1.0325034 *(0.025726) = 0.024003

where 0.025726 is the previously calculated actual index arithmetic return on the date of the announcement.

The next step is to calculate the abnormal return in order to determine the effect of the released information. The abnormal return is the difference between the actual stock return on the announcement date and the previously calculated normal or expected return.

Table 9 illustrates the values of the calculated stock and index returns.

DATE	STOCK PRICE	DAILY STOCK RETURN	INDEX PRICE	DAILY INDEX RETURN
1/30/2003	9.88	0.04	510.35	0.025726
1/31/2003	9.7	0.01822	513.75	0.006662

Table 9. EADS stock and Market Index Daily Returns

According to the methodology, the abnormal return for the EADS stock on the announcement day is calculated as:

Abnormal return = Actual stock return – Normal (predicted) return.

The substitution results in:

Abnormal return = 0.04 - 0.024003 = 0.015997.

The same procedure is followed in order to calculate the abnormal return for the day after the announcement.

The final step of the procedure is to calculate the appropriate **t-statistic,** which functions as a measure to determine if the calculated abnormal returns were statistically significant. To do so, the abnormal return is divided by the standard error of the

regression analysis. This standard error can either be calculated or derived directly from the MS Excel Data Analysis Regression tool output, as illustrated in Table 10:

Regression Statistics	
Multiple R	0.60616992
R Square	0.36744198
Adjusted R Square	0.36208132
Standard Error	0.03105359
Observations	120

Table 10. EADS and EURONEXT 100 (Market index) Regression Statistics

Otherwise the standard error can be calculated using the following formula:

$$SE = \sqrt{\frac{\sum_{i=1}^{120} (R_{it} - \mu_i)^2}{n-2}}$$, where n=120, the number of days in the estimation window.

The example is completed by calculating the t-statistic for January 30, 2003, dividing the abnormal return (0.015997) by the standard error of Table 10 (0.03105359), resulting in a t-statistic value of 0.51513 (rounded).

B. METHOD OF ANALYSIS

1. Hypothesis Testing

The analysis of the data for the event studies requires the implementation of a statistical hypothesis testing, which is a common method of making decisions based on experimental data. The testing procedure begins with the assumption that the null hypothesis, denoted as H_0, is true. Then, using the previous calculated test statistic (as outlined previously in Section A) and a decision rule, an assessment is made whether the null or the alternative hypothesis, denoted as H_1, is supported by the data. In statistical hypothesis testing the basic question to be answered is what, assuming the null hypothesis is true, is the probability of observing a value for the test statistic as extreme as the value that was actually observed?

In these event studies. the null hypothesis H_0 is defined as the consolidation announcement having no effect on the abnormal return of a given stock price. That means that the abnormal return is equal to zero. The alternative hypothesis, H_1, is defined as the consolidation announcement having an effect on the abnormal return of a given stock price, thus the abnormal return is not equal to zero.

In these event studies both positive and negative abnormal returns can be observed, so a two-tailed hypothesis test is used; the mathematical representation of the hypotheses is as follows:

H_o: $AR_{it} = 0$, where AR_{it} represents the abnormal return.

H_1: $AR_{it} \neq 0$, where AR_{it} represents the abnormal return.

C. DETERMINATION OF STATISTICAL SIGNIFICANCE

Since the abnormal returns calculated for a specific date are not equal to zero, it is essential to determine whether or not there is sufficient evidence to infer statistical significance in the finding. For this purpose the *Student's t-distribution* or simply *t-distribution* is used as shown in Figure 2. It is often used as an alternative to the normal distribution, and the overall shape of its probability density function resembles the bell shape of a normally distributed variable with mean 0 and variance 1, although it is described more as mound shaped than bell shaped. The basic parameter of the t-distribution is the degrees of freedom, denoted with the Greek letter ν. As the number of degrees of freedom grows, the *t*-distribution approaches the normal distribution with mean 0 and variance 1. Thus, the t-distribution depends on ν, but not μ (mean) or σ (variance).

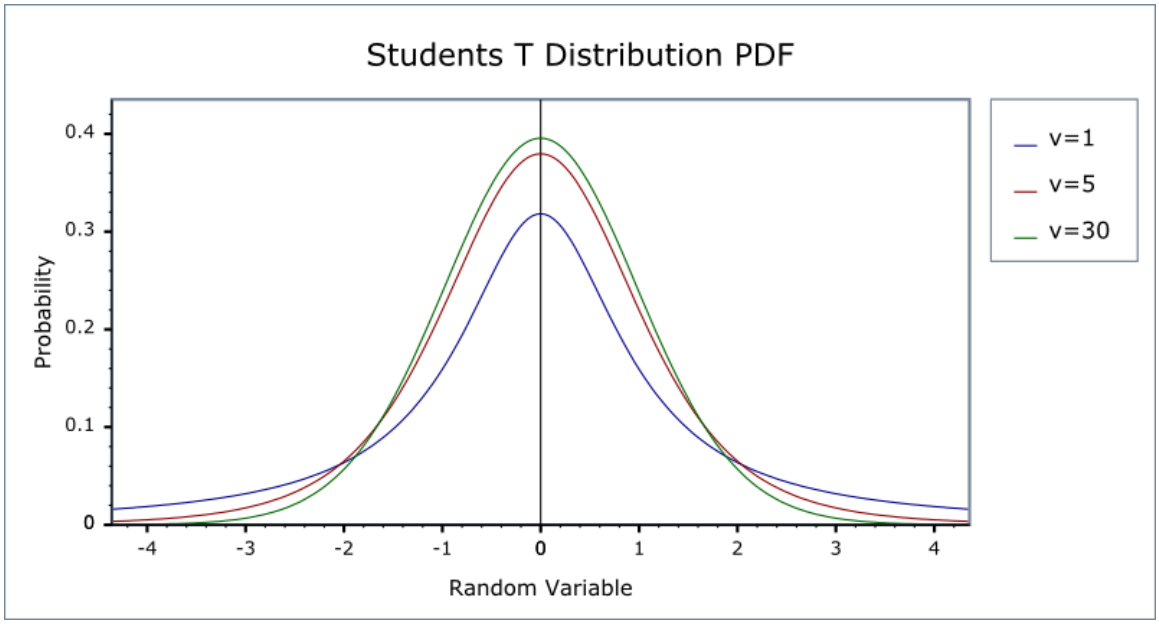


Figure 2. Student's T-distribution Probability Density Function with different ν

In order to determine whether or not there is sufficient evidence to infer statistical significance in the finding, the previously calculated *t*-statistic is compared to the *Critical values* of t-distribution. The tables of *Critical values* of t-distribution can be obtained from numerous sources. A subsection of this table is presented below in Table 11.

Deg. Freedom	**$t_{.200}$**	**$t_{.100}$**	**$t_{.050}$**	**$t_{.002}$**	**$t_{.001}$**
120	**1.289**	**1.658**	**1.980**	**2.358**	**2.617**

Table 11. Critical Values of *t for two-tailed test* (After**:** Statistics for Management and Economics, Seventh Edition, Appendix B-9 (Keller, 2005))

In this report, the degrees of freedom used are defined as the number of observations, *n*, minus the number of regressors in the sample. The number of observations, *n*, represents the number of the 120 trading days used in the regression analysis. The degrees of freedom used to determine the critical *t* values is 120, since there is one regressor and that is the closest value of degrees of freedom in the table that matches the actual degrees of freedom from the event studies.

In hypothesis testing it is possible to commit two errors:

A Type I error occurs when the researchers reject a true null hypothesis:

P (Type I error) =α.

A Type II error occurs when the researcher fails to reject a false null hypothesis:

P (Type II error) =β.

The probability of committing a type I error (α) is the significance level of the test.

The probability of not committing a type I error (1-α) is the confidence level of the test.

The probability of not committing a type II error (1-β) is the power of the test.

The determination of the significance level of the abnormal returns is based on t-statistic value thresholds, which correspond to the critical values of t and are listed below in Table 12.

Range	**t<1.289 t>-1.289**	**1.289<t<1.658 -1.658<t<-1.289**	**1.658<t<1.980 -1.980<t<-1.658**	**1.980<t<2.617 -2.617<t<-1.980**	**2.617<t t<-2.617**
Level of statistical significance (α)	<20% none	10%-20% weak	5%-10% moderate	1%-5% strong	>1% Very strong

Table 12. t-statistic Value Thresholds

For example, if the calculated *t*-statistic value is lower than the critical value of *t* at 1.289, then the null hypothesis (the abnormal return actually equals zero) is accepted, since the finding is not statistically significant. If the calculated *t*-statistic is between the critical values for *t* of 1.289 and 1.658, then the finding is significant at the 10%-20% level but the statistical inference is of weak significance. The rejection areas according to the level of statistical significance (α) are represented in Figure 3.

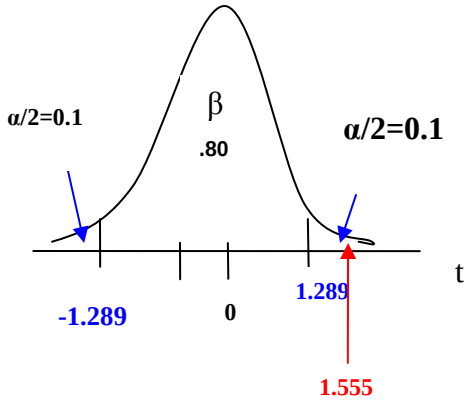


Figure 3. Rejection regions for 20% statistical significance (α= 0.2)

In conclusion, the stronger the statistical significance (smaller α value), the smaller the probability of committing a Type I error, rejecting a true null hypothesis.

IV. DATA ANALYSIS

A. DATA ANALYSIS INTRODUCTION

A total of 80 event studies were executed for the top four European Defense Companies. In some cases, event studies were executed for the same company in different stock markets, in order to examine the reaction of different stock markets to the same announcement. In particular, the event studies for EADS and Thales were executed for both the "CAC 40" and "EURONEXT 100" stock markets.

The results are presented in Tables 13 through 18. Each table can be interpreted as follows: all the events are presented in chronological order from the oldest to the newest. The first column presents the announcement date, the second the target company that was acquired or merged with the examined company, the third the "t-stat" of the analysis for the announcement date, the fourth the statistical significance of the "t-stat" for the announcement date, the fifth the "t-stat" of the following date of the announcement and the sixth the statistical significance of the "t-stat" of the following date of the announcement. Only the announcements that experienced statistically significant results are presented; this case study set the threshold at the 20% significant level. The significant results of the consolidations are presented in dark characters, while the rest are not presented at all for easier presentation.

1. BAE Systems

Twenty-one announcements were examined for BAE Systems for the period between 2001 and 2009 and an event study executed for each. Table 13 presents in detail the results concerning the arithmetic return events for each announcement of the company. Fourteen out of the 21 announcements, or 67%, presented statistically significant abnormal returns, while 33% did not present any statistically significant abnormal returns. Eight of these announcements (57%) resulted in positive significant abnormal returns, while six of these announcements (43%) resulted in negative significant abnormal returns. Thus, 38% of the announcements resulted in positive significant abnormal returns and 29% resulted in negative significant abnormal returns.

Announce Date	Target	t-stat	Stat Signif.	t-stat	Stat Signif.
10/22/2002	Condor Pacific Industries	-0.9515		-1.1384	
2/5/2003	MEVATEC Corp	-0.3059		0.4575	
2/17/2003	Advanced Power Technologies Inc	0.7401		-0.6760	
8/22/2003	29% of ALVIS	0.7705		0.1218	
4/5/2004	STI Industries Inc	0.4479		-0.5719	
6/3/2004	**ALVIS PLC**	**24.6044**	**>1%**	**24.6026**	**>1%**
7/1/2004	BOEING Commercial Electronics Unit	0.0042		-0.6639	
7/8/2004	Practical Imagineering Inc	-0.6540		-0.2813	
9/2/2004	**Digital Net**	**-9.7349**	**>1%**	**-9.7354**	**>1%**
9/28/2004	**ALFATECH**	**9.0625**	**>1%**	**10.2687**	**>1%**
3/7/2005	**United Defense Industries**	**-2.5504**	**1%-5%**	0.3454	
9/7/2006	**National Sensor Systems LLC**	**4.9605**	**>1%**	**6.5602**	**>1%**
5/8/2007	**Armor Holdings Inc**	**24.3954**	**>1%**	**24.3966**	**>1%**
11/28/2007	**Pitch Technologies AB**	**5.0540**	**>1%**	**2.6561**	**>1%**
12/24/2007	**MTC Technologies**	**-5.5990**	**>1%**	**-5.5992**	**>1%**
1/3/2008	**Petards LTD**	**5.9278**	**>1%**	**3.1945**	**>1%**
1/18/2008	**Tenix Defense**	**5.3251**	**>1%**	**5.3240**	**>1%**
4/16/2008	**IST Dynamics**	**-1.6351**	**10-20%**	**-1.4639**	
7/28/2008	**Detica Group PLC**	**-12.434**	**>1%**	**-12.434**	**>1%**
12/22/2008	**Tenix Toll Defense Logistics**	**5.0780**	**>1%**	**5.0826**	**>1%**
3/12/2009	**Advanced Ceramics Research**	**-6.1796**	**>1%**	**-6.1805**	**>1%**

Table 13. BAE Systems Arithmetic Return Events: Statistical Significance

These results indicate that BAE Systems' announcements for consolidations or acquisitions of other companies affected the stock price return, usually for the better. So the market responded to the strategy of the company concerning consolidations, and in a more positive than negative manner.

2. EADS

Twenty-one announcements were examined for EADS for the period between 2001 and 2009 and 39 regressions were executed. Eighteen were examined for "EURONEXT 100" and 20 one for "CAC 40." The difference in the number of examined announcements is due to the fact that the authors did not find accurate data concerning the same announcements in both of the stock markets.

Tables 14 and 15 present in detail the results concerning the arithmetic return events for each announcement of the company in each stock market. Table 14 presents the results relative to the "EURONEXT 100" stock market and Table 15 present the results relative to the "CAC 40" stock market.

Announcement Date	Target	t-stat Announcement Date	Stat Signif.	t-stat Following date	Stat Signif.
10/16/2001	PZL	-0.3418		0.7887	
12/3/2001	COGENT	0.5566		-0.7200	
1/30/2003	ASTRIUM	0.5151		-0.7258	
11/20/2003	ASL Lemwerder	-0.7184		1.3898	
10/6/2004	RACAL Instruments	-1.0416		-0.5966	
12/1/2005	**Dutch space**	**-2.1142**	**1%-5%**	0.0477	
12/30/2005	ATLAS ELECTRONICS	-0.9828		-0.9633	
4/7/2006	GET	-1.2563		-0.6423	
5/4/2006	IFR	0.3285		-0.0352	
5/9/2006	Sofrelog	1.0334		-0.3321	
6/9/2006	Dynamic	0.1355		0.8420	
10/13/2006	20% of Airbus	-0.0629		0.1424	
11/5/2007	**Mc ALPINE**	**-2.6355**	**>1%**	-0.7737	
4/7/2008	SURREY	-0.4454		0.0901	
4/22/2008	**PLANT CML**	-0.0042		**-1.6675**	**5%-10%**
5/28/2008	MOTORFLUG	-0.0781		-0.9128	
7/8/2008	SPOT	0.3103		0.7839	
10/1/2008	**IMASS**	1.2383		**1.5558**	**10%-20%**

Table 14. EADS in “EURONEXT 100” Arithmetic Return Events: Statistical Significance

Announcement Date	Target	t-stat Announcement Date	Stat Signif.	t-stat Following date	Stat Signif.
6/20/2001	**Australian aerospace**	**-0.9102**		**1.6832**	**5%-10%**
6/27/2001	Finnish Patria	-0.7111		-0.2790	
7/19/2001	BOSCH Satcom	-0.7356		-0.2261	
10/16/2001	PZL	-1.0788		0.3423	
12/3/2001	COGENT	0.4923		-0.8408	
1/30/2003	ASTRIUM	0.5648		-0.7610	
11/20/2003	ASL Lemwerder	-0.6538		0.9982	
10/6/2004	RACAL Instruments	-0.9458		-0.5167	
12/1/2005	**Dutch space**	**-1.9060**	**5%-10%**	0.2522	
12/30/2005	ATLAS ELECTRONICS	-0.9071		-0.9181	
4/7/2006	GET	-0.0890		0.9455	
5/4/2006	IFR	0.3470		0.0737	
5/9/2006	Sofrelog	0.9140		-0.4806	
6/9/2006	Dynamic	0.7925		-0.8318	
10/13/2006	20% of Airbus	-0.0284		0.1369	
11/5/2007	Mc ALPINE	-2.7206		-0.8013	
4/7/2008	SURREY	-0.4406		0.1000	
4/22/2008	PLANT CML	-0.2376		-0.8513	
5/28/2008	MOTORFLUG	-0.0206		-0.8927	
7/8/2008	SPOT	-0.0388		-0.6414	
10/1/2008	**IMASS**	**1.2959**	**10-20%**	**1.8012**	**5%-10%**

Table 15. EADS in “CAC 40” Arithmetic Return Events: Statistical Significance

In total seven out of the 39 announcements of EADS or a percentage of 18% presented statistically significant abnormal returns. In particular three of these announcements or a percentage of 8% resulted positive significant abnormal returns, while four or a percentage of 10% resulted negative significant abnormal returns. The reaction of “EURONEXT 100” and “CAC 40” financial markets was as follows:

Four out of 18 announcements of EADS in the "EURONEXT 100," or a percentage of 22%, presented statistically significant abnormal returns. Three of these announcements (75%) resulted in negative significant abnormal returns, while one announcement (25%) resulted in a positive significant abnormal return. Overall, these numbers represented a 17% rate of negative significant abnormal returns and a 5% rate of positive significant abnormal returns.

The results were almost the same in the "CAC 40" stock market. Three out of 21 announcements of EADS in the "CAC 40," or 14%, presented statistically significant abnormal returns. Two of these announcements (67%) resulted in positive significant abnormal returns, while one (33%) resulted in negative significant abnormal returns. Overall, these numbers represent rates of nine-point-five percent positive significant abnormal returns and four-point-five % negative significant abnormal returns.

Examining the results in total, in seven out of 39 event studies the markets responded to firm's announcements by presenting statistically significant abnormal returns. Three of these announcements or 43%, resulted in positive significant abnormal returns, while four of these announcements, or 57%, resulted in negative significant abnormal returns. As part of the total number of announcements, there were eight % positive significant abnormal returns and ten % negative significant abnormal returns.

Both of the stock markets responded to the firm's consolidation in two out of four common announcements and did not respond at all to the other 14. Also, the common responses were made in the same manner, one negatively and one positively, but with different significance. So, the two financial markets responded in the same way in 16 out of 18 common announcements (i.e., 89% of the time).

These results indicate that EADS' announcements for consolidations or acquisitions of other companies had some effect on the stock price return in both the "EURONEXT 100" and "CAC 40" stock markets, 8% positively and ten % negatively in total.

So, it is evident that both markets responded almost identically to the strategy of the company concerning consolidations, with "EURONEXT 100" and "CAC 40" responding in the same way in sixteen out of eighteen common announcements.

3. Thales

Eight announcements were examined for Thales for the period between 2001 and 2009 and 16 event studies were executed. Tables 16 and 17 present in detail the results concerning the arithmetic return events for each announcement. Table 16 presents the results relative to the "EURONEXT 100" stock market and Table 17 the results relative to the "CAC 40" stock market.

In total two out of the 16 announcements of Thales or a percentage 12.5% presented statistically significant abnormal returns. In particular both of these announcements or a percentage of 20.5% resulted negative significant abnormal returns. The reaction of "EURONEXT 100" and "CAC 40" financial markets was as follows:

None of the announcements in the "EURONEXT 100" stock market presented any statistically significant abnormal returns as shown in Table 16.

Announcement Date	Target	t-stat Announcement Date	Stat Signif.	t-stat Following date	Stat Signif.
5/16/2006	Diehl	-0.3390		-0.9565	
9/11/2006	SVS	0.3556		0.4214	
10/12/2006	ADI Group Holdings Pty Ltd	0.1517		1.2401	
12/4/2006	Alcatel-Lucent	0.6892		-0.9839	
1/30/2007	DCN	-0.6535		2.2159	
8/1/2008	Airbus unit Laupheim site	0.2635		-0.7939	
9/1/2008	Barco's Software Development Unit	1.2175		0.0802	
10/10/2008	nCipher PLC	0.7932		-0.7561	

Table 16. Thales in "EURONEXT 100" Arithmetic Return Events: Statistical Significance

Two out of eight announcements in the "CAC 40," or 25%, presented statistically significant abnormal returns and all of them were negative as shown in Table 17.

Announcement Date	Target	t-stat Announcement Date	Stat Signif.	t-stat Following date	Stat Signif.
5/16/2006	**Diehl**	**-4.4572**	**>1%**	**2.5491**	**1%-5%**
9/11/2006	SVS	0.2728		1.2206	
10/12/2006	ADI Group Holdings Pty Ltd	0.2113		-0.0272	
12/4/2006	Alcatel-Lucent	0.0701		-1.2612	
1/30/2007	DCN	0.3395		0.8382	
8/1/2008	Airbus unit Laupheim site	0.9682		1.0701	
9/1/2008	Barco's Software Development Unit	1.0548		0.9758	
10/10/2008	**nCipher PLC**	1.0516		**-1.3911**	**10%-20%**

Table 17. Thales in "CAC 40" Arithmetic Return Events: Statistical Significance

These results indicate that Thales' announcements for consolidations or acquisitions of other companies had no effect on the stock price return in the "EURONEXT 100" stock market, while it negatively affected the stock price return in the "CAC 40" stock market 25% of the time. In particular, the two financial markets responded to the company's consolidation strategy in the same manner in six out of eight common announcements (i.e., 75% of the time) and differently in two out of eight. In those, "EURONEXT 100" did not respond at all and "CAC 40" first responded slightly and in a negative manner.

4. Finmeccanica

Four announcements were examined for Finmeccanica for the period between 2001 and 2009, and the same number of event studies executed. Table 18 presents in detail the results concerning the arithmetic return events for each announcement. One out of the four announcements, or 25%, presented statistically significant abnormal returns, in the negative.

Announcement Date	Target	t-stat Announcement Date	Stat Signif.	t-stat Following date	Stat Signif.
3/30/2007	SELEX	-0.9973		0.9198	
10/15/2007	REMINGTON	-0.2939		-0.3047	
10/22/2008	**DRS**	**-4.0014**	**>1%**	**-2.3971**	**1%-5%**
11/5/2008	EUROTECH	0.6649		-1.1415	

Table 18. Finmeccanica Arithmetic Return Events: Statistical Significance

These results indicate that Finmeccanica's announcements for consolidations or acquisitions of other companies affected the stock price return in a negative manner, 25% of the time.

Therefore, the market first responded slightly to the strategy of the company concerning consolidations, and did so in a negative manner.

B. SUMMARY

The results of the data analysis are summarized in Table 19, which presents the percentage of events experiencing statistically significant abnormal returns in total, the percentage of those that resulted in positive returns and the percentage that resulted in negative returns.

Contractor	Total Percentage of Events Experiencing Statistically Significant Abnormal Returns	Percentage of Events Experiencing Positive Statistically Significant Abnormal Returns in Total	Percentage of Events Experiencing Negative Statistically Significant Abnormal Returns in Total
BAE Systems	67%	38%	29%
EADS "EURONEXT 100"	22%	5%	17%
EADS "CAC 40"	14%	9.5%	4.5%
Thales "EURONEXT 100"	0%	0%	0%
Thales "CAC 40"	25%	0%	25%
Finmeccanica	25%	0%	25%
Total	30%	14%	16%

Table 19. Summary of Statistically Significant Events

Summarizing the results of the data analysis, of the 80 examined event studies only 23 resulted in statistically significant returns the day of the announcement or the following date, which translates to a rate of almost 29%. Eleven announcements, (14%) resulted in positive abnormal returns and 12 announcements (15%) resulted in negative abnormal returns.

Figure 4 presents the results in a pie chart.

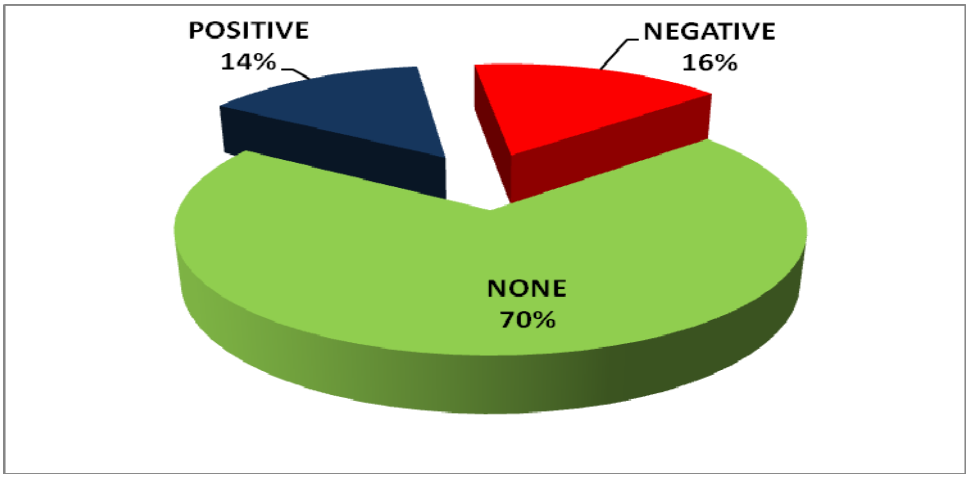


Figure 4. Percent of Events Presenting Statistically Significant Abnormal Returns

Figure 5 presents the percentage of statistically significant abnormal returns that every company experienced from its examined consolidations.

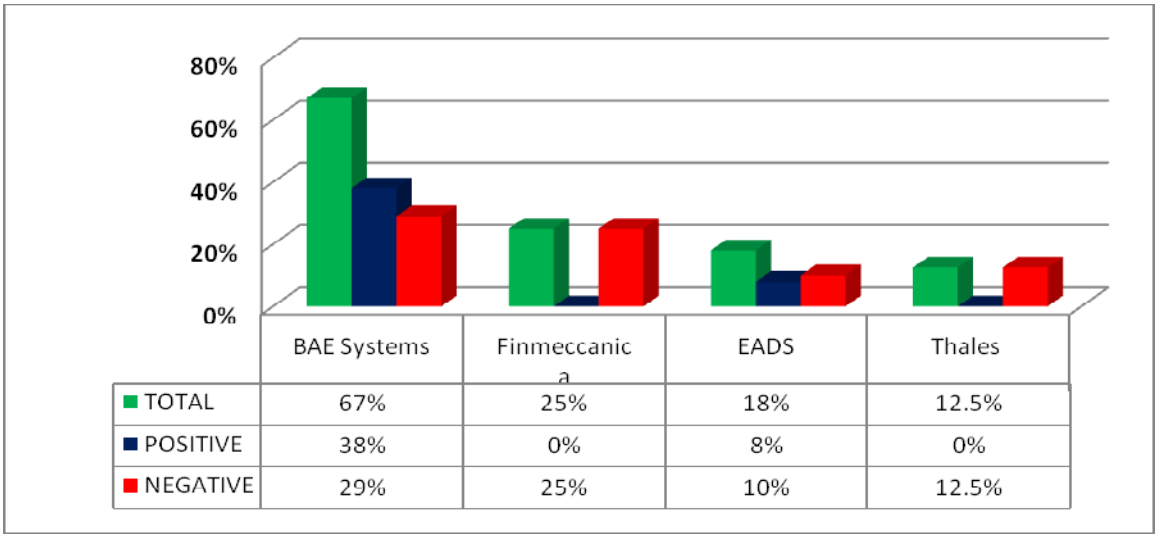
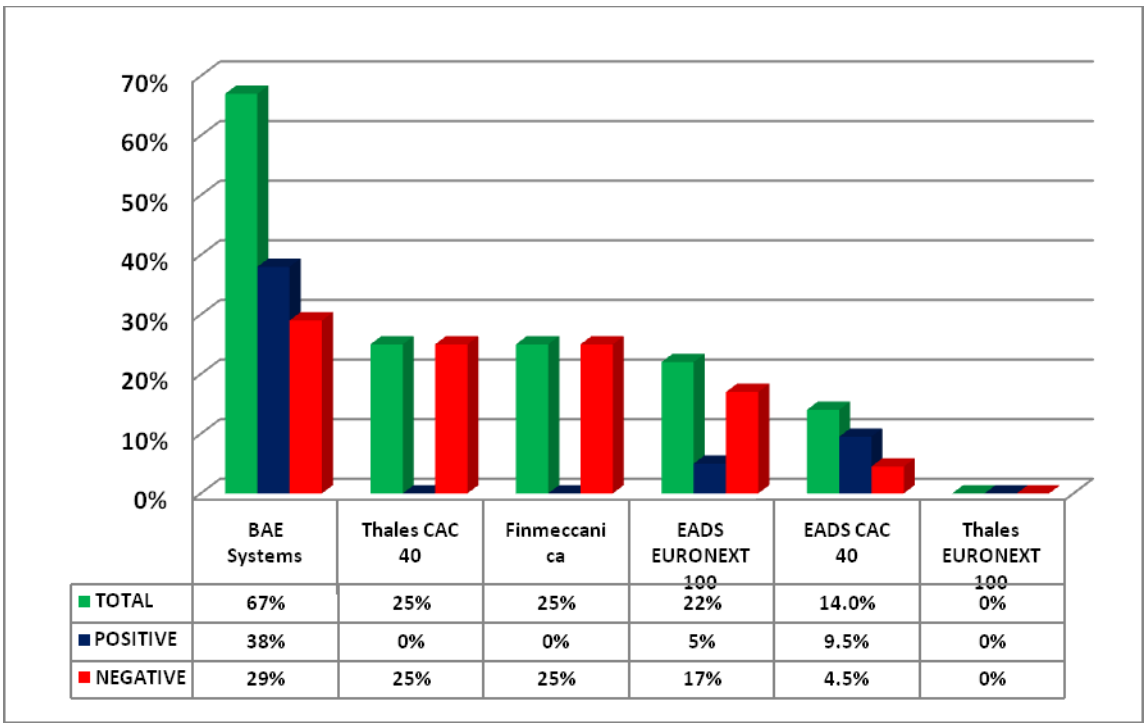


Figure 5. Percentage of Statistically Significant Abnormal Returns in Relative Stock Market

Figure 6 presents the percentage of the statistically significant abnormal returns that every company experienced in its relative stock market from its examined consolidations.



	BAE Systems	Thales CAC 40	Finmeccanica	EADS EURONEXT 100	EADS CAC 40	Thales EURONEXT 100
TOTAL	67%	25%	25%	22%	14.0%	0%
POSITIVE	38%	0%	0%	5%	9.5%	0%
NEGATIVE	29%	25%	25%	17%	4.5%	0%

Figure 6. Percentage of Statistically Significant Abnormal Returns in Total

From these statistically significant returns it is evident that the market responded more to BAE Systems' consolidations, far above the mean of the examined consolidations. In particular, the market responded positively to BAE Systems' announcements 38% of the time and negatively 29% of the time.

The market responded to Finmeccanica's consolidations with nearly the same total percentage of all examined consolidations. Specifically, the market responded 25% of the time in a negative manner.

As for Thales, in "CAC 40" the market responded to the company's consolidations with almost the same percentage in all the examined consolidations. That is, the market responded 25% of the time in a negative manner.

The market responded to EADS' announcements for consolidations in the "EURONEXT 100" and "CAC 40" markets 22 and 14.3% of the time, respectively. Those rates are close to the mean of the examined consolidations for "EURONEXT 100" and half the percentage for "CAC 40." Specifically, in total the market responded positively eight % of the time and negatively 10% of the time.

Finally, the “EURONEXT 100” stock market did not respond at all to the announcements of consolidations of Thales, with 0% of the events experiencing statistically significant abnormal returns.

As for the reaction of different markets to the same announcements, in the examined cases of EADS and Thales in both the “EURONEXT 100” and “CAC 40” stock markets, the results show that the markets responded practically the same in most of the cases. In particular the stock markets responded in the same manner in 22 out of the 26 common examined announcements that is nearly 85% of the time.

Figure 7 presents the common reaction of EURONEXT 100” and “CAC 40” financial markets concerning the announcements of EADS and Thales.

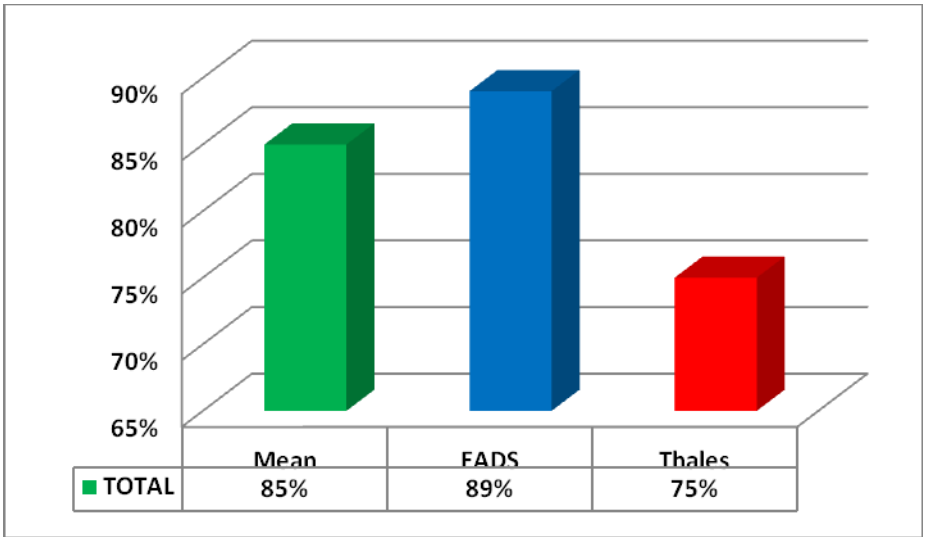


Figure 7. Common Reaction of Stock Markets

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V. CONCLUSIONS

This project examines the statistically significant reaction of the financial markets to the top four European defense contractors' announcements of consolidations for the period 2001–2009. Although this is a quantitative analysis, the authors make some qualitative assessment of the findings as well.

The main conclusions, based on the results that were derived from the data analysis, can be summarized as follows:

There was moderate statistically significant reaction of the financial markets to the announcements of consolidation. Specifically, the markets responded only 29% of the time and showed no response in the remaining 71% of announcements. Their responses were nearly evenly divided between positive and negative reaction, with 14% positive and 15% negative. The markets' responses and their evaluations regarding each company are presented in a grade order as follows:

1. From the data analysis it is obvious that BAE Systems seems to have triggered the financial markets most, with a percentage much above the mean (sixty-two percent 62% against 29). Also, its positive abnormal returns outnumber the negative ones. So, in the case of BAE Systems, the stock market anticipated that the announcement of consolidation would result in a more significant benefit than loss to the company and to its shareholders as well.

2. Finmeccanica follows with a 25% statistically significant response, close to the mean, but all in a negative manner. In this case, the stock market responded somewhat to the announcements and, when it did, it expected that this action would result in a loss to the company and to the stockholders' wealth.

3. EADS comes in third, with statistically significant response. Also, the markets' responses were more negative than positive. So, in the case of EADS, the stock markets anticipated that the announcement of consolidations would result more in a loss than a gain to the company and to the shareholders' wealth.

4. Finally, the financial markets responded least to the announcements of Thales, with a percentage of 12.5, all negative. Hence, the stock markets responded mildly to the announcements, and in doing so expected that this action would result in a loss to the company and to the shareholders' wealth.

A. Two of the companies, EADS and Thales, were examined in different stock markets, "EURONEXT 100" and "CAC 40." In both cases the reaction of the markets was nearly the same (89 and75%, respectively), and close to the mean (85%). The large percentages show that, regardless of the situations that might predominate in the two markets at a given time, they respond similarly to the same actions of the same companies.

B. The findings of this project are mainly quantitative. Many factors led to these results and can be the basis for further research. Some of these factors are as follows:

1. The examined defense contractors chose different strategies concerning the type and magnitude of mergers and acquisitions. BAE Systems seems to have chosen the consolidation of the U.K.'s national defense infrastructure into one company, with major transatlantic mergers and acquisitions in order to dominate Europe's defense industry and to penetrate the U.S. defense market. On the other hand, EADS was formed via a merger of mergers, producing a firm that would strengthen its position in the world defense industry. Thales and Finmeccanica followed nearly the same strategy as EADS but to a lesser degree. Evaluating the results of the data analysis and the relative strategy of each company, it is evident that the financial markets expected that companies that choose aggressive strategies, which combine strengthening of their position with organic growth, would result in more significant gains than losses to the wealth of the company. That is why BAE Systems was graded first among the examined firms, not only with a considerable lead but with a more positive than negative impression as well. The strategy of the other companies not only did not trigger considerable response from the financial markets, but what response it did get tended to be negative.

2. In this study the statistically significant results of the arithmetic abnormal returns were examined at the time of the consolidation's official announcement date. It is quite common that there could have been a leakage of information concerning the company's intent to consolidate before the official announcement. Such pieces of information are usually exploited by the financial markets ad hoc, before the announcement of the final agreements. So, the markets may not have responded in the examined period of time, but in a different one, which cannot be easily traced. Nevertheless, taking into account all the assumptions, event studies will continue to be a useful tool for analyzing certain situations in the area of finance and economics.

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VI. RECOMMENDATIONS FOR FUTURE RESEARCH

This project focuses on a quantitative analysis of the statistically significant reaction of the stock markets to the consolidation announcements of the top four European defense contractors. During the research, some interesting questions were raised in addition to the primary and secondary research questions. Some of the most challenging research issues that intrigued the authors and could be the basis for future research are presented below:

A. A QUALITATIVE ANALYSIS OF THE FACTS THAT INFLUENCED THE REACTION OF THE STOCK MARKETS.

This project makes a quantitative analysis of the statistically significant reaction of the stock markets. It would be quite interesting to examine the factors that led the financial markets to react differently to the announcements for consolidations of the defense firms. The research can examine the status of the stock markets and the overall economy at certain periods of time (e.g., a "snapshot" of the market, if it was facing a gain or a loss and how the markets reacted to consolidations of different financial categories such as pharmaceutical, banking, defense, etc.). Also, it can examine the different strategies that every defense firm chose concerning the consolidations. For example, aggressive strategies with major mergers and acquisitions, conservative strategies with acquisitions of numerous small companies or mergers with companies focused on civilian activities.

B. A QUANTITATIVE AND QUALITATIVE ANALYSIS OF THE STATISTICALLY SIGNIFICANT REACTION OF THE STOCK MARKETS TO THE ANNOUNCEMENTS OF JOINT VENTURES OF THE TOP FOUR EUROPEAN DEFENSE CONTRACTORS.

The formation of joint ventures is a very common strategy in the European defense industry, since the creation of multinational consortia (like the Eurofighter European jet fighter consortium) results in a "value creation" to the involving companies.

In some cases joint ventures create greater promise for economic growth than mergers and acquisitions. So, the research on the statistically significant reaction of the stock markets to the announcements of joint ventures would be quite interesting.

C. EXPAND THE RESEARCH FOR OTHER DEFENSE COMPANIES.

This study focuses on the top four European defense firms. It would be interesting to examine the reaction of the financial markets to the announcements of consolidations of other well-known global defense contractors in the same or other continents (U.S., Asia, Australia). The research results from the other companies can be used together with the results of this project, as the primary elements for a wider quantitative and qualitative analysis of the impact of consolidations on the financial markets worldwide.

D. IMPLEMENTATION OF OTHER MODELS AND TEST STATISTICS.

The implementation of other multifactor and modified models, as well as the use of more sophisticated test statistics, may deal more effectively with various situations such as the uncertainty of the event date and the fluctuations of the variance during the event period, which are responsible for reducing the sensitivity of the traditional method.

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