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EFFECT OF GLOBAL GEOPOLITICAL RISK ON BIG FIVE

Onur Kemal Şanlı
117620012

Assoc. Prof. Serda Selin Öztürk

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PREFACE

Firstly, I would like to thank and show my gratitude to my thesis advisor Assoc. Prof. Serda Selin Öztürk. From my first day to the last day of my thesis venture ,she answered all of my e-mails and unnecessary questions with great patience. Without her, this thesis would not exist.

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I dedicate this thesis to My mother Nebahat Şanlı, who has been my biggest supporter and closest friend in every aspect of life.

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LIST OF ABBREVIATIONS

BC	Boeing Company
GPR	Geopolitical Risk Index
GDC	General Dynamics Corp.
LMT	Lockheed Martin Corporation
NGC	Northrop Grumman Corporation
RC	Raytheon Company
S&P	Standard and Poor's
T-Bill	U.S. 1 year Treasury Bond Yield

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ABSTRACT

Relationship between war related news and the economic repercussions is examined widely in lots of different aspects. When a political tension occurs, this tension has an economic and a psychological consequences. This perception shifts the behaviour of the individuals or companies.

Our objective is to examine the correlation between Global Geopolitical Risk Index and the U.S. Defense companies. In this thesis, biggest U.S. five defense companies and the GPR index are taken into consideration. Gpr Index is simply constructed on the electronically achievable newspapers keywords. 11 American and International Newspapers are the root of this Index.

In order to check the relationship between GPR benchmark monthly volatility and the stock prices of certain companies, the CAPM model is used. The research covers the time period between January 1, 1985 and January 1, 2019. There are 4 models used and, two separate dummy variables are incorporated into the equation for GPR Index. Empirical findings of the two methods show that war related announcements have statistically significant effects on Excess Returns on some different levels. In order to select the best model that fits on the data, two dummy variables are used (dummy variable in time $t-1$, slope dummy variable in time $t-1$) in our model and the regression analysis.

Keywords: Geopolitical Risk, Defense Contractors, GPR Index, War, CAPM, Dummy Variable, Big Five

ÖZET

Savaşla ilgili haberler ve ekonomik yansımaları arasındaki ilişki birçok farklı açıdan geniş çapta incelenmiştir.. Politik bir gerilim olduğunda, bu gerilimin ekonomik ve psikolojik sonuçları olur.Ve Bu algı, bireylerin veya şirketlerin davranışlarını değiştirir.

Amacımız, Küresel Jeopolitik Risk Endeksi ile ABD Savunma şirketleri arasındaki ilişkiyi incelemektir. Bu tezde, en büyük Beş Savunma Şirketi ve GPR endeksi dikkate alınmıştır. Gpr Endeksi elektronik olarak temin edilebilir gazete anahtar kelimeleri üzerine inşa edilmiştir. 11 Amerikan ve Uluslararası gazete bu Endeksin kökenidir.

GPR Endeksi aylık oynaklığı ile ve bu beş hisse senedi fiyatı arasındaki ilişkiyi araştırmak için CAPM modeli kullanılmıştır. Araştırma, 1 Ocak 1985 ile 1 Ocak 2019 arasındaki süreyi kapsamaktadır. Toplam 4 Model oluşturulmuş olup, GPR Endeksi denklemine iki ayrı dummy değişken dahil edilmiştir. GPR verisi aylık olduğundan veri 2 yöntemle toplanmıştır; günlük getirilerin aylık ortalaması ve her ayın son günkü günlük getirisi hesaplanarak İki yöntemin ampirik bulguları, savaşla ilgili anonsların farklı noktalarda ve farklı güven seviyelerinde istatistiksel olarak anlamlı etkileri olduğunu göstermektedir.

Anahtar Kelimeler: Jeopolitik Risk, Savunma Şirketleri, GPR Endeksi, Savaş, CAPM, Dummy Değişken, Büyük Beşli

INTRODUCTION

Defense expenditures are the biggest slice of most countries in the World, Especially in the U.S.A. For example in 2020, the defense budget of the U.S. is 1.4 trillion \$. (For comparison, Turkey's total GDP is 743 billion \$ in 2019). 6 of the 7 current biggest defense contractors all over the world are American. Moreover the 5 of them have been the trivet of this industry for almost a century: Boeing, Lockheed Martin, General Dynamics, Raytheon and Northrop Grumman.

To demonstrate why these companies are the big five, we should go back to the end of the cold war. During war times and the cold-war period, the U.S. Defense budget/ Total GDP ratio was relatively high. For example in WWII, the defense budget was almost %40 of total GDP. This was also a fact for the 1970-1980 era. When it was 1993, there was a "big fifty-one", and the government decided to reduce the defense budget share. This might result in a demand shortage for this many corporations. Therefore, the Department Of Defense decided to work with only a couple of companies. They planned to not intervene and see other businesses close. As they predicted some companies were closed, and some other ones are merged. There is a simple philosophy behind the drive towards acquisitions. Since its peak in 1985, the government procurement budget has declined 67 percent, causing arms manufacturers to cut off employees and shut factories at a rate possibly unseen in recent U.S. business history. The Pentagon and industry representatives conclude that bigger companies would act more effectively in expanding the low budget and executing the big-ticket programs portraying military spending in the late nineteen's. As a consequence, we have the big five.

"The frenzy of defense industry mergers can be traced to 1993 when then-Deputy Defense Secretary William Perry invited executives to dinner. At an event now referred to as the last supper, Perry urged them to combine into a few, larger companies because Pentagon budget cuts would endanger at least half the combat

jet firms, missile makers, satellite builders and other contractors represented at the dinner that night.” (Mint 1997)

Besides gun and army based manufacturing, these companies also contributed to humankind greatly. For instance, Apollo Lunar Module, Atlas Rocket, Microwave oven, telecommunication devices etc. Although these companies have been losing power during last years, they still overrule the market.

"This theory that you can't beat the big five, that they have so much political influence that they're just going to knock everyone else out of the way that is essentially the opposite of what we see being the case here," he said. "If you're a Silicon Valley firm considering idea of breaking into defense game, the market access information would probably look pretty good."(Klimas, 2016)

"24/7 Wall St. reviewed contract data from the Federal Procurement Data System to identify the companies making the most from the federal government. The government paid 30 companies at least \$2.3 billion each in fiscal 2017. Four companies on this list were each awarded federal contracts worth over \$14 billion – more than the entire budget for the Environmental Protection Agency or the Department of the Interior."(Sauter, Stebbins, 2019)

Since the start of the Trump period, U.S. military expenditures have been on the rise. However, the stronger focus of the new administration on improving the nation's military is projected to hold defense spending on the higher side as well in the future.

NATO countries do seem to be focused on rising military budgets to tackle possible Russian and Mid-east threats. Also, military spending from other countries, such as India, China, and Japan, has been rising due to continuing potential threats. Besides that, elevated international tensions are generating high demand for weaponry in

the Mid East and North Korea. These elevations appear to be the main driver between the production growth and arms race.

While conventional hazards (ground, sea, and air-based) continues to evolve, cyber-related concerns have indeed culminated in technological innovations and digitalization. Strategy and tactics are changing worldwide, to be organized for the future. Besides, countries strive to incorporate virtual tools and techniques to handle conventional as well as digital-age risks. This has contributed to a stronger emphasis on several cyber systems. In the near term they're predicted to play a critical role. Besides, space becomes a significant part of the overall environment of the arms industry as increasing global conflicts may pose a danger to aerospace facilities like satellites.

They are also dependent on military activities such as monitoring, communication, and guidance of missiles. Since shielding these assets has become essential, this can contribute to the militarization of space. The U.S., China, and Russia have already started to develop spatial domination. Certain nations, such as North Korea and India, follow slowly.

Political tension and footsteps of war usually mean fear, patriotism, urge to defense, and tools for security. It is also understandable that these emotions lead to a demand in the market. These more demanded might look more profitable as well. For example, the political tension that occurred between the U.S.A and Iran lead to an abrupt jump in defense sector stocks. 4 weeks after U.S. operation in the field, the S&P 500 aviation sub-industry gained shareholders an amount of 1.5 percent. Shares of defense firms continue to outperform the stock market when the US takes military action in the Middle East, history shows.

“In the wake of U.S. airstrikes that killed Iranian General Qassem Soleimani last week, ‘war stocks’—companies in the defense industry—have climbed: Over the last five days of trading, the SPDR S&P Aerospace & Defense ETF (XAR) rose almost 4%, while the iShares U.S. Aerospace & Defense ETF (ITA) was up 2.5%. Big-name defense stocks are rising, with Northrop Grumman leading the rally last Friday. Northrop has risen 8% in the last five days, while Lockheed Martin and Raytheon have jumped around 4% and 2%, respectively.” (Klebnikov, 2020)

Although it is desired or not, defense companies will eventually make a profit from war. Clearly, the items are produced and will be used in this direction. Our question is that on what extent escalating tensions worldwide, or war-related news affect the value of this biggest American companies.

On the other hand, Geopolitics is a really important subject to understand international relationships and possible conflicts. Since we live in a middle-eastern country, the importance of land, resources, and political regimes are crucial in our territory. And history gives us a lot of examples, stories and life lessons. Geopolitics is basically focused on geographically linked political authority. In specific, in accordance with the diplomatic history, territorial waters, and land territories. Geopolitical discussions include relationships between

the objectives of international political players. Additionally, those topics which are focused on a region, area, or geographic factor; relationships that establish a geopolitical structure.

Geopolitics also a great indicator to interpret public opinion and psychology. We chose to use the Geopolitical Risk Index (GPR Index). GPR is introduced by Dario Caldara and Matteo Iacoviello. This index is a well structured and most achievable index. The historical data goes back to the early 1900s. Aim of this index is to count the occurrence of war or geopolitical-tension related keywords from newspapers. is a useful tool.

GPR Index shows us that current tension levels are high considering the last century. Surely, the levels are not high as big World wars, or 9/11 or 2003 invasion of Iraq. However, levels are still higher than the Vietnam War or Six days war of the middle east era.

Not only for stock prices as we opted to discover, but lots of other elements also seem to be correlated with GPR Index. For example Oil prices are highly affected by geopolitical acts.

Geopolitical volatility and petrol markets are historically been connected. Conflicts and political tractions sometimes cause oil production to go offline. This might lead to higher oil prices. Or even more interestingly, since the demand is dropped crucially for coronavirus (Covid-19) lockdown, Brent crude oil is negatively priced nowadays. (as of May 2020)

However, a substantial rise in oil prices has not occurred in the last couple of years. given the increase in geopolitical risk in the oil supply glut.

This paper is structured in 5 Chapters.

Chapter One, is the Introduction chapter. In this section, some basic information, the outline of the paper, and the rationale for this research are explained.

Chapter Two, is about the term “Geopolitical Risk”. In this section, there are two sub-titles.

The first subtitle is “definition”. It is mostly about the term, meaning, and historical importance.

The second sub-title is Data source. In this part, there is an explanation of the data source, method of the GPR Index, source, and execution.

Chapter Three is called “Largest U.S. Defence Corporations, Introduction and Their History”

In this section, There are six sub-titles. Definition of a defense company, Biggest five defense contractors of U.S., their basic history, the importance of these corporations, and civilian applications are explained. Some controversial aspects are also depicted.

Chapter Four is called “Literature Review”.

In this section, former academic literature and related papers, and methodological frontiers are introduced. Additionally, the scope of the paper, limitations, and method are briefly explained.

Chapter Five is called “Data and Methodology”. In this section, There are three sub-titles. In “Data”, definition and the source of data is explained. In “The Capital Asset Pricing Model(CAPM)”, CAPM model, history, drawbacks of the model are explained. Since the model is the core of our model, it is important to explain it in a different section. Lastly, In the “Methodology” section, our 4 model, formulation of CAPM, and dummy variables are explained.

Except for these 5 sections, In the “Results”, the outcome of the models and log-likelihoods are interpreted with more precision. In “conclusion”, outlook and the results are summoned briefly.

2.GEOPOLITICAL RISK

2.1. DEFINITION

It could be wise to start with the definition of the word “Geopolitical”.

“Geo” means “Earth, and definition of the word “Politics” is “related to citizens of the Government” in ancient Greek.

“The literal meaning of geopolitics is the political relations between countries and groups of countries in the world, as influenced by their geography; the study of these relations” (Oxford Dictionary, 2020) This includes location, topography, environment, natural resources, property, and, of course, positioning in relation to significant factors such as water bodies and neighboring nations, most prominently.

Geopolitics is the part of geology that vows to clarify the connections between topographical real factors and universal issues. This kind of connections exist has been noted naturally since the ancient Greeks. It was uniquely with the revelation of the applied and methodological apparatuses of current geology that theoreticians became persuaded that they could inspect those associations with insightful separation and something moving toward logical exactness. The fundamental assignment going up against the order appeared to be clear: to distinguish those land conditions that most sufficiently clarify the force, interests, character, and conduct of countries.

The analysis of geopolitics typically looks at ways in which the physical position affects how people respond to each other. With growing global exposure and legitimacy across history, geopolitics considers how citizens throughout nations relate to each other, as well as through foreign relationships (war / conflict, diplomacy, rivalry, etc.), governance, institutions, commerce, and the mix of cultures.

The term “geopolitical risk” covers a number of categories and situations; some events may be fleeting, having an important impact for a day or two, while others have a more sustained effect on the markets. The scenarios may be economic or political, encompassing a range of threats (terrorism, war, cyber incidents) as well as normal occurrences that take place frequently in democratic nations (elections, congressional or parliamentary actions, and the push and pull of political movements in general). Risk is sometimes defined as uncertainty, particularly with possible surprise; one key to managing risk effectively is to have timely quantitative information and to interpret it correctly.

There is a survey conducted of more than 1,000 investors by Gallup 2017. In this survey, 7.5% of respondents indicated stresses with regard the monetary consequences of the numerous military and conciliatory conflicts taking place worldwide, placing geopolitical hazard against political and financial risk.

In general, global volatility has been quite low since the end of the global 2008 financial crisis, with occasional spikes: e.g., around the Brexit vote and the Trump election. However, even as the volatilities across assets, asset classes, sectors and countries intensify and ease, they tend to be correlated

2.2. Geopolitical Risk Index

Although geopolitical risk is an element of risk that needs to be analysed, it is a type of risk that has significant effects on the economies of countries and is very difficult to calculate. By Caldara and Lacovello, The Geopolitical Risk (GPR) Index which takes into account incremental events has been studied. They developed the GPR index by counting the number of events that are identified as geopolitical in leading English-language newspapers of articles that contain the geopolitical events and risks.

Geopolitics is a definition that includes many meanings, and has been used historically to describe states' strategy of managing and fighting for territory. But power struggles and other activities that involve a range of actors – including companies, non governmental groups, rebel movements, and political parties – have also been considered as part of geopolitics in past decades. For this reason, the widespread definition of the term "geopolitics" encompasses a wide variety of occurrences, from terrorist threats to global warming, from Brexit to the Global recession.

Caldara and Lacovello defined in their work as follows: circumstances when identifying geopolitical risk in which the power struggles of actors over territories can not be solved peacefully and democratically. They, therefore, describe geopolitical risk as the risk involved with war, acts of terrorism, and conflicts between countries affecting the usual and peaceful path of global politics. Geopolitical risk covers both the risk materializing these incidents and the emerging threats associated with worsening current events.

The interpretation follows closely the traditional use of the phrase geopolitics and includes terrorism, in line with recent evaluations of current international relations among countries. Terrorism has come to dominate the international (and local, especially in Turkey) culture and vocabulary. at least since 9/11. Even before 9/11, acts of terrorism created political tensions between countries. Consequently, and in some cases contributed to full-fledged wars. This activity is not limited to Al-Qaeda and ISIS. The term goes back to any episode in which political groups perpetrated acts of violence to promote religious, cultural, or revolutionary purposes.

GPR Index is a well-used indicator (by World Bank, Federal Reserve Bank of U.S., and other Institutions). From 1900 to this day, local and global tensions are tracked down to have a significant analysis. GPR Index is peaked during the era of Big Depression, Both World Wars, Cuba Missile Crisis, Coup attempt in Turkey, etc. Even these events clearly express that the Index is correlated with global tensions.

The GPR Index displays automated text-search returns from 11 national and international newspapers online archives. These Newspapers are listed below.

- The Boston Globe
- Chicago Tribune
- The Daily Telegraph
- The Globe and Mail
- The Washington Post
- The Los Angeles Times
- The New York Times
- The Times
- The Wall Street Journal
- The Bbc

For each month, the authors measure the index by counting the number of GPR-related articles in each newspaper. The record is then standardized to an approximation of 100 for the decade 2000-2009 on average.

The authors chose to narrow the reportings of the newspaper to the historical index of the only three newspapers for which they had online access to all 1900's articles:

- The New York Times
- The Chicago Tribune
- The Washington Post

In each month, the index depicts the number of articles covering rising geopolitical risks divided by the total number of news that is published. The index is standardized to an average value of 100 in the 2000-09 decade. For example if there

is a reading of 200. This indicates that in that month the source addresses growing geopolitical tension twice as often as it was during the 2000s.

Their archives for the articles is ProQuest News stream Historical Newspapers.

The definition of such events is rarely crystal clear. For instance, the authors examined the attempted coup in 2016 in Turkey. This act falls within the description of the writers. Even though the act ended up having only domestic repercussions, there were absolute spillovers. In Syria and Iraq in particular, in the Middle East and the fight against ISIS. However, Brexit is not falling within the scope, since it was the outcome of a referendum.

Authors are pursuing publications that contain references to six categories. Word sets are collected after a pilot analysis of newspaper pieces. This pilot audit addresses global conflicts and isolates the most common unigrams and bigrams in the literature on global affairs. The reason for this process is ensuring that the other geopolitics involves territories, governments, states, and leadership. And the defining elements of geopolitical risk centers around the risk of wars and terror.

The first four categories refer to conflicts and international frictions. The last two categories are more related to geopolitical events and actions.

Group 1 includes words that specifically mention geopolitical risk. This Group describes tensions. This involves large regions of the world and the US in military tensions. The associated articles tend to depict geopolitical risks with direct U.S. intervention. Iraq, Afghanistan, Vietnam can be shown as an example. Also regional tensions among two or more countries are described. (These countries are engaged to the U.S. diplomatically)

Group 2 contains words that describe nuclear threats.

Groups 3 and 4, respectively, comprise the words that portray armed conflict and terror threats.

Lastly, Groups 5 and 6 seek to catch media attention (as opposed to pure risks) of real adverse geopolitical events. The coverages that can reasonably be expected to contribute to increased global instability, which might lead to acts of terror or a big war.

GPR Benchmark Index (GPR)

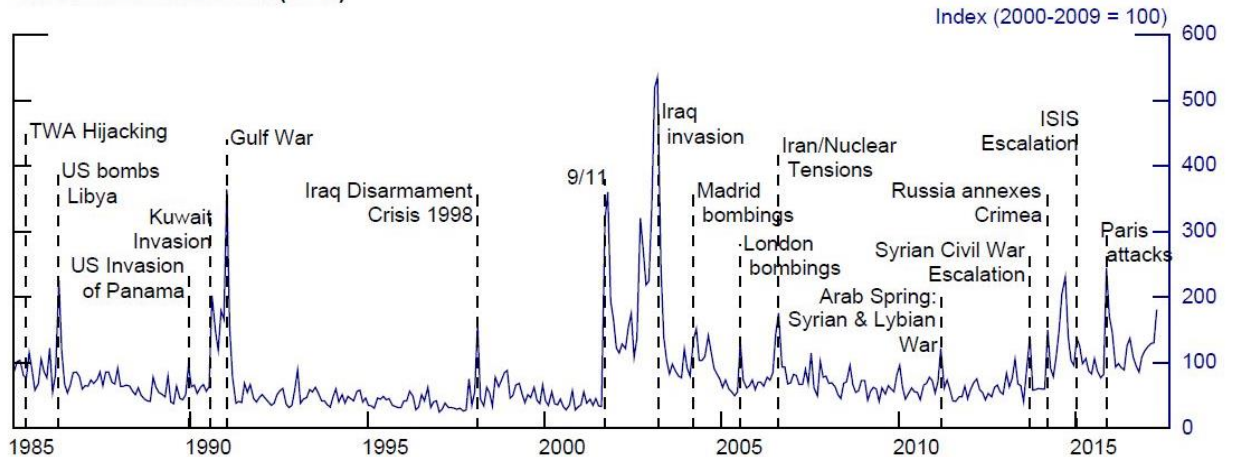


Table 2.1. GPR Index, Events Graphic

Source: <https://www.matteoiacovello.com/gpr.htm#charts>

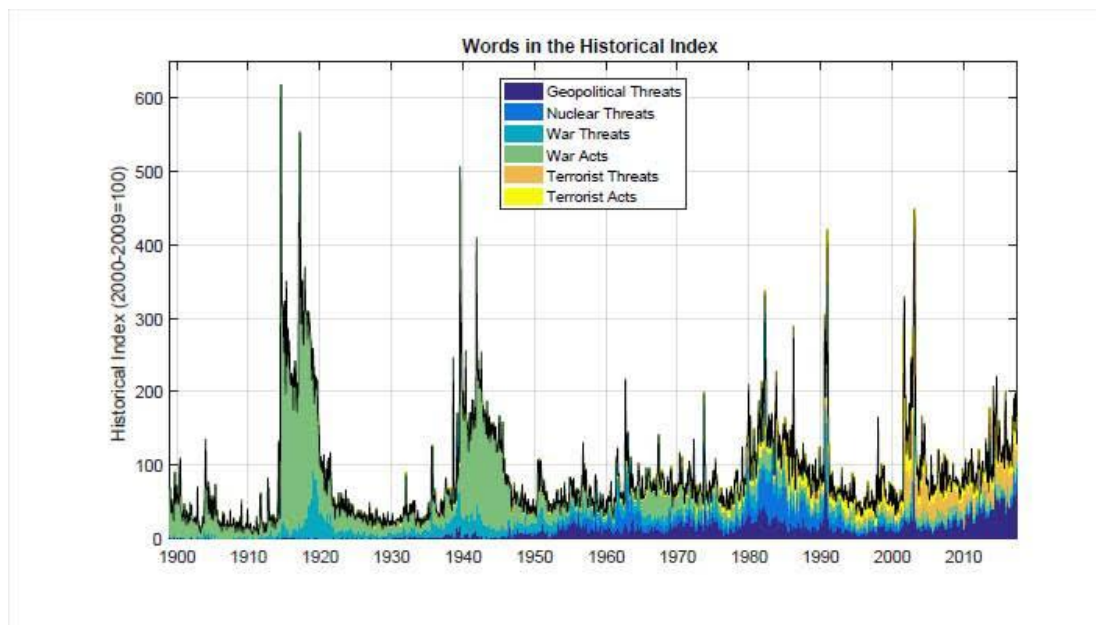


Table 2.2. Words in the Historical Index

Source: <https://www.matteoiacovello.com/gpr.htm#charts>

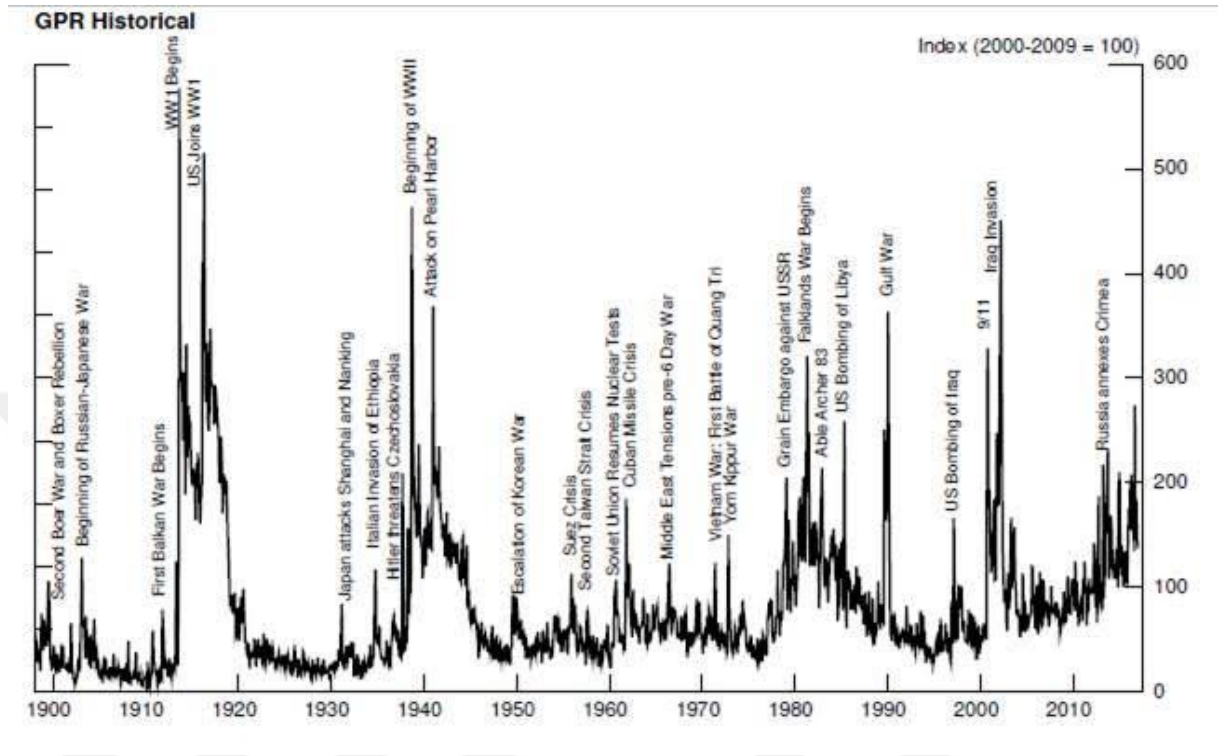


Table 2.3. GPR Historical Events

Source: <https://www.matteoiacoviello.com/gpr.htm#charts>

As the authors stated in their work, they are not the pioneer ones to capture an indicator to measure geopolitical risk. On the contrary, lots of private companies published or marketed some indicator of political and geopolitical uncertainty, since it is such a hot topic to work on. The construction of this GPR index, though, eliminates the numerous weaknesses of current metrics, which make them unsuited to empirical research.

Firstly, many indices either do not describe geopolitical threats or choose a specific term that includes many various events. Issues from battles to major economic issues to global warming. Consequently, what those indices quantify is vague.

Second, indices already in existence are highly difficult to recreate. Benchmark indices built by private corporations are usually not publicly accessible. They are subjectively built and come with a method that is less than transparent. GPR Index database, on the other hand, can be reproduced and reviewed, as both their algorithm and audit guide are open to the public. Third, there is very little variation in certain indices, and they are valid for several years. Many of them are quantitative measures of whether states are politically stable and are recorded using color-coded maps or from one to five numerical numbers.

This index is such a versatile indicator that almost in any topic, it is possible to use it. For example, when we look for the literature, lot of papers are using this index as a benchmark (relationships such as gold, oil, crypto currency market, construction delays, sport events, tourism...)

In this paper, We chose to use The Benchmark Index (GPR). Since the index comprises 11 newspapers, it provides more precision and diversification than 3 newspapers for our research.

3. LARGEST U.S. DEFENSE CORPORATIONS, INTRODUCTION AND THEIR HISTORY

3.1. Definiton of a Defense Contractor

A defense contractor is a company or entity that produces products or services. Such services may represent the governments' national arm forces or departments of intelligence.

Usually, the items are military or civilian airplanes, boats, trucks, weapons, and electrical systems. Services in collaboration with the governments may include transportation, technical support and training, communication support, and engineering support.

In the last periods (the 2000s and 2010's), procurement for the defense has grown significantly. Especially in the U.S, wherein the Department of Defense spent nearly \$316 billion for agreements throughout the last fiscal year. Contractors have also had a much greater role on the ground during recent American conflicts For example: during the Gulf War of 1991, the ratio of contractors to the regular military was around 1/50. Although the U.S. employed more than 190,000 contractors throughout the first four years of the Iraq War, it exceeded the overall U.S. military presence after the Iraq upsurge in 2007 and also 23 times the number of other ally military personnel.

As an inglorious example, Blackwater USA is established in 1997. It started as a private security company offering services to law enforcement, the justice department, and military agencies. The company earned its first contract from the U.S. government in 2000. Just after the bombing of the U.S.S. Cole. During the Iraq War, Blackwater was one of the private security firms used to protect officers, security personnel, and army forces. Their first contact in Iraq was in the summer

of 2003. They received a contract of \$21 million for the Personal Security Detachment and two helicopters for US occupation head Paul Bremer in Iraq.

One of their duties there was guarding the US Embassy. A squad of Blackwater contractors charged with protecting employees of the State Department opened fire on a small vehicle driven by a family with their child in tow on September 16th, 2007. Staff said they were first assaulted while other witnesses reported contractors started shooting because the car wouldn't

get out of the convoy's way . Twenty Iraqi people have been killed, in all. Both Governments questioned what occurred and their reports never approved.

This incident sparked a domestic interest in the number of private forces being used in Iraq. And also raised questions about legality, accountability, and oversight. A survey in 2007 showed that there were as many private contractors in Iraq as there was military personnel. And that number is considered to be an underestimate.

The main problem is that private security contracts have different objectives than military ones. The role of private security is to protect individuals or sites, not to obey the government's strategy of winning a war. To be specific, the concerns that emerged about the use of private forces in Iraq, and the expense of doing business that way, both morally and financially, are not only restricted to Blackwater.

Other companies are accompanying them, but the incident that brought all these issues to the forefront was one that engaged Blackwater. A drunken Blackwater staff got into a fight with an Iraqi guard on New year's eve 2006. As a result, the Guard was shot to death. The mercenary was forced to evacuate from the country rapidly. In May 2007, further massacres of Iraqi civilians were documented resulting in an armed confrontation. Incidents like this aren't uncommon and they don't meet the same consequences if there is any. Because they're not military. In 2008, Blackwater stated that it would begin to concentrate its operations away from security contracting due to the risks associated.

Although companies like Blackwater do, defense contractors usually do not directly fund combat operations. Defense contractors working in direct support of combat operations could be rightful targets of military counter-actions. This rule is determined under the 1949 Geneva Conventions. That's not an absolute prohibition, though. There are also examples of large corporations financing both sides for terrorist activities.

“The suit, filed in U.S. District Court in Washington, D.C., alleges that the large Western companies made protection payments to the Taliban because they had lucrative businesses in post-9/11 Afghanistan, and they all paid the Taliban to refrain from attacking their business interests.” (Gordon, Donati, 2019)

But since these aspects are not in our paper’s scope, we would like to only focus on the biggest corporation stock price abnormal returns.

3.2. Boeing Company

Boeing Company(BC) is an American aerospace company that is the biggest player in the aviation industry. This company is also a leading producer of defensive industry. This portfolio comprises helicopters, space vehicles, and missiles. Formerly, known as Boeing Airplane Company, the company took its well-known name in 1961.

This change depicts Boeing’s to extend its business lines into different segments. of Boeing’s Headquarters were in Seattle. However, After the year 2001, Boeing changed the location of its factories to Chicago.

Although Boeing is a very famous name for the civilian Aviation sector, BC’s main business lines are based around three different segments. These groups are:

- Commercial airplane(very well known planes such as 707, 727, 737, 747, 777,787's)
- Military aircraft & missiles
- space & communication devices.

Boeing produces seven main groups of commercial airplanes which include the industry standard 737. These planes are assembled in two facilities—Renton Factory and Everett Factory which is in Washington. The Renton factory section builds the narrow-body aircraft. And the wide-body Boeing aircrafts (Such as 767, 777,787 Dreamliner, and remnant orders of discontinued 747's are assembled at the Everett plant Factory.

The Boeing 787 aircrafts on the other hand are assembled in two factories. The main factory Everett plant and at a facility in South Carolina.

Boeing Business Jets, a partnership between Boeing Company and General Electric Co., manufactures and sells business jets. Their portfolio is centered on the 737-700 aircraft, and also the wide-body models.

The defense-related operations of the corporation are mostly focused on the design, manufacturing, and support of fighter planes, bombers, carriers, air vehicles, and missiles.

Boeing was the second largest company according to the Top 100 US Federal Contractors list. Total contract amounts amount to USD 50 billion In 2008 and 2009.

The Boeing Company also dealt with lots of lawsuits since 1995.

The corporation has agreed to pay approximately 1.6 Billion USD to resolve around 40 cases. This total number also includes the big case In 2006 which cost Boeing USD 615 million. Although the company takes responsibility, This case was concerning illegally hiring of government workers and abuse of classified information.

In 2019 and 2020, Boeing Company having difficulties both on financing and reputation.

Their latest major product 737 max has been involved in a couple of accidents with fatalities due to malfunctioning of their autopilot software. These unfortunate events made the company stop production of this aircraft and pay compensation to airline companies that already have purchased orders.

“Boeing's spent US\$16.9 million on lobbying expenditures in 2009. In the 2008 presidential election, Barack Obama was by far the biggest recipient of campaign contributions from Boeing employees and executives, hauling in US\$197,000 – five times as much as John McCain, and more than the top eight Republicans combined.” (Portero, 2011)

3.3. General Dynamics Corp.

General Dynamics Corp is a big U.S. based defense contractor which is very well known for their multi-role fighter plane F-16. The company's headquarters are in Virginia.

The Initial company was founded in 1899. It was called the Electric Boat Company. EBC built the first submarine which is purchased by the U.S. Navy in the 1900s. EBC continued to develop submarines and naval ships and launched the Nautilus. This was the first nuclear-powered submarine in the world until 1954. EBC was incorporated under General Dynamics Corp In 1952.

After WWII, General Dynamics started differentiating into other safety projects and during the 1950s, became a giant producer of military aircrafts.

It also developed and manufactured army, corporate, and commercial aircraft whilst making submarines. Also; spacecraft, shielded trucks and propelled equipment for hardware

General Dynamics also developed the F-16 project. Followed by The Fighter plane F-111, and the primary combat tank M1.

After the end of the Cold War era, GD sold its fighter airplanes, private aircraft, and rocket framework organizations in 1992. Space frameworks business is sold afterward too. (in 1994). The organization at that point revamped itself into two divisions: the Marine Group(MG) and the Combat Systems Group(CSY). MG kept on and making submarines of different types (included Electric Boat), just as surface warships.

On the other hand, CSY made M1 tanks and other shielded vehicles for defense purposes. Another third division was made in 1998. Information Systems and Technology is based around electronics for the military. A larger part of General Dynamics' yearly incomes kept on being gotten from government contracts with the United States. General Dynamics has \$30.9 billion in deals starting at 2017 essentially military, yet additionally non-military personnel with its Gulfstream Aerospace unit and ordinary shipbuilding and fix with its National Steel and Shipbuilding auxiliary.

3.4. Lockheed Martin

“Lockheed Martin received \$36 billion in government contracts in 2008 alone, more than any company in history. It does work for more than two dozen government agencies from the Department of Defense and the Department of Energy to the Department of Agriculture and the Environmental Protection Agency. It's involved in surveillance and information processing for the CIA, the FBI, the

Internal Revenue Service (IRS), the National Security Agency (NSA), The Pentagon, the Census Bureau and the Postal Service.” (Hartung, 2011)

Lockheed Martin Corporation (LMC), is a large multi-purpose American enterprise. The company's primary focus lies in aerospace equipment. This portfolio includes aircrafts, space vehicles, satellites, and defense systems, as well as other advanced products and services. Half of the sales of the company are to the U.S. Department of Defense. LMC is also a major partner for U.S. Power Agency and NASA.

It was presented in 1995 when Lockheed Corporation and Martin Marietta Corporation merged. These firms were respectively the second and third largest defense contractors in the US in that era. By the purchase of a new company, the business expanded further in 1996. Loral Corporation's electronics and systems division joined the team (this group comprises of nine different large aerospace and defense corporations. Companies such as IBM, Xerox, and Ford. The Center of the Company is in Maryland.

Among other aircrafts, the F-16 Fighting Falcon MRF (with general dynamics as described above) is developed by the LMC. The procurement list also includes C-130 transport, P-3 Orion maritime aircrafts. Certain programs include the F-22 Raptor in collaboration with Boeing Aircraft. On the contrary; the Joint Strike Fighter (JSF) in competition with Boeing.

Lockheed Martin produces the Titan IV, Atlas missiles, The Centaur rockets, The Trident II in the space industry. Smaller tactical weapon systems for airplanes and ground-based systems are still used. Titan IV is the biggest expendable US-made launcher. Atlas Rocket families are very well-known launchers on dispensable.

These rockets are used to change an era and make the first four men made the voyage to orbit earth's lower orbit. Atlas rockets are still in use with schedules in the 2020s.

The upper-stage Centaur rocket is a thruster used in Atlas.

The Trident II is a ballistic missile, fired underwater. The company also makes military satellites and various satellites for science, the weather, and telecommunications.

LMC is one of the suppliers for the US Space Transport External Storage tanks. In addition, LMC is operating with Boeing in a joint company called the United Space Alliance. The partnership handles the routine operation and supervision of NASA's space shuttle program.

As part of International Launch Services(ILS), a partnership with the Russian companies Energia and Khrunichev was founded in 1995. ILS is launching services worldwide for Atlas and Proton commercial markets.

In addition, the company provides fire-control systems, radars, and other components. Aegis Combat System by U.S. navy force, which subsequently monitors antagonistic objectives and manages missile protection.

“In 1943, under the leadership of the aircraft engineer and designer Clarence L. (Kelly) Johnson, Lockheed established a highly secret section, Advanced Development Projects (ADP), to design a fighter around a British De Havilland jet engine. The result was the P-80 Shooting Star, the first American jet aircraft to enter operational service. After the WWII, ADP became the American aerospace industry’s leading military airplane developer. It produced the F-104 Starfighter, the first operational aircraft capable of stable speeds more than twice that of sound; the U-2 spy plane (1955); and the twin-engine plane SR-71 Blackbird (1964), capable of more than three times the speed of sound. In 1977 ADP flew the first stealth aircraft, an experimental prototype code-named Have Blue, which was made to be nearly invisible to radar. Its stealth research culminated in the development of the F-117A Nighthawk.” (Weiss, Amir, 2020)

LMC introduced several propeller-driven airliners in the civilian sector following WW II, which includes the popular triple rudder Constellation and Super Constellation. The introduction of wide-body carriers in the 1960s provided the

company with yet another opportunity to enter the business. Given the fact that in the initial stages it had missed entering the commercial jetliner arena.

The company was responsible for the production and operation of the Hubble Space Telescope structures in the late 1970s and 1980s. Delivered in 1990 by space transport into space.

In 1977, the company changed its name to Lockheed Enterprise. In that era, aircraft and related departments accounted for just over 50 % of their business.

In the early 1990s, LMC expanded its lines of military aircraft. An acquisition is made with the Fort Worth (Texas) Division of General Dynamics. This division's most favorable product was the F-16 fighter airplane.

3.5. Northrop Grumman Corporation

Northrop Grumman Corporation (NGC) is a major technology producer in the US. The company is involved in products and services for civil and military aviation, telecommunications, and info systems. Initially, the company was founded as Northrop Aircraft, Inc. in 1939. After that the brand is changed in 1958. Lastly, The current title was introduced in 1994, by the acquisition of Grumman Corporation (which is an aircraft engineering company). NGC headquarters is in L.A. The Total Amount of employees of the company is around 80,000 people.

NGC's most sophisticated product is the B-2 stealth bomber fleet. This aircraft operates under U.S. Air Force. The company is the prime contractor and in charge of operations and the maintenance of this fleet. This plane is the most expensive airplane which is built so far. The approximate initial cost is around 2.2 Billion \$. For comparison, the cost of a big aircraft carrier is built for 4.5 billion \$. There are only 20 of operating the B-2's currently (one of them crashed due to software

malfunction. Unlike any other airplane, this aircraft does not have a rudder. The rudder commands are imitated by the flight computer. This boomerang look-alike airplane also resembles a Turkish made prototype THK-13 in the late 1940s. Sadly, this prototype never has been become realized and the factory is closed.

NGC is also the leading contractor for Joint STARS. This system (Joint Surveillance Target Attack Radar System) is well known for its state-of-art air observation, threat detection, and identification capabilities. This system is also designed for the U.S. Air Force.

The company produces radar systems for military activities. This involves aerial fire-controls and highly sophisticated warning radar systems. The portfolio comprises electronic warfare systems to early warning airplanes. Airplane options are derived from the E-2C Hawkeye to autonomous drone and missile launcher planes. NGS is also a primary provider of military aircraft projects for the Boeing Company.

NGC is a major space management system developer, too. In countries around the globe, it produces civilian ATC (Air Traffic Control) solutions for airports. The wholly-owned affiliate, Logicon, Inc., provides information security services to United States government departments and business clients, and assistance for American military defense systems in management.

John Knudsen Northrop is the founder of the NGC. And the History of the group is highly related to his career. Mr. Northrop founded his first company in 1928. Back then, this company was called Avion Corporation. The company needed to flourish to be called Northrop Corporation until 1958.

In the 1950s, Northrop Aircraft introduced low-life-cycle cost models for developing and promoting the N-156 a light, supersonic fighter plane for easy

operation and lower cost. Like T-38 Talon, it has become an industry-standard training airplane.

This product is also exported to other countries, not only the United States the Air Force. Northrop also became the largest American producer of target drones(unmanned) and a major producer of radar systems for tactical and strategic rockets, while continuing to develop components and sub-assemblies for other aviation competitors.

In 1981, the group received an offer from the United States government to develop the combat fighter B-2 Spirit. The B-2 airplane was based on the specific wing design (which literally looks like a boomerang) of Mr. John Northrop. The B-2 was first started to operate in 1989 and concluded its operational presence in 1993.

In 1969 Grumman was awarded a contract to develop the carrier-based air-superiority fighter F-14 Tomcat. This was the most sophisticated and low-cost aircraft of the time of the West. Other prominent maritime Grumman airplanes included the lightweight, long-range E-2 Hawkeye. This was the first airliner explicitly developed for airborne early-warning monitoring (in 1964).

In the civil sector, NGC introduced G-159. This aircraft (which is also known as Gulfstream I) is a twin-turboprop model. Grumman's space experiments derived from its design and construction of the Apollo Lunar Modules.

This phenomenal project brought U.S astronauts to the moon back.

In the late 1980s,. NGC started to minimize its aviation projects. In 1996, NGC incorporated Westinghouse Electric Corporation's aerospace and telecommunications systems divisions to its assets. And one year later, NGC bought Logicon, Inc., This company is a defense information technology firm.

“In 1995, Robert Ferro, an employee for TRW Inc., a company Northrop Grumman acquired in 2002, discovered that satellite components manufactured for the U.S.

Air Force (USAF) were faulty and likely to fail in operation. TRW suppressed Ferro's report of the problem and hid the information from the USAF, even after a satellite in space equipped with the faulty components experienced serious anomalies. Ferro later sued Northrop Grumman in federal court under the federal whistle-blower law In 1999, Ten years later, on April 2, 2009, Northrop Grumman agreed to pay \$325 million to settle the suit.” (Drew, 2009)

3.6. Raytheon Company

Raytheon Company(RC) is a major American industry giant. The company's main focus is with core manufacturing. The company thrives especially in defense and aerospace technology. RC is established in 1922. Then, it reincorporated in 1928 and took its currently known name in 1959.

The group's portfolio includes missiles, radar and sonar systems, gun detectors, and targeting systems. On the intelligence side, communication and combat management systems, also satellite components. RC is a pioneer in marine technology, shipboard detector engineering, and sonar, autopilot, and GPS systems too.

In 2011, around 70,000 people around the world were hired by The firm. The items were marketed globally in more than 80 countries. Head offices of RC's are in Massachusetts.

Raytheon was established in 1922 by three physicist-engineers in Cambridge, Massachusetts, comprising Laurence K. Marshall, Charles G. Smith, and Vannevar Bus.

Raytheon got a deal in earlier World War II to develop a system called "magnetron". Raytheon's practice on the magnetron tubes revealed microwave ability for cooking. The firm showed the Radarange Microwave for community use in 1947.

In 1965, the company bought Amana Refrigeration, Inc. This company is a refrigerator and air conditioner maker. By using the label of Amana and its marketing power, Raytheon started selling the first household microwave oven stove in 1967 and became the biggest producer in the microwave oven industry. In 1945, through acquisitions that integrated the Submarine Signal Company, the organization expanded its device versatility.

Raytheon bought Beech Aircraft Corporation in 1980. Beech Aircraft is still a well-known aviation company and a leading general aviation aircraft manufacturer established in 1932. With the takeover of Corporate Jets Inc. in 1993, Raytheon increased its aviation output by including the Hawker. Beech and Hawker developed business jets such as the Hawker 800XP and Horizon. Also, the duo created the iconic aircraft Beech King Air twin turboprop series. Beech's unique-mission aircraft, the T-6A Texan II, was selected to be the main learning airplane for the US. Army.

In 1991, during the Persian Gulf War, Raytheon's Patriot rocket got an extraordinary worldwide presentation, bringing about a significant increment in deals for the organization outside the US. With an end goal to set up an administration in the resistance business, in 1996 Raytheon bought one after another Chrysler Partnership's safeguard hardware and airplane alteration organizations. RC it purchased the protection gadgets units of Texas Instruments in 1997.

It additionally divested itself of a few nondefense organizations during the 1990s, which also the initial kick-starter Amana Refrigeration. In 2007, RC sold its airplane subsidiary.

4. LITERATURE REVIEW

(Fama, Fisher, Jensen, Roll 1969) In their work, the team emphasizes that successive price shifts are very nearly separate from individual common stocks. And there is a great deal of scientific evidence that suggests this. Their research suggests the information is being noticed on the market. The announcement of a split is used to re-evaluate the anticipated share income stream. Their evidence also suggests that the market's expectations about the information repercussions of a split are completely priced into the market of a share within a month at the minimum but almost instantly after the announcement.

(Adams, 1982) Examined the Iron Triangle phenomena and the data of eight major aerospace/defense contractors. An "iron triangle" is a political relationship. That relationship consists of three key participants: Federal administration, Legislative key committees and leaders, and lastly corporate interest. Yet the data hardly sustain his argument that the defense triangle plays "a paramount role in defining national security.

(Brown, Warner 1984) The author reviews daily stock return assets. The center of the analysis is about the basic characteristics of these data. He looks for the results of the methodologies of event study for evaluating the effect of company-specific events on the share price.

(Thompson 1985) is aimed to bring the event study problem into the realm of classical econometric theory and examine the relationship between residual returns and events.

(Karafiath, 1988) Mr. Karafiath describes a dummy variable methodology in this research which is a convenient procedure for obtaining cumulative estimation errors and associated test statistics. The primary benefit of this methodology is that any regular regression system could provide both prediction errors and accurate test

statistics. His papers aim to enable and facilitate the use in financial publications of a dummy variable technique previously introduced to a case study.

(Trevino, Higgs, 1992) found that the profit margins of the top 50 military contractors were considerably higher than those of the non-defense firms throughout the era 1970-1989. The inference covers any section of finance. Investing in defense contractors was not any riskier than engaging in similar, non-defense firms. They adopted the traditional method of CAPM's beta-coefficients estimation.

Their data analysis reveals that the top defense companies outperformed the market by an enormous margin through every benchmark for the period 1970-1989 overall. Moreover, it is not convincing to claim that investment in defense firms was riskier than investment in the general market.

(Erb, Harvey, Viskanta 1996) The team questioned the economic content of five separate country risk initiatives. The main aim of the research is to evaluate if any of these indicators provide information on predicted future returns on stocks. The team performed a study of time series ~ cross-sectional. This research links these risk assessments to expected future returns. And analyzed the linkages among essential attributes like book-to-price ratio and risk.

Their findings indicate the country-risk practices are associated with potential returns on equity. Additionally, these measures are strongly correlated with indicators for equity valuation.

(Boyle, Higgins, Rhee 1997) The team looked at the investor behavior towards information about social responsibility. The purpose of the team is to demonstrate how shareholders assess the impact of information on corporate value through social responsibility. The establishment of the Defense Industries Initiative (DII) I held by 32 major defense contractors in 1986. This establishment provides an excellent template for measuring stock market reactions on an ethical plane. The

output of the DII companies was contrasted to that of a non-DII defense companies control group that didn't seem to sign a contract. Their results show that the market has reacted adversely to this initiative's signatories and non-signatories.

(Barber , Lyon 1997) They analyzed the analytical strength and interpretation of test statistics in the methodologies of events in their study. Especially for the ones designed to detect abnormal long-run returns. The team reported that test statistics are not listed based on abnormal returns measured using a reference portfolio. They recorded the analytical strength and reliability of test statistics used in event studies designed to identify abnormal stock returns over the long run (1 to 5 years).

(Lyon, Barber, Tsai 1999) The team analyzed long-run tests of abnormal returns and documented that two approaches yield well-specified testing. While both methods work well in random samples, non-random sample misspecification is ubiquitous. Their key message is impactful. Long-run analyzes of abnormal returns are treacherous.

(Shapiro, 1999) Throughout this article they focus on a set of defense contractors' responses to war- or peace-related events. The event-study approach is used. Karafiath's Dummy approach is also embraced. GARCH estimates of abnormal returns indicate that the defense sector has a positive response to war-related announcements and a negative reaction otherwise. A cross-sectional study of the abnormal returns to companies in the Gulf War shows that greater abnormal yields are correlated with R&D concentrated corporations. These firms are mostly involved in sectors whereas lower abnormal returns are associated with corporations engaged in above-average capital expenditure levels.

(Kaltchev, 2009) This paper conducts a critical analysis of the impact of security lawsuits on investment returns. Sometimes a positive response to the litigation may be found. Negative reaction to lawsuits is twice as frequent as a positive reaction.

According to the author, Shareholders should not be worried. Legal actions will not always automatically lead to falls in stock returns.

(Guidolin, Ferrara 2010) The writer researched the impact of the dispute on asset markets using the Methodology for Event Studies. Throughout the era 1974–2004, the authors analyze a data set of 101 domestic and inter-state disputes and note that a large proportion of them had a major effect on stock market indexes, exchange rates, oil and commodity prices. This proportion is inconsistent with sheer luck, which is to say with the chosen likelihood of type-I errors in their statistical significance measures. The findings indicate that local stock markets are, on avg, more prone to show positive than negative responses to the start of the dispute. This is an important indicator to state that conflicts have an important effect on local markets.

(Schnedier, Troeger, 2014) The team discusses the impact of the political trends within three conflict zones on global markets between 1990 and 2000. The listed markets are the big ones such as CAC, Dow Jones, FTSE. Time-series analyses adjust for the impact exerted by the conflicts. The data is chosen for the disputes between Israel and the Palestinians, the Invasion of Iraq by the U.S, and the events held in former Yugoslavia. Using daily stock exchange data, the writers indicate that the disputes have negatively affected the interactions in the Western world at the heart of the capital markets.

(Brune, Hens, Rieger, Wang, 2014) The team looked for stock market responses to major global armed conflicts since the Wwii. Their approach was to use a press interpretation proxy to measure the probability of conflict likely to result in a battle. They found that a rise in the probability of battle appears to lower stock prices. On the other side, they are strengthened by the unavoidable start of the war. Although, in situations where a war surprisingly begins, the outbreak of a battle lowers stock prices.

(Ko, Lee 2015) Through Wavelet Approach, the team studied the connection between economic policy uncertainty and share price on both time and frequency. The study is being carried out for 11 nations, and the years 1998 – 2014. This study shows that the relationship is usually negative. The relationship also varies with low to high-frequency fluctuations over the period. Furthermore, frequency timing alterations intersect when US policy instability co-shifts with the policy uncertainty of other states. As a consequence, the quantitative findings suggest that after EPU raising, the stock price falls.

(Dakhlaoui, Aloui 2015) The team is researching the complexities of the spillover effects of instability between US economic policy uncertainty and the BRIC equities. In a rolling approach, the researchers conduct the function of cross-correlation. Mean spillover of returns between BRIC stock indexes and US volatility is negative. Still, spillover variance is observed to oscillate between positive and negative values. Investing in the US and BRIC capital markets at the same time is also extremely risky for traders. They find strong evidence of a time-varying connection between economic instability in the US and fluctuations in the stock markets. The correlation has also been found to be highly volatile at times that the economy worldwide is not quite stable.

(Chang, Chen, Gupta, Nguyen 2015) This research applies the causality test to the bootstrap panel. The aim is to examine the causal relationship between political uncertainty and share prices. The data is selected for seven OECD countries and 2001 to 2013 monthly periods. Empirical results demonstrate not all countries are the same. And that the theoretical assumption that stock prices fall when a policy shift is announced is not always backed up. They find compelling proof for Italy and Spain leading the stock price hypothesis. But for the United Kingdom and the USA it can not be rejected.

(Apergis, Bonato, Gupta, Kyei 2017) The objective of the team was to add steps in the relevant literature and to understand the role of the geopolitical risks for making

predictions in stock returns and the volatility of 24 major contractors in the global defense industry. In their research, the analysis used the k-th-order nonparametric causality test at a monthly frequency, spanning the period of 1985:1 to 2016:06. They find that there is no evidence of predictability of stock returns of these contractors for the geopolitical risk measure. However, The GPR index does predict volatility in 50% of the contractors. The results indicate that while global geopolitical events over a period of time are less likely to predict returns, such global risks are more inclined in affecting future risk profiles of defense contractors.

(Bayar, Gavriletea, 2017) The team is studying the relationship between economic growth, security, and terror in 18 MENA states. Their methodology is to analyze panel data over the period 2008–2014. As a result, their findings indicate that the calm atmosphere has had a positive effect on economic development. On the contrary, terrorism has had a negative impact on development. It has also commonly established a bilateral causality between peace and economic growth and terrorism and economic progress.

(Liu, Shu, Wei 2017) They questioned the fact that models of political risk predict that increases in political uncertainty cause stock prices to fall, especially for politically sensitive firms. They used the event of the Bo Xilai political scandal in 2012 in China as an exogenous shock to identify the impact of political uncertainty on asset prices. They document that the Bo scandal caused a significant drop in stock prices, especially for firms that are more politically sensitive. Further analysis shows that the stock price drop is mainly driven by a change in the discount rate, providing strong support for the existence of priced political risk.

(Caldara, Iacoviello, 2018) They presented the idea of the GPR index via keywords from Major newspapers. They stated that high geopolitical risk leads to a decline in real activity, lower stock returns, and movements in capital flows away from emerging economies and to the advanced economies. Extending their index back to 1900, geopolitical risk rose dramatically during World War I and World War II was

elevated in the early 1980s and has drifted upward since the beginning of the 21st century. Their results indicate that exogenous changes in geopolitical risks depress economic activity and stock returns in the US. (This paper will be more discussed in the Geopolitical Risk Index Section)

(Gurdgiev, Marra, Mulhair 2019) analyzed the effects of the U.S military participation in direct and indirect foreign conflicts, defense budget announcements, and various political factors have on the five largest U.S. defense companies share prices. They conducted this analysis by using a fixed effect panel approach along with event studies, using daily, monthly, and quarterly data from 1990 to the end of the first quarter of 2018.

They find that, in contrast to the established literature, defense budget announcements have a statistically significant positive relationship with defense company stock performance quarterly. However, there is no lagged effects and no shorter-term effects.

When we look for the domestic studies, There are also a couple of domestic works as stated below:

(Akar, 2008) In this study, causality was examined between IMKB100 index prices and net foreign transaction volume. As an econometric method, the Toda-Yamamoto causality procedure, which examines the causality between integrated series of different orders, was chosen. Monthly data between January 1997 and September 2005 were used in the study. Although the results indicate bidirectional causality, it seems that there is a statistically more significant causality from the index price to the net foreign transaction volume.

Altay(2013) In his study, he examined the effects of terrorism in the Middle East on the economies of the country. Turkey, Egypt and Saudi Arabia in the country, to

determine the effects of terrorism on the economy; Altay used data from 1996 to 2010 of economic indicators such as exports, imports, economic growth, tourism, foreign direct investments, unemployment and per capita national income. In the research, the Panel data analysis method was used. As a result of the study, he stated that terrorism had negative effects on all economic indicators used in the research.

Tuna(2014) In this article, by using the ISE 100 index between 2002-2012, he analyzed the volatility in financial markets. As a result of the models made using ARCH and GARCH models, it was determined that a structure was observed in the BIST 100 index, especially in times of crisis and uncertainty, and volatility was observed. This volatile structure in financial markets concluded that the investor was influential in investment decisions.

Korkmaz(2017) examined the volatility effect on the Istanbul Gold Exchange, BIST100, and sub-sector index returns which is caused by the Terrorist acts in Turkey. In the study, She used the EGARCH and GJR-GARCH models because of the different effects of negative and positive events on volatility. As a result, In conclusion, BIST 100, the sub-sector, and the Istanbul Gold Exchange volatility index has been shown a statistically insignificant effect.

Kamışlı(2018) In this paper, the relationship between Sub-sector returns of the BIST and Geopolitical Risk Index (GPR) index is examined by the Frequency-Causality test. According to the results, it has been determined that geopolitical risks have an impact on the overall sub-sector index returns.

Erkan, (2019) In this study, including Turkey, eight Middle Eastern countries (the United Arab Emirates, Palestine, Jordan, Lebanon, Oman, Egypt, Qatar, and Turkey) are examined for the causal relationship between geopolitical risk indices and stock market volatility) using the stock exchange data between dates 2004/2018. In her study, monthly volatility was calculated by using daily stock returns of each country and one-way relationship analysis was established with

GPR corresponding to the relevant month. As a result of the research, it was reached that the stock market volatility of Qatar, Palestine, and Jordan countries have a causal relationship with GPR.

In this paper, the Relationship between global geopolitical uncertainty and the stock prices of the biggest five American Defense contractors are examined. The purpose of this study is to define if there is any connection between the terror, and the growth of these companies.

There are numerous numbers of studies and academic papers about the relationship between political uncertainty and some economic movement. Also using daily stock returns for event studies is not something discovered new.

Our scope is to narrow the research for only global geopolitical uncertainty and the stock price movements of certain corporations.

Our study has some limitations within which our findings need to be interpreted carefully. Some limitations of this study are mentioned below.

-To have a more diversified sample for the GPR index, We obtain the data between 1985-2019 instead of the historical index. Thus, our sample size is more limited comparing to 1900-2019.

-Since the GPR data is monthly, and the stock prices are daily, we correlated the data in two ways; by selecting the last working day of each month, and calculating the average stock price of each month. If the GPR data would be daily, we might have demonstrated more precise results.

In this dissertation study, a quantitative research method was used. It examines social events, quantitative research through statistical analysis of data that can be measured numerically and reveals the cause and effect relationships between these event.

5. DATA AND METHODOLOGY

5.1. Data

Monthly data of the GPR Index between 1985-2019 and the daily stock prices of the biggest 5 American Defense contractors, Boeing Company (BC), General Dynamics Corporation (GDC), Lockheed Martin Corporation (LMT), Northrop Grumman Corporation (NGC), Raytheon Company (RC), are examined.

-GPR data is obtained from the web site of the authors: www.matteoiacoviello.com/
-Stock prices, S&P 500 market data and for the risk free rate, 1 year Government Treasury Bond yields are received from Bloomberg Station.

We made our analysis for stocks, S&P 500 and T-bill in two methods;

- 1) Calculating Logarithmic Return for the last day of each month.
 - 2) Calculating Logarithmic Return for each day and take a monthly average.
- GPR data is monthly. Therefore we are able to make a monthly comparison.

5.2. The capital asset pricing model (CAPM)

“We will show that such an extension provides a theory with implications consistent with the assertions of traditional financial theory described above. Moreover, it sheds considerable light on the relationship between the price of an asset and the various components of its overall risk. For these reasons it warrants consideration as a model of the determination of capital asset prices.” (Sharpe, 1964)

The capital asset pricing model (CAPM) of William Sharpe and John Lintner is the biggest actor in the asset pricing model. The CAPM is still most commonly used in applications. This application comprises events like estimating the cost of capital for firms or evaluating the performance of the chosen portfolios. The method is the

core of modern Finance based investment courses. Moreover, it is often the most commonly thought asset pricing model in these courses.

When we look for the origins of the CAPM, two papers appear to possess been the first inspirations. In 1952, Harry Markowitz provided the first truly rigorous justification for selecting and diversifying a portfolio with the publication of his paper "Portfolio Selection." After a while, he expanded his mean-variance analysis to a book-length study that firmly established portfolio theory joined the cornerstones of financial economics.

Markowitz's work shows an instantaneous and obvious path to the model. After the publishing of his first paper, Markowitz became interested in making the portfolio selection problem more simple and comprehensible. His original mean-variance analysis expressed difficulties in implementation: to search out a mean-variance efficient portfolio, one has to calculate the variance-covariance matrix with $N(N-1)/2$ elements. Therefore, a sensibly measured arrangement of only 100 securities requires the overwhelming undertaking of figuring 4,950 variances or covariances.

Markowitz offered a possible solution for this problem by suggesting a "one-factor model". Surely, it was the very idea that involved William Sharpe with Markowitz and put Sharpe on the urge for the research that concluded in his version of CAPM.

The Capital Asset Pricing Model (CAPM) describes the relationship between the series. These series may indicate systematic risks, expected return for assets, stocks, and currently for lots of other relationships. CAPM is mainly used throughout the financial sector. The main purpose of the financial sector is for measuring risky stocks in comparison to a benchmark index. Also securities, calculating the expected returns for assets given the risk of those assets and cost of capital.

$$ER_i = R_f + \beta_i(ER_m - R_f)$$

where:

ER_i = Expected return of investment

R_f = Risk-free rate

β_i = Beta of the investment

$(ER_m - R_f)$ = Market risk premium

Investors hope to be made up of risk and the time estimation of money. The risk-free rate (RFR) in the CAPM formula describes the time value of money. Different segments of the CAPM equation represent the investor taking on the extra risk. The beta of a potential investment is the calculation of how much additional risk the investment will add to the portfolio that looks like the market. If a stock is riskier than the market, it will have a beta bigger than one. If the beta is less than one than the formula assumes that it will reduce the risk of a portfolio.

A stock's beta is then multiplied by the market's risk premium, which is the return expected from the market above the risk-free rate. The RFR is then added to the stock's beta and the market risk premium. The results should hint an investor the required return or discount rate they can use to find the value of an asset.

The goal of the CAPM formula is to evaluate whether a stock is fairly valued when its risk and the time value of money are compared to its expected return.

The CAPM's one of the initial contributor is Harry Markowitz. The model is developed by his model of portfolio choice in 1959. In Markowitz's model, a financial specialist selects a portfolio at time $t - 1$ that produces a stochastic return at t . The model is assuming that investors are risk averters. when choosing between portfolios, they check only about the mean and variance of their one-period investment return. Eventually, investors choose "mean-variance-efficient" portfolios, in the sense that the portfolios

- 1) minimize the variance of portfolio return, given expected return, also
- 2) maximize expected return, given variance.

For these reasons, the Markowitz approach is seldomly called a “mean-variance model.” The portfolio model offers an algebraic condition on asset weights in mean-variance efficient portfolios.

There are a few presumptions behind the CAPM formula that have been demonstrated not to hold in actuality. Despite these issues, the CAPM formula is still broadly used because it is really simple and allows us to make easy comparisons of investment alternatives.

Including beta in the formula assumes that risk can be calculated by a stock’s price volatility. Nonetheless, price movements in both directions are not similarly risky. The think back period to decide a stock's volatility isn't standard since stock returns (and risk) are not normally distributed.

The CAPM also assumes that the RFR will remain constant over the discounting period. If we assume that the interest rate on U.S. Treasury bonds rose to 5% or 6% during the 10-year holding period., an increase in the RFR also increases the cost of the capital used in the investment and could make the stock look overvalued.

The market portfolio that is used to find the market risk premium is only a hypothetical value. This value is not an asset that can be purchased or invested in as an alternative to the stock. Mostly, financial specialists will use a major stock index, like the S&P 500, to substitute for the market, which is a flawed comparison. The most serious critique of the CAPM is the presumption that future cash flows can be predicted for the discounting process. If a financial specialist could estimate the future return of a stock with a high level of accuracy, the CAPM would not be a necessity.

The charm of the CAPM is that it provides powerful and intuitively pleasing predictions about how to measure risk and the relation between expected return and

risk. However, the empirical record of the model is poor—poor enough to invalidate the way it is used in applications. The CAPM’s empirical problems may reflect theoretical failings, the result of many simplifying assumptions.

5.3. Methodology

Monthly average data of GPR Index, Stock prices, S&p 500 market return and 1 year T-bill are analysed for our study.

Our model is based on The Capital Asset Pricing Model (CAPM). Excess return of the all stocks and S&500 are calculated. In addition, GPR Index is also added as a Dummy Variable.

“Dummy Variable in event study method” is well known and adapted technique from the study of Karafiath in 1988.

“the author outlines a dummy variable technique that is a convenient procedure for obtaining cumulative prediction errors and related test statistics. By appending a vector of (0,1) dummy variables to the right-hand side of the market model, results usually obtained in two steps can be obtained in a single multiple regression. The primary advantage of this technique is that both prediction errors and correct test statistics may be obtained from any standard regression package. “ (Karafiath,1988)

In our model, If the GPR Index is a positive event (Which means the monthly value is bigger than 0), the dummy variable is 1. Otherwise, the dummy variable is 0.

$$PD = \begin{cases} 1, & \text{If there is a positive announcement} \\ 0, & \text{otherwise} \end{cases}$$

Excess Returns of the Stock Prices and market are estimated in two ways:

- 1) Logarithmic Return of the last day of each month.
- 2) Logarithmic Return for each return and take the monthly average.

After all the necessary data is obtained, we made 4 model for a Linear Regression;

Model 1:

$$R_t - R_t^f = \beta_0 + \beta_1 * (R_t^m - R_t^f) + \beta_2 * (R_t^m - R_t^f)^2 + \beta_3 * D_{t-1} + \beta_4 * (R_t^m - R_t^f) * D_{t-1} + \varepsilon_t$$

where:

R_t = return on stock each stock, at day t

R_t^m = market return at day t

R_t^f = risk-free rate at day t

D_{t-1} = dummy variable at time t-1, =1 if GPR index is positive, and zero otherwise

ε_t = residual for stock i on observation t.

Model 2:

$$R_t - R_t^f = \beta_0 + \beta_1 * (R_t^m - R_t^f) + \varepsilon_t$$

where:

R_t = return on stock each stock, at day t

R_t^m = market return at day t

R_t^f = risk-free rate at day t

ε_t = residual for stock i on observation t.

Model 3:

$$R_t - R_t^f = \beta_0 + \beta_1 * (R_t^m - R_t^f) + \beta_2 * D_{t-1} + \varepsilon_t$$

where:

R_t = return on stock each stock, at day t

R_t^m = market return at day t

R_t^f = risk-free rate at day t

D_{t-1} = dummy variable at time t-1, =1 if GPR index is positive, and zero otherwise

ε_t = residual for stock i on observation t.

Model 4:

$$R_t - R_t^f = \beta_0 + \beta_1 * (R_t^m - R_t^f) + \beta_2 * D_{t-1} + \beta_3 * (R_t^m - R_t^f) * D_{t-1} + \varepsilon_t$$

where:

R_t = return on stock each stock, at day t

R_t^m = market return at day t

R_t^f = risk-free rate at day t

D_{t-1} = dummy variable at time t-1, =1 if GPR index is positive, and zero otherwise

ε_t = residual for stock i on observation t.

6.RESULTS

6.1. Model 1

6.1.1. End of The month Data Results

Variable/Stock	LMT	BC	GDC	NGC	RC
$(R_t^m - R_t^f)$	0.4676*** (0.1162)	0.9768*** (0.09748)	0.5975*** (0.0940)	0.5367*** (0.1037)	0.7020*** (0.1058)
$(R_t^m - R_t^f)^2$	-5.2797 (5.8769)	-7.5239 (4.9306)	14.7314*** (4.7542)	1.2981 (5.2462)	3.5097 (5.3514)
D_{t-1}	0.0004 (0.0007)	-0.0001 (0.0005)	-0.0001 (0.0005)	0.0010* (0.0006)	0.0012* (0.0006)
$(R_t^m - R_t^f) * D_{t-1}$	0.0044 (0.1646)	-0.0490 (0.1381)	-0.1092 (0.1332)	-0.1001 (0.1470)	-0.1943 (0.1499)
Constant	-0.0000 (0.0005)	0.0003 (0.0004)	0.0003 (0.0004)	-0.0004 (0.0004)	-0.0004 (0.0005)
R-square	0.0913	0.3614	0.1620	0.1172	0.1641

Note: Numbers in parenthesis are estimated standard errors. “***”, “**”, and “*” indicate significance at 1%, 5% and 10% respectively.

Table 6.1.1. represents model estimation results basen end of the month return data.

First of all, CAPM β parameters are significant for all the stocks. BC has the highest, but still less than 1. These results indicate that the market has more risk than all the stocks. LMT has the lowest one. Only for GDC square parameter is significant.

This implies that only for LMT risk parameter differs when the market is bull or bear and the risk that stock carries increases when the market is bull since the parameter is positive and equals 14.7314. Furthermore, for none of the stocks, the

constant is significant which suggests no abnormal return. However, the coefficients for dummy at time t-1 are significant for NGC and RC.

Based on the result, since the value of the dummy variable is added to constant and constant represents an abnormal return, these results suggest that when there is an increase in the global terror index at time t-1, these stocks have significant positive abnormal return at time t. The slope dummy variable is not significant for any of the stocks therefore risk parameter is unrelated to the global terror index. Moreover, a higher R-square value for BC shows that there is a higher correlation between the market and stock return.

6.1.2. Monthly Average Data Results

Variable/Stock	LMT	BC	GDC	NGC	RC
$(R_t^m - R_t^f)$	0.6476*** (0.1224)	1.0937*** (0.1180)	0.9301*** (0.1076)	1.0620*** (0.1293)	0.7304*** (0.1180)
$(R_t^m - R_t^f)^2$	-6.1884*** (2.0500)	-1.1196 (1.9761)	-2.3209 (1.8012)	-4.6524** (2.1650)	-2.4643 (1.9753)
D_{t-1}	0.0041 (0.0030)	0.0024 (0.0029)	-0.0030 (0.0027)	0.0049 (0.0032)	0.0017 (0.0029)
$(R_t^m - R_t^f) * D_{t-1}$	-0.1268 (0.1664)	-0.1975 (0.1604)	-0.1205 (0.1462)	-0.6607*** (0.1757)	-0.1683 (0.1603)
Constant	0.00009 (0.0023)	0.0001 (0.0022)	0.0026 (0.0020)	-0.0004 (0.0024)	0.0009 (0.0022)
R-square	0.1702	0.2993	0.2950	0.2215	0.1672

Note: Numbers in parenthesis are estimated standard errors. “***”, “**”, and “*” indicate significance at 1%, 5% and 10% respectively.

Table 6.1.2. represents model estimation results basen Monthly Average Data.

β parameters are significant for all the stocks. BC still has the highest which is closely followed by NGC, also both numbers are more than 1. These results indicate that, except BC and NGC, the market has more risk than the stocks for Monthly Average Data. LMT has the lowest one.

The square parameter is significant for LMT and NGC. This implies that only for LMT and NGC, risk parameter differs when the market is bull or bear and the risk that stocks carry decreases when the market is bull since the parameters are negative and equal to -6.1884 and -4.6524 respectively. Furthermore, if market return is less than the risk-free rate, these negative numbers suggest that the risk that these stock carry will increase.

Additionally, for none of the stocks, the constant is significant which suggests no abnormal return again. The coefficients for dummy at time t-1 are not significant as well. However, the slope dummy variable for NGC is significant, which means risk parameter is related to the global terror index and it decreases the time after index increases

Similar to parameters, BC and GDC have higher R-square values comparing to others which shows that there is a higher correlation between the market and these stock returns.

6.2. Model 2

6.2.1. End of The month Data Results

Variable/Stock	LMT	BC	GDC	NGC	RC
$(R_t^m - R_t^f)$	0.4816*** (0.0766)	0.9668*** (0.0644)	0.5120*** (0.6290)	0.4874*** (0.6855)	0.6013*** (0.701)
Constant	0.0000 (0.0003)	0.0000 (0.0002)	0.0005* (0.0003)	0.0002 (0.0003)	0.0003 (0.0003)
R-square	0.0885	0.3561	0.1402	0.1105	0.1530

Note: Numbers in parenthesis are estimated standard errors. “***”, “**”, and “*” indicate significance at 1%, 5% and 10% respectively.

Table 6.2.1. represents model estimation results basen end of the month return data.

Firstly, CAPM β parameters are significant for all the stocks. BC has the highest but still all stocks are less than 1. LMT has the lowest value.

These results indicate that the market has more risk than all the stocks. Furthermore, for none of the stocks; except GDC, the constant is significant which suggests no abnormal return. And Lastly, higher R-square value for BC shows that there is a higher correlation between the market and this stock's return.

6.2.2. Monthly Average Data Results

Variable/Stock	LMT	BC	GDC	NGC	RC
$(R_t^m - R_t^f)$	0.6726*** (0.082)	1.0130*** (0.077)	0.9084*** (0.0710)	0.8083*** (0.0885)	0.6837*** (0.0777)
Constant	0.0006 (0.0015)	0.0010 (0.015)	0.0003 (0.0013)	0.0006 (0.0017)	0.0008 (0.0014)
R-square	0.1427	0.2944	0.2869	0.1699	0.1596

Note: Numbers in parenthesis are estimated standard errors. “***”, “**”, and “*” indicate significance at 1%, 5% and 10% respectively.

Table 6.2.2. represents model estimation results basen Monthly Average Data.

Similarly, CAPM β parameters are significant for all the stocks.

BC has the highest which is bigger than 1. These results indicate that; Except BC, the market has more risk than all the stocks. Furthermore, for none of the stocks, the constant is significant which suggests no abnormal return.

And Lastly, higher R-square value for BC shows that there is a higher correlation between the market and this stock's return. In this model, GDC's R-square value is quite close to BC.

6.3. Model 3

6.3.1. End of The month Data Results

Variable/Stock	LMT	BC	GDC	NGC	RC
$(R_t^m - R_t^f)$	0.4802*** (0.0767)	0.9672*** (0.0646)	0.5137*** (0.0628)	0.4841*** (0.0685)	0.5980*** (0.0700)
D_{t-1}	0.0004 (0.0007)	-0.0002 (0.0006)	-0.0001 (0.0006)	0.0010 (0.0006)	0.0012* (0.0006)
Constant	-0.0001 (0.0005)	0.0001 (0.0004)	0.0007* (0.0004)	-0.0003 (0.0004)	-0.0003 (0.0004)
R-square	0.0892	0.3562	0.1418	0.1161	0.1605

Note: Numbers in parenthesis are estimated standard errors. “***”, “**”, and “*” indicate significance at 1%, 5% and 10% respectively.

Table 6.3.1. represents model estimation results basen End of the month return data.

CAPM β parameters are significant for all the stocks. BC has the highest but still less than 1. These results indicate that the market has more risk than all the stocks. LMT has the lowest one as usual.

Furthermore, for none of the stocks; Except GDC, the constant is significant which suggests no abnormal return. The coefficient for dummy at time t-1 is significant for RC.

This results suggest that when there is an increase in the global terror index at time t-1, this stock has significant positive abnormal return at time t. higher R-square value for BC shows that there is a higher correlation between the market and stock return.

6.3.2. Monthly Average Data Results

Variable/Stock	LMT	BC	GDC	NGC	RC
$(R_t^m - R_t^f)$	0.6759*** (0.0817)	1.014*** (0.0778)	0.9055*** (0.0710)	0.8105*** (0.0876)	0.6849*** (0.0780)
D_{t-1}	0.0040 (0.0030)	0.0019 (0.0029)	-0.0033 (0.0026)	0.0030 (0.0032)	0.0013 (0.0029)
Constant	-0.0015 (0.0021)	0.0000 (0.0020)	0.0019 (0.0018)	-0.0012 (0.0023)	0.0002 (0.0020)
R-square	0.1469	0.2953	0.2898	0.1752	0.1600

Note: Numbers in parenthesis are estimated standard errors. “***”, “**”, and “*” indicate significance at 1%, 5% and 10% respectively.

Table 6.3.2. represents model estimation results basen Monthly Average Data.

CAPM β parameters are significant for all the stocks. BC still has the highest which is followed by GDC. These results indicate that the market (except BC) has more risk than other stocks for Monthly Average Data.

LMT has the lowest one.

Additionally, for none of the stocks, the constant is significant which suggests no abnormal return again. The coefficients for dummy at time t-1 are not significant as well.

Similar to CAPM β parameters, BC and GDC have higher R-square values comparing to others which shows that there is a higher correlation between the market and these stock returns

6.4. Model 4

6.4.1. End of The month Data Results

Variable/Stock	LMT	BC	GDC	NGC	RC
$(R_t^m - R_t^f)$	0.5040*** (0.1086)	1.0300*** (0.0912)	0.4950*** (0.0888)	0.5264*** (0.0971)	0.6760*** (0.0992)
$(R_t^m - R_t^f)$ * D_{t-1}	-0.0450 (0.1535)	-0.1255 (0.1290)	0.0365 (0.1255)	-0.0785 (0.1373)	-0.1490 (0.1403)
Constant	0.0000 (0.0003)	0.0000 (0.0003)	0.0006** (0.0003)	0.0002 (0.0003)	0.0003 (0.0003)
R-square	0.0887	0.3576	0.1418	0.1111	0.1555

Note: Numbers in parenthesis are estimated standard errors. “***”, “**”, and “*” indicate significance at 1%, 5% and 10% respectively.

Table 6.4.1. represents model estimation results basen end of the month return data.

CAPM β parameters are significant for all the stocks. BC still has the highest which is followed by RC. These results indicate that the market (except BC) has more risk than other stocks for End of the month Data.

GDC has the lowest one.

Except for GDC; for none of the stocks, the constant is significant which suggests no abnormal return.

These results suggest that when there is an increase in the global terror index at time t-1,

GDC has a significant positive abnormal return at time t.

The slope dummy variable is not significant for any of the stocks therefore risk parameter is unrelated to the global terror index. Lastly, a higher R-square value for BC shows that there is a higher correlation between the market and stock return.

6.4.2. Monthly Average Data Results

Variable/Stock	LMT	BC	GDC	NGC	RC
$(R_t^m - R_t^f)$	0.7708*** (0.1125)	1.1074*** (0.1071)	0.999*** (0.0978)	1.1457*** (0.1182)	0.7790*** (0.1072)
$(R_t^m - R_t^f)$ * D_{t-1}	-0.2050 (0.1613)	-0.1970 (0.1535)	-0.1901 (0.1402)	-0.7041*** (0.1695)	-0.1986 (0.1536)
Constant	0.0005 (0.0015)	0.0008 (0.0015)	0.0001 (0.0013)	0.0001 (0.0016)	0.0007 (0.0014)
R-square	0.1463	0.2974	0.2901	0.2072	0.1631

Note: Numbers in parenthesis are estimated standard errors. “***”, “**”, and “*” indicate significance at 1%, 5% and 10% respectively.

Table 6.4.2. represents model estimation results basen Monthly Average Data.

CAPM β parameters are significant for all the stocks. NGC has the highest which is followed by BC. These results indicate that the market (except BC And NGC) has more risk than other stocks for Monthly Average Data. LMT has the lowest one.

Additionally, for none of the stocks, the constant is significant which suggests no abnormal return again. However, the Slope dummy variable for NGC is significant. This means, for any other of the stocks, the risk parameter is unrelated to the global terror index.

Similar to CAPM β parameters, BC and GDC have higher R-square values comparing to others which shows that there is a higher correlation between the market and these stock returns.

6.5 Log Likelihood's Results

	Log -likelihood			
Return Type	Model 1	Model 2	Model 3	Model 4
End Of The Month	1537.610	1535.196	1532.760	1532.750
Montly Average	904.787	905.069	903.265	903.378

Table 6.5.1. Log-likelihood's Table of GDC

Since the highest numbers for the End Of The Month Data are for Model 1, This model is the best fit to interpret GDC stocks.

The highest numbers for the Monthly Average Data are for Model 2, This model is the best fit to interpret GDC stocks.

	Log -likelihood			
Return Type	Model 1	Model 2	Model 3	Model 4
End Of The Month	1451.122	1454.524	1450.661	1450.537
Montly Average	851.9940	847.467	846.282	846.210

Table 6.5.2. Log-likelihood's Table of LMT

Since the highest numbers for the End Of The Month Data are for Model 2, This model is the best fit to interpret LMT stocks.

The highest numbers for the Monthly Average Data are for Model 2, This model is the best fit to interpret LMT stocks.

	Log -likelihood			
Return Type	Model 1	Model 2	Model 3	Model 4
End Of The Month	1522.751	1525.293	1521.109	1521.544
Montly Average	856.966	868.050	865.805	866.417

Table 6.5.3. Log-likelihood's Table of BC

Since the highest numbers for the End Of The Month Data are for Model 2, This model is the best fit to interpret BC stocks.

The highest numbers for the Monthly Average Data are for Model 2, This model is the best fit to interpret BC stocks.

	Log -likelihood			
Return Type	Model 1	Model 2	Model 3	Model 4
End Of The Month	1497.437	1499.926	1497.199	1496.032
Montly Average	829.742	814.554	817.957	826.021

Table 6.5.4. Log-likelihood's Table of NGC

Since the highest numbers for the End Of The Month Data are for Model 2, This model is the best fit to interpret NGC stocks.

The highest numbers for the Monthly Average Data are for Model 1, This model is the best fit to interpret NGC stocks.

	Log -likelihood			
Return Type	Model 1	Model 2	Model 3	Model 4
End Of The Month	1489.333	1490.766	1488.463	1487.246
Monthly Average	867.129	867.887	865.375	866.108

Table 6.5.5. Log-likelihood's Table RC

Since the highest numbers for the End Of The Month Data are for Model 2, This model is the best fit to interpret RC stocks.

The highest numbers for the Monthly Average Data are for Model 2, This model is the best fit to interpret RC stocks.

Overall, It is safe to state that Model 2 results are a better choice in terms of Log-likelihood.

CONCLUSION

The relationship between war-related news and the stock prices is examined widely in lots of different aspects. Our scope was the Global Geopolitical Risk Index and the Defense companies of the U.S.A. In this thesis, the biggest Five Defense Companies and the GPR index are taken into consideration.

Gpr Index is simply constructed on the electronically achievable newspaper keywords. 11 American and International Newspapers are the root of this Index. (The Boston Globe, Chicago Tribune, The Daily Telegraph, Financial Times, The Globe and Mail, The Guardian, Los Angeles Times, The New York Times, The Times, The Wall Street Journal, and The Washington Post) When a political conflict or tension occurs (i.e. invasion of Iraq), these index depicts the keywords which demonstrate panic, fear, or uncertainty about the geopolitical future.

GPR Index is a well-used indicator (by the World Bank and other Institutions). From 1900 to this day, local and global tension is tracked down in order to have a significant analysis. GPR Index is peaked during the era of Big Depression, Both World Wars, Cuba Missile Crisis, Coup attempt in Turkey, etc. Even these events clearly express that the Index is correlated with the tension.

One of the main reasons for this research is the prejudice towards the Defence Companies. Some people might think that companies that sell guns or military products must be highly correlated with war-related events. For example, if tension occurs, defense companies might have substantial abnormal returns, even further these companies might choose to have political tension. This is the main reason why we choose The Biggest U.S. Defense Contractors. Since the firms and newspapers are from the U.S.A, the relationship is assumed to be stronger.

In this thesis, I concentrate on the relationship between GPR Index monthly volatility and the stock prices of certain tickets. To obtain the abnormal returns, S&P 500 and the 1 year U.S. treasury bill yields are taken into consideration in the model. In literature, several papers analyze the impacts of war-related announcements on different financial variables, such as equity returns, stock market prices, or country-based GDP's. This paper contributes to the literature by narrowing the scope by picking five biggest (and mostly associated) companies and the timeline between 1985-2019

In order to investigate the relationship between GPR Index monthly volatility and the stock prices of certain tickets, the CAPM model is used. The research covers the time period between January 1, 1985, and January 1, 2019. In the model, two separate dummy variables are incorporated into the equation for GPR Index. Positive dummy variables are created for the monthly increase in the Index. Positive dummy variables take 1 if there is a monthly increase, and if there is no change or a negative change, the dummy variable is 0. In order to have more accurate results, Daily returns are calculated in two methods; Daily return of the last day of each month, and secondly monthly average of Daily stock returns.

Empirical findings of the two methods show that war-related announcements have statistically significant effects on Excess Returns at different confidence levels on some level. In order to select the best model that fits on the data, two dummy variables are used(dummy variable in time $t-1$ and the slope dummy variable in time $t-1$) in our model and the regression analysis.

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APPENDIX

Regression Results of CAPM Model 1 (End Of the Month Data)

Dependent Variable: NORTH__G_

Method: Least Squares

Date: 02/13/20 Time: 08:33

Sample (adjusted): 1985M03 2019M02

Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000366	0.000460	-0.794914	0.4271
S_P	0.536734	0.103722	5.174757	0.0000
S_P^2	1.298168	5.246254	0.247447	0.8047
DUMMY(-1)	0.001019	0.000616	1.654954	0.0987
S_P*DUMMY(-1)	-0.100140	0.146970	-0.681366	0.4960

R-squared	0.117211	Mean dependent var	0.000276
Adjusted R-squared	0.108449	S.D. dependent var	0.006568
S.E. of regression	0.006202	Akaike info criterion	-7.315855
Sum squared resid	0.015499	Schwarz criterion	-7.266697
Log likelihood	1497.434	Hannan-Quinn criter.	-7.296403
F-statistic	13.37696	Durbin-Watson stat	2.016974
Prob(F-statistic)	0.000000		

Dependent Variable: LMT

Method: Least Squares

Date: 02/13/20 Time: 08:32

Sample (adjusted): 1985M03 2019M02

Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.14E-05	0.000516	-0.080321	0.9360
S_P	0.467622	0.116190	4.024624	0.0001
S_P^2	-5.279753	5.876916	-0.898388	0.3695
DUMMY(-1)	0.000388	0.000690	0.562013	0.5744
S_P*DUMMY(-1)	0.004441	0.164637	0.026977	0.9785

R-squared	0.091273	Mean dependent var	0.000140
Adjusted R-squared	0.082254	S.D. dependent var	0.007252
S.E. of regression	0.006947	Akaike info criterion	-7.088819
Sum squared resid	0.019449	Schwarz criterion	-7.039662
Log likelihood	1451.119	Hannan-Quinn criter.	-7.069367
F-statistic	10.11940	Durbin-Watson stat	1.996685
Prob(F-statistic)	0.000000		

Dependent Variable: BA

Method: Least Squares

Date: 02/11/20 Time: 23:18

Sample (adjusted): 1985M03 2019M02

Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000313	0.000433	0.722675	0.4703
S_P	0.976792	0.097490	10.01943	0.0000
S_P^2	-7.524535	4.930783	-1.526033	0.1278
DUMMY(-1)	-0.000170	0.000579	-0.293883	0.7690
S_P*DUMMY(-1)	-0.048981	0.138141	-0.354572	0.7231

R-squared	0.361358	Mean dependent var	0.000237
Adjusted R-squared	0.355019	S.D. dependent var	0.007257
S.E. of regression	0.005828	Akaike info criterion	-7.439957
Sum squared resid	0.013690	Schwarz criterion	-7.390799
Log likelihood	1522.751	Hannan-Quinn criter.	-7.420505
F-statistic	57.00652	Durbin-Watson stat	1.893991
Prob(F-statistic)	0.000000		

Dependent Variable: G_D_

Method: Least Squares

Date: 02/13/20 Time: 08:34

Sample (adjusted): 1985M03 2019M02

Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000356	0.000417	0.853962	0.3936
S_P	0.597493	0.093995	6.356638	0.0000
S_P^2	14.73138	4.754288	3.098545	0.0021
DUMMY(-1)	-0.000139	0.000558	-0.249512	0.8031
S_P*DUMMY(-1)	-0.109221	0.133188	-0.820056	0.4127

R-squared	0.162013	Mean dependent var	0.000667
Adjusted R-squared	0.153696	S.D. dependent var	0.006109
S.E. of regression	0.005620	Akaike info criterion	-7.512790
Sum squared resid	0.012729	Schwarz criterion	-7.463632
Log likelihood	1537.609	Hannan-Quinn criter.	-7.493338
F-statistic	19.47862	Durbin-Watson stat	2.004113
Prob(F-statistic)	0.000000		

Dependent Variable: RAYTHEON

Method: Least Squares

Date: 02/13/20 Time: 08:33

Sample (adjusted): 1985M03 2019M02

Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000412	0.000470	-0.876618	0.3812
S_P	0.702047	0.105802	6.635504	0.0000
S_P^2	3.509692	5.351460	0.655838	0.5123
DUMMY(-1)	0.001222	0.000628	1.945301	0.0524
S_P*DUMMY(-1)	-0.194325	0.149917	-1.296217	0.1956

R-squared	0.164151	Mean dependent var	0.000397
Adjusted R-squared	0.155855	S.D. dependent var	0.006885
S.E. of regression	0.006326	Akaike info criterion	-7.276145
Sum squared resid	0.016127	Schwarz criterion	-7.226987
Log likelihood	1489.334	Hannan-Quinn criter.	-7.256693
F-statistic	19.78616	Durbin-Watson stat	1.968798
Prob(F-statistic)	0.000000		

Regression Results of CAPM Model 2 (Monthly Average Data)

Dependent Variable: NORTH_G_
 Method: Least Squares
 Date: 02/13/20 Time: 08:49
 Sample (adjusted): 1985M03 2019M02
 Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000425	0.002471	-0.171865	0.8636
S_P	1.062057	0.129312	8.213146	0.0000
S_P^2	-4.652390	2.164919	-2.148991	0.0322
DUMMY(-1)	0.004869	0.003207	1.518134	0.1298
S_P*DUMMY(-1)	-0.660698	0.175768	-3.758917	0.0002
R-squared	0.221546	Mean dependent var	0.002822	
Adjusted R-squared	0.213819	S.D. dependent var	0.035930	
S.E. of regression	0.031858	Akaike info criterion	-4.042856	
Sum squared resid	0.409026	Schwarz criterion	-3.993699	
Log likelihood	829.7427	Hannan-Quinn criter.	-4.023405	
F-statistic	28.67312	Durbin-Watson stat	2.074685	
Prob(F-statistic)	0.000000			

Dependent Variable: G_D_
 Method: Least Squares
 Date: 02/13/20 Time: 08:49
 Sample (adjusted): 1985M03 2019M02
 Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002651	0.002056	1.289775	0.1979
S_P	0.930081	0.107587	8.644961	0.0000
S_P^2	-2.320911	1.801196	-1.288538	0.1983
DUMMY(-1)	-0.003075	0.002668	-1.152364	0.2499
S_P*DUMMY(-1)	-0.120492	0.146238	-0.823946	0.4105
R-squared	0.295043	Mean dependent var	0.003027	
Adjusted R-squared	0.288046	S.D. dependent var	0.031413	
S.E. of regression	0.026506	Akaike info criterion	-4.410720	
Sum squared resid	0.283133	Schwarz criterion	-4.361563	
Log likelihood	904.7870	Hannan-Quinn criter.	-4.391269	
F-statistic	42.16645	Durbin-Watson stat	1.968901	
Prob(F-statistic)	0.000000			

Dependent Variable: LMT
 Method: Least Squares
 Date: 02/13/20 Time: 08:48
 Sample (adjusted): 1985M03 2019M02
 Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000956	0.002340	0.408813	0.6829
S_P	0.647609	0.122448	5.288832	0.0000
S_P^2	-6.188491	2.050012	-3.018759	0.0027
DUMMY(-1)	0.004122	0.003037	1.357410	0.1754
S_P*DUMMY(-1)	-0.126799	0.166439	-0.761838	0.4466
R-squared	0.170157	Mean dependent var	0.002673	
Adjusted R-squared	0.161921	S.D. dependent var	0.032953	
S.E. of regression	0.030167	Akaike info criterion	-4.151931	
Sum squared resid	0.366759	Schwarz criterion	-4.102774	
Log likelihood	851.9940	Hannan-Quinn criter.	-4.132480	
F-statistic	20.65854	Durbin-Watson stat	1.993921	
Prob(F-statistic)	0.000000			

Dependent Variable: RAYTHEON
 Method: Least Squares
 Date: 02/13/20 Time: 08:50
 Sample (adjusted): 1985M03 2019M02
 Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000905	0.002254	0.401436	0.6883
S_P	0.730447	0.117989	6.190800	0.0000
S_P^2	-2.464315	1.975354	-1.247531	0.2129
DUMMY(-1)	0.001736	0.002926	0.593194	0.5534
S_P*DUMMY(-1)	-0.168287	0.160377	-1.049319	0.2947
R-squared	0.167274	Mean dependent var	0.002949	
Adjusted R-squared	0.159009	S.D. dependent var	0.031698	
S.E. of regression	0.029069	Akaike info criterion	-4.226127	
Sum squared resid	0.340532	Schwarz criterion	-4.176969	
Log likelihood	867.1299	Hannan-Quinn criter.	-4.206675	
F-statistic	20.23823	Durbin-Watson stat	1.942620	
Prob(F-statistic)	0.000000			

Dependent Variable: BA
 Method: Least Squares
 Date: 02/13/20 Time: 08:48
 Sample (adjusted): 1985M03 2019M02
 Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000109	0.002255	0.048143	0.9616
S_P	1.093685	0.118036	9.265669	0.0000
S_P^2	-1.119657	1.976145	-0.566586	0.5713
DUMMY(-1)	0.002438	0.002927	0.832854	0.4054
S_P*DUMMY(-1)	-0.197504	0.160442	-1.231002	0.2190
R-squared	0.299327	Mean dependent var	0.004060	
Adjusted R-squared	0.292373	S.D. dependent var	0.034570	
S.E. of regression	0.029080	Akaike info criterion	-4.225326	
Sum squared resid	0.340805	Schwarz criterion	-4.176169	
Log likelihood	866.9666	Hannan-Quinn criter.	-4.205875	
F-statistic	43.04039	Durbin-Watson stat	2.043741	
Prob(F-statistic)	0.000000			

Regression Results of CAPM Model 2 (End Of the Month Data)

Dependent Variable: BA
Method: Least Squares
Date: 04/23/20 Time: 07:28
Sample: 1985M02 2019M02
Included observations: 409

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.77E-05	0.000288	0.235009	0.8143
S_P	0.966807	0.064433	15.00493	0.0000
R-squared	0.356163	Mean dependent var	0.000240	
Adjusted R-squared	0.354581	S.D. dependent var	0.007249	
S.E. of regression	0.005824	Akaike info criterion	-7.448864	
Sum squared resid	0.013804	Schwarz criterion	-7.429237	
_log likelihood	1525.293	Hannan-Quinn criter.	-7.441099	
F-statistic	225.1478	Durbin-Watson stat	1.907963	
Prob(F-statistic)	0.000000			

Dependent Variable: LMT
Method: Least Squares
Date: 04/23/20 Time: 07:33
Sample: 1985M02 2019M02
Included observations: 409

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.90E-05	0.000343	0.172318	0.8633
S_P	0.481673	0.076604	6.287818	0.0000
R-squared	0.088541	Mean dependent var	0.000145	
Adjusted R-squared	0.086301	S.D. dependent var	0.007243	
S.E. of regression	0.006924	Akaike info criterion	-7.102805	
Sum squared resid	0.019512	Schwarz criterion	-7.083178	
_log likelihood	1454.524	Hannan-Quinn criter.	-7.095039	
F-statistic	39.53665	Durbin-Watson stat	1.999174	
Prob(F-statistic)	0.000000			

Dependent Variable: G_D_
Method: Least Squares
Date: 04/23/20 Time: 07:33
Sample: 1985M02 2019M02
Included observations: 409

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000551	0.000281	1.957533	0.0510
S_P	0.511961	0.062891	8.140413	0.0000
R-squared	0.140019	Mean dependent var	0.000642	
Adjusted R-squared	0.137906	S.D. dependent var	0.006122	
S.E. of regression	0.005684	Akaike info criterion	-7.497289	
Sum squared resid	0.013151	Schwarz criterion	-7.477662	
_log likelihood	1535.196	Hannan-Quinn criter.	-7.489524	
F-statistic	66.26632	Durbin-Watson stat	2.028283	
Prob(F-statistic)	0.000000			

Dependent Variable: RAYTHEON
Method: Least Squares
Date: 04/23/20 Time: 07:34
Sample: 1985M02 2019M02
Included observations: 409

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000285	0.000314	0.910128	0.3633
S_P	0.601303	0.070108	8.576796	0.0000
R-squared	0.153074	Mean dependent var	0.000393	
Adjusted R-squared	0.150993	S.D. dependent var	0.006877	
S.E. of regression	0.006337	Akaike info criterion	-7.280030	
Sum squared resid	0.016343	Schwarz criterion	-7.260403	
_log likelihood	1490.766	Hannan-Quinn criter.	-7.272265	
F-statistic	73.56143	Durbin-Watson stat	1.967264	
Prob(F-statistic)	0.000000			

Dependent Variable: NORTH__G_
Method: Least Squares
Date: 04/23/20 Time: 07:35
Sample: 1985M02 2019M02
Included observations: 409

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000197	0.000307	0.644026	0.5199
S_P	0.487462	0.068555	7.110486	0.0000
R-squared	0.110497	Mean dependent var	0.000285	
Adjusted R-squared	0.108312	S.D. dependent var	0.006562	
S.E. of regression	0.006196	Akaike info criterion	-7.324823	
Sum squared resid	0.015627	Schwarz criterion	-7.305196	
_log likelihood	1499.926	Hannan-Quinn criter.	-7.317057	
F-statistic	50.55902	Durbin-Watson stat	2.021459	
Prob(F-statistic)	0.000000			

Regression Results of CAPM Model 2 (Monthly Average Data)

Dependent Variable: G_D_
Method: Least Squares
Date: 04/23/20 Time: 07:59
Sample: 1985M02 2019M02
Included observations: 409

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000251	0.001330	0.188610	0.8505
S_P	0.908456	0.071000	12.79517	0.0000

R-squared	0.286861	Mean dependent var	0.003057
Adjusted R-squared	0.285109	S.D. dependent var	0.031381
S.E. of regression	0.026533	Akaike info criterion	-4.415986
Sum squared resid	0.286526	Schwarz criterion	-4.396359
Log likelihood	905.0691	Hannan-Quinn criter.	-4.408220
F-statistic	163.7164	Durbin-Watson stat	1.957991
Prob(F-statistic)	0.000000		

Dependent Variable: BA
Method: Least Squares
Date: 04/23/20 Time: 07:59
Sample: 1985M02 2019M02
Included observations: 409

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000973	0.001456	0.667920	0.5046
S_P	1.012993	0.077726	13.03290	0.0000

R-squared	0.294452	Mean dependent var	0.004102
Adjusted R-squared	0.292718	S.D. dependent var	0.034538
S.E. of regression	0.029046	Akaike info criterion	-4.234966
Sum squared resid	0.343383	Schwarz criterion	-4.215339
Log likelihood	868.0506	Hannan-Quinn criter.	-4.227200
F-statistic	169.8564	Durbin-Watson stat	2.034357
Prob(F-statistic)	0.000000		

Dependent Variable: RAYTHEON
Method: Least Squares
Date: 04/23/20 Time: 08:00
Sample: 1985M02 2019M02
Included observations: 409

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000832	0.001457	0.571147	0.5682
S_P	0.683705	0.077757	8.792846	0.0000

R-squared	0.159636	Mean dependent var	0.002944
Adjusted R-squared	0.157572	S.D. dependent var	0.031659
S.E. of regression	0.029058	Akaike info criterion	-4.234167
Sum squared resid	0.343658	Schwarz criterion	-4.214540
Log likelihood	867.8871	Hannan-Quinn criter.	-4.226401
F-statistic	77.31414	Durbin-Watson stat	1.941675
Prob(F-statistic)	0.000000		

Dependent Variable: LMT
Method: Least Squares
Date: 04/23/20 Time: 08:00
Sample: 1985M02 2019M02
Included observations: 409

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000671	0.001531	0.438015	0.6616
S_P	0.672590	0.081738	8.228652	0.0000

R-squared	0.142636	Mean dependent var	0.002749
Adjusted R-squared	0.140529	S.D. dependent var	0.032948
S.E. of regression	0.030546	Akaike info criterion	-4.134316
Sum squared resid	0.379744	Schwarz criterion	-4.114689
Log likelihood	847.4675	Hannan-Quinn criter.	-4.126550
F-statistic	67.71072	Durbin-Watson stat	1.949382
Prob(F-statistic)	0.000000		

Dependent Variable: NORTH_G_
Method: Least Squares
Date: 04/23/20 Time: 08:00
Sample: 1985M02 2019M02
Included observations: 409

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000591	0.001660	0.356362	0.721
S_P	0.808305	0.088587	9.124411	0.000

R-squared	0.169820	Mean dependent var	0.00306
Adjusted R-squared	0.167780	S.D. dependent var	0.03628
S.E. of regression	0.033105	Akaike info criterion	-3.97336
Sum squared resid	0.446056	Schwarz criterion	-3.95374
Log likelihood	814.5540	Hannan-Quinn criter.	-3.96560
F-statistic	83.25487	Durbin-Watson stat	1.99878
Prob(F-statistic)	0.000000		

Regression Results of CAPM Model 3 (End Of the Month Data)

Dependent Variable: BA

Method: Least Squares

Date: 04/23/20 Time: 07:37

Sample (adjusted): 1985M03 2019M02

Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000154	0.000420	0.366486	0.7142
S_P	0.967249	0.064611	14.97026	0.0000
DUMMY(-1)	-0.000166	0.000579	-0.287001	0.7743

R-squared	0.356246	Mean dependent var	0.000237
Adjusted R-squared	0.353067	S.D. dependent var	0.007258
S.E. of regression	0.005837	Akaike info criterion	-7.441712
Sum squared resid	0.013801	Schwarz criterion	-7.412217
Log likelihood	1521.109	Hannan-Quinn criter.	-7.430041
F-statistic	112.0611	Durbin-Watson stat	1.900670
Prob(F-statistic)	0.000000		

Dependent Variable: LMT

Method: Least Squares

Date: 04/23/20 Time: 07:38

Sample (adjusted): 1985M03 2019M02

Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000154	0.000499	-0.307929	0.7583
S_P	0.480298	0.076789	6.254797	0.0000
DUMMY(-1)	0.000397	0.000688	0.576983	0.5643

R-squared	0.089230	Mean dependent var	0.000140
Adjusted R-squared	0.084733	S.D. dependent var	0.007252
S.E. of regression	0.006938	Akaike info criterion	-7.096378
Sum squared resid	0.019493	Schwarz criterion	-7.066883
Log likelihood	1450.661	Hannan-Quinn criter.	-7.084706
F-statistic	19.83937	Durbin-Watson stat	1.998617
Prob(F-statistic)	0.000000		

Dependent Variable: G_D_

Method: Least Squares

Date: 04/23/20 Time: 07:39

Sample (adjusted): 1985M03 2019M02

Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000672	0.000408	1.645992	0.1005
S_P	0.513738	0.062793	8.181507	0.0000
DUMMY(-1)	-0.000182	0.000563	-0.323003	0.7469

R-squared	0.141854	Mean dependent var	0.000667
Adjusted R-squared	0.137616	S.D. dependent var	0.006109
S.E. of regression	0.005673	Akaike info criterion	-7.498821
Sum squared resid	0.013035	Schwarz criterion	-7.469327
Log likelihood	1532.760	Hannan-Quinn criter.	-7.487150
F-statistic	33.47378	Durbin-Watson stat	2.046223
Prob(F-statistic)	0.000000		

Dependent Variable: RAYTHEON

Method: Least Squares

Date: 04/23/20 Time: 07:39

Sample (adjusted): 1985M03 2019M02

Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000332	0.000455	-0.730161	0.4657
S_P	0.597990	0.069994	8.543484	0.0000
DUMMY(-1)	0.001183	0.000627	1.886443	0.0600

R-squared	0.160578	Mean dependent var	0.000397
Adjusted R-squared	0.156433	S.D. dependent var	0.006885
S.E. of regression	0.006324	Akaike info criterion	-7.281683
Sum squared resid	0.016196	Schwarz criterion	-7.252188
Log likelihood	1488.463	Hannan-Quinn criter.	-7.270012
F-statistic	38.73738	Durbin-Watson stat	1.972210
Prob(F-statistic)	0.000000		

Dependent Variable: NORTH_G_

Method: Least Squares

Date: 04/23/20 Time: 07:40

Sample (adjusted): 1985M03 2019M02

Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000336	0.000446	-0.754049	0.4513
S_P	0.484122	0.068511	7.066352	0.0000
DUMMY(-1)	0.001000	0.000614	1.628824	0.1041

R-squared	0.116194	Mean dependent var	0.000276
Adjusted R-squared	0.111830	S.D. dependent var	0.006568
S.E. of regression	0.006190	Akaike info criterion	-7.324507
Sum squared resid	0.015517	Schwarz criterion	-7.295013
Log likelihood	1497.199	Hannan-Quinn criter.	-7.312836
F-statistic	26.62273	Durbin-Watson stat	2.010425
Prob(F-statistic)	0.000000		

Regression Results of CAPM Model 3 (Monthly Average Data)

Dependent Variable: RAYTHEON

Method: Least Squares

Date: 04/23/20 Time: 08:02

Sample (adjusted): 1985M03 2019M02

Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000172	0.002054	0.083601	0.9334
S_P	0.684871	0.077968	8.783996	0.0000
DUMMY(-1)	0.001331	0.002885	0.461293	0.6448

R-squared	0.160083	Mean dependent var	0.002949
Adjusted R-squared	0.155935	S.D. dependent var	0.031698
S.E. of regression	0.029122	Akaike info criterion	-4.227332
Sum squared resid	0.343473	Schwarz criterion	-4.197838
Log likelihood	865.3758	Hannan-Quinn criter.	-4.215661
F-statistic	38.59530	Durbin-Watson stat	1.941851
Prob(F-statistic)	0.000000		

Dependent Variable: BA

Method: Least Squares

Date: 04/23/20 Time: 08:02

Sample (adjusted): 1985M03 2019M02

Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-9.59E-06	0.002052	-0.004673	0.9963
S_P	1.014554	0.077886	13.02615	0.0000
DUMMY(-1)	0.001883	0.002882	0.653446	0.5138

R-squared	0.295328	Mean dependent var	0.004060
Adjusted R-squared	0.291848	S.D. dependent var	0.034570
S.E. of regression	0.029091	Akaike info criterion	-4.229439
Sum squared resid	0.342750	Schwarz criterion	-4.199944
Log likelihood	865.8056	Hannan-Quinn criter.	-4.217768
F-statistic	84.86780	Durbin-Watson stat	2.025052
Prob(F-statistic)	0.000000		

Dependent Variable: NORTH__G_

Method: Least Squares

Date: 04/23/20 Time: 08:03

Sample (adjusted): 1985M03 2019M02

Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.001200	0.002307	-0.519987	0.6034
S_P	0.810466	0.087577	9.254304	0.0000
DUMMY(-1)	0.003053	0.003241	0.942168	0.3467

R-squared	0.175250	Mean dependent var	0.002822
Adjusted R-squared	0.171178	S.D. dependent var	0.035930
S.E. of regression	0.032711	Akaike info criterion	-3.994891
Sum squared resid	0.433351	Schwarz criterion	-3.965396
Log likelihood	817.9578	Hannan-Quinn criter.	-3.983220
F-statistic	43.02905	Durbin-Watson stat	2.013504
Prob(F-statistic)	0.000000		

Dependent Variable: G_D_

Method: Least Squares

Date: 04/23/20 Time: 08:02

Sample (adjusted): 1985M03 2019M02

Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001893	0.001872	1.011346	0.3125
S_P	0.905500	0.071054	12.74392	0.0000
DUMMY(-1)	-0.003340	0.002629	-1.270312	0.2047

R-squared	0.289764	Mean dependent var	0.003027
Adjusted R-squared	0.286257	S.D. dependent var	0.031413
S.E. of regression	0.026539	Akaike info criterion	-4.413064
Sum squared resid	0.285253	Schwarz criterion	-4.383570
Log likelihood	903.2651	Hannan-Quinn criter.	-4.401393
F-statistic	82.61649	Durbin-Watson stat	1.947148
Prob(F-statistic)	0.000000		

Dependent Variable: LMT

Method: Least Squares

Date: 04/23/20 Time: 08:03

Sample (adjusted): 1985M03 2019M02

Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.001410	0.002153	-0.655205	0.512
S_P	0.675937	0.081703	8.273049	0.000
DUMMY(-1)	0.004012	0.003023	1.326939	0.185

R-squared	0.146596	Mean dependent var	0.00267
Adjusted R-squared	0.142382	S.D. dependent var	0.03295
S.E. of regression	0.030517	Akaike info criterion	-4.13373
Sum squared resid	0.377172	Schwarz criterion	-4.10424
Log likelihood	846.2827	Hannan-Quinn criter.	-4.12206
F-statistic	34.78505	Durbin-Watson stat	1.95228
Prob(F-statistic)	0.000000		

Regression Results of CAPM Model 4 (End Of the Month Data)

Dependent Variable: NORTH_G_
 Method: Least Squares
 Date: 04/23/20 Time: 07:41
 Sample (adjusted): 1985M03 2019M02
 Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000196	0.000308	0.635729	0.5253
S_P	0.526440	0.097135	5.419670	0.0000
DUMMY(-1)*S_P	-0.078586	0.137316	-0.572301	0.5674
R-squared	0.111123	Mean dependent var	0.000276	
Adjusted R-squared	0.106734	S.D. dependent var	0.006568	
S.E. of regression	0.006208	Akaike info criterion	-7.318786	
Sum squared resid	0.015606	Schwarz criterion	-7.289292	
Log likelihood	1496.032	Hannan-Quinn criter.	-7.307115	
F-statistic	25.31566	Durbin-Watson stat	2.024977	
Prob(F-statistic)	0.000000			

Dependent Variable: LMT
 Method: Least Squares
 Date: 04/23/20 Time: 07:42
 Sample (adjusted): 1985M03 2019M02
 Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.82E-05	0.000344	0.169104	0.8658
S_P	0.503975	0.108593	4.640937	0.0000
DUMMY(-1)*S_P	-0.044947	0.153514	-0.292788	0.7698
R-squared	0.088674	Mean dependent var	0.000140	
Adjusted R-squared	0.084174	S.D. dependent var	0.007252	
S.E. of regression	0.006940	Akaike info criterion	-7.095768	
Sum squared resid	0.019505	Schwarz criterion	-7.066273	
Log likelihood	1450.537	Hannan-Quinn criter.	-7.084096	
F-statistic	19.70378	Durbin-Watson stat	2.000538	
Prob(F-statistic)	0.000000			

Dependent Variable: BA
 Method: Least Squares
 Date: 04/23/20 Time: 07:43
 Sample (adjusted): 1985M03 2019M02
 Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.47E-05	0.000289	0.258307	0.7963
S_P	1.029529	0.091247	11.28284	0.0000
DUMMY(-1)*S_P	-0.125505	0.128993	-0.972959	0.3312
R-squared	0.357616	Mean dependent var	0.000237	
Adjusted R-squared	0.354444	S.D. dependent var	0.007258	
S.E. of regression	0.005831	Akaike info criterion	-7.443843	
Sum squared resid	0.013771	Schwarz criterion	-7.414349	
Log likelihood	1521.544	Hannan-Quinn criter.	-7.432172	
F-statistic	112.7322	Durbin-Watson stat	1.898307	
Prob(F-statistic)	0.000000			

Dependent Variable: RAYTHEON
 Method: Least Squares
 Date: 04/23/20 Time: 07:43
 Sample (adjusted): 1985M03 2019M02
 Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000300	0.000314	0.955026	0.3401
S_P	0.676080	0.099250	6.811925	0.0000
DUMMY(-1)*S_P	-0.149000	0.140305	-1.061968	0.2889
R-squared	0.155553	Mean dependent var	0.000397	
Adjusted R-squared	0.151383	S.D. dependent var	0.006885	
S.E. of regression	0.006343	Akaike info criterion	-7.275715	
Sum squared resid	0.016293	Schwarz criterion	-7.246220	
Log likelihood	1487.246	Hannan-Quinn criter.	-7.264044	
F-statistic	37.30204	Durbin-Watson stat	1.950677	
Prob(F-statistic)	0.000000			

Dependent Variable: G_D_
 Method: Least Squares
 Date: 04/23/20 Time: 07:43
 Sample (adjusted): 1985M03 2019M02
 Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000574	0.000281	2.041636	0.041
S_P	0.494913	0.088775	5.574899	0.000
DUMMY(-1)*S_P	0.036540	0.125498	0.291156	0.771
R-squared	0.141812	Mean dependent var	0.00066	
Adjusted R-squared	0.137574	S.D. dependent var	0.00610	
S.E. of regression	0.005673	Akaike info criterion	-7.49877	
Sum squared resid	0.013035	Schwarz criterion	-7.46927	
Log likelihood	1532.750	Hannan-Quinn criter.	-7.48710	
F-statistic	33.46239	Durbin-Watson stat	2.03853	
Prob(F-statistic)	0.000000			

Regression Results of CAPM Model 4 (Monthly Average Data)

Dependent Variable: NORTH_G_
 Method: Least Squares
 Date: 04/23/20 Time: 08:04
 Sample (adjusted): 1985M03 2019M02
 Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000156	0.001610	0.097048	0.9227
S_P	1.145794	0.118262	9.688604	0.0000
DUMMY(-1)*S_P	-0.704117	0.169518	-4.153650	0.0000
R-squared	0.207215	Mean dependent var	0.002822	
Adjusted R-squared	0.203300	S.D. dependent var	0.035930	
S.E. of regression	0.032071	Akaike info criterion	-4.034419	
Sum squared resid	0.416556	Schwarz criterion	-4.004924	
Log likelihood	826.0214	Hannan-Quinn criter.	-4.022748	
F-statistic	52.92862	Durbin-Watson stat	2.064466	
Prob(F-statistic)	0.000000			

Dependent Variable: RAYTHEON
 Method: Least Squares
 Date: 04/23/20 Time: 08:05
 Sample (adjusted): 1985M03 2019M02
 Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000789	0.001460	0.540669	0.5890
S_P	0.779064	0.107195	7.267727	0.0000
DUMMY(-1)*S_P	-0.198641	0.153654	-1.292777	0.1968
R-squared	0.163095	Mean dependent var	0.002949	
Adjusted R-squared	0.158963	S.D. dependent var	0.031698	
S.E. of regression	0.029070	Akaike info criterion	-4.230925	
Sum squared resid	0.342241	Schwarz criterion	-4.201431	
Log likelihood	866.1088	Hannan-Quinn criter.	-4.219254	
F-statistic	39.46308	Durbin-Watson stat	1.944857	
Prob(F-statistic)	0.000000			

Dependent Variable: LMT
 Method: Least Squares
 Date: 04/23/20 Time: 08:05
 Sample (adjusted): 1985M03 2019M02
 Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000547	0.001532	0.356632	0.7216
S_P	0.770896	0.112553	6.849205	0.0000
DUMMY(-1)*S_P	-0.205090	0.161334	-1.271218	0.2044
R-squared	0.146292	Mean dependent var	0.002673	
Adjusted R-squared	0.142076	S.D. dependent var	0.032953	
S.E. of regression	0.030522	Akaike info criterion	-4.133383	
Sum squared resid	0.377306	Schwarz criterion	-4.103888	
Log likelihood	846.2100	Hannan-Quinn criter.	-4.121711	
F-statistic	34.70059	Durbin-Watson stat	1.954874	
Prob(F-statistic)	0.000000			

Dependent Variable: BA
 Method: Least Squares
 Date: 04/23/20 Time: 08:05
 Sample (adjusted): 1985M03 2019M02
 Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000885	0.001458	0.606509	0.5445
S_P	1.107434	0.107114	10.33885	0.0000
DUMMY(-1)*S_P	-0.196906	0.153538	-1.282459	0.2004
R-squared	0.297438	Mean dependent var	0.004060	
Adjusted R-squared	0.293969	S.D. dependent var	0.034570	
S.E. of regression	0.029048	Akaike info criterion	-4.232438	
Sum squared resid	0.341723	Schwarz criterion	-4.202943	
Log likelihood	866.4174	Hannan-Quinn criter.	-4.220767	
F-statistic	85.73091	Durbin-Watson stat	2.046506	
Prob(F-statistic)	0.000000			

Dependent Variable: G_D_
 Method: Least Squares
 Date: 04/23/20 Time: 08:06
 Sample (adjusted): 1985M03 2019M02
 Included observations: 408 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000176	0.001332	0.132272	0.8948
S_P	0.999682	0.097837	10.21783	0.0000
DUMMY(-1)*S_P	-0.190163	0.140240	-1.355983	0.1759
R-squared	0.290157	Mean dependent var	0.003027	
Adjusted R-squared	0.286651	S.D. dependent var	0.031413	
S.E. of regression	0.026532	Akaike info criterion	-4.413617	
Sum squared resid	0.285095	Schwarz criterion	-4.384123	
Log likelihood	903.3780	Hannan-Quinn criter.	-4.401946	
F-statistic	82.77426	Durbin-Watson stat	1.955960	
Prob(F-statistic)	0.000000			