



# INVESTOR SENTIMENT AND THE PERFORMANCE OF THE AEROSPACE INDUSTRY

An Interactive Qualifying Project

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## Abstract

It is important to understand how investor sentiment affects a certain industry because it allows market participants and company executives to make the right decisions to be profitable. This paper hopes to address the queries that new investors may come across regarding behavioral finance. Through Yahoo Finance, Excel, and the Bloomberg Terminal, we can analyze and compare the stock returns from Boeing, Lockheed Martin, and Orbital ATK to the VIX and S&P 500. An analysis into the aerospace industry reveals that from the top 7 companies, the first 2, Boeing and Airbus, lead the pack by double the revenue from those firms that focused more on government contracts. Whereas the diversified products of Boeing and Airbus make most of their income stream. By examining successful companies and how investor sentiment affects them, it should give insight to market participants on where to invest their money.

## Acknowledgements

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# 1 Introduction

The Interactive Qualifying Project (IQP) is an undergraduate requirement that motivates students to take on projects outside of their major. With the guidance of a faculty advisor, students can tackle real-world problems by analyzing not only the technical but also the social and humanistic variables that shape their decisions<sup>1</sup>. It is completed during the student's junior year, strengthening research, writing and teamwork skills that will aid in the future completion of their senior year capstone project, the Major Qualifying Project.

This project began as encompassing the entirety of the stock market and how investor fear and sentiment affected it. At the beginning of the data gathering, the magnitude that sentiment had on the markets became very apparent, marked by historic events that in most cases determined a bear market. To further analyze the data, it was decided to put a spotlight on the aerospace industry to examine how it had reacted towards the same sentiments that severely affected the stock market.

## 1.1 Objectives of the Project

The main objective of this project is, like any other research done on the stock market, to find if there is a way to predict the market to make a profit. This paper will highlight and effectively demonstrate that investor sentiment indeed plays a role on the stock market's volatility.

Regression models will be implemented to compare three aerospace companies (Boeing, Lockheed Martin, Orbital ATK) in the industry to the VIX, S&P 500, US GDP and certain short term economic indicators.

Throughout the beginning of the data analysis, different factors will be examined to show their negative impact on the industry. One factor that is looked at is currency movements which can wreak havoc on corporations and investors through three main short-run currency drivers. The power of the news and social media is also another factor that influences sentiment, especially in today's day in age where information is so ready available and easily accessible. The last factor that will be studied is the consequences of government actions both taken by the president and the Federal Reserve System.

The report will then shift to what actions aerospace companies take to raise investor confidence and combat the bear sentiment that the previously stated factors may cause. Such tactics include financial transparency, regular audits, accountability of boards for their actions and the influence they have on employee's ethical behavior, as well as raising dividends. These are measures that an investor should be attentive to, since they may mark an uptick in investor confidence therefore increasing the stock price.

## 1.2 Importance to Investors and Market Participants

*It seems like he [Trump] has woken up the animal spirits...consumer confidence, small business confidence, business confidence has skyrocketed because it's a growth agenda.*<sup>2</sup>

-Jamie Dimon, JPMorgan CEO

During a morning interview, Dimon shared with Bloomberg that the increase of confidence was due to Trump's business agenda, which plans to overhaul taxes, regulations and infrastructure investment. Uncoincidentally, US banks' shares have risen on speculation of higher returns due to an increase in economic growth and interest rates.

The animal spirits that Jamie Dimon was referring to is a concept by John Maynard Keynes, whom through his book *The General Theory of Employment, Interest and Money*, described the many instincts and emotions that influence human behavior, which he stated can be measured in terms of consumer confidence. The phrase derives from the Latin words, *spiritus animales*, which can be interpreted as the spirit of which drives human thought, feeling, and action.<sup>3</sup>

Investors may find it important because asset prices that do not appropriately reflect fundamental values, whether it be over or under valued, may result in the inefficient allocation of capital, having an impact on the overall portfolio performance. It is important to understand investor sentiment for the industry as causality tests point that investor fear drive return across firm-size and value. (L.A. Smales)

One of the most important reasons as to why investors and market participants should pay close attention to financial psychology is simply because the unknown is what carries the most danger. "One investor's mistakes can become another investor's profits. But one investor's mistakes can also become another investor's risk! Thus, an investor ignores the mistakes of others at his or her

own peril” (Shefrin 4). An investor should not only worry about the decisions he will make but should also be alert to those of other investors, as opportunity or danger may lie amongst the failures and successes of others.

Investors may also find it important to know the effects that sentiment directly has on companies. An investment banker who has good experience and a network of contacts, can lead the way for acquisition of a company whose founders feel discouraged such as that of the Lockheed brothers and Robert Gross. When engineers are discouraged by low-performing sales and are ready to quit, there are investment bankers ready to acquire companies and provide stability.

### 1.3 Multidisciplinary and Interdisciplinary Importance

The goal of this paper echoes that of the project, which aims to pair students with fields outside of their major. The paper tries to do a light analysis on an industry and see how it is affected by investor confidence. This is important to not only investors who are looking to break into any industry but also industry leaders themselves. An adequate measure of investor confidence and behavioral finance is important because it allows the average investor to see if it is beneficial to buy stocks from a certain company based on the performance of the whole industry. On the other hand, it is important for company executives because it allows them to make decisions on what next steps their companies should take. Executives are always focused in raising the market capitalization of their company for their shareholders to make more money, but without knowing the sentiment of the market, this could prove to be tricky. The ability to examine an industry and its performance in the stock market is very important as it affects engineers, businessmen, and consumers alike.

More importantly, this paper served as an introduction to what I would like to do in the future with my career. Currently being a junior in college, it is difficult to imagine where my career will take me in a couple of decades from now. But my goal is to eventually rise through the ranks of where I’m working or open my own company. To accomplish either of these goals, it is important to have an interdisciplinary knowledge, particularly in business and finance, to know how a company operates.



## 2 Review of Literature

### 2.1 Background on the American Aerospace Industry

The aerospace industry faced many setbacks since its origin but none were most visible than in the late 20<sup>th</sup> century. The winding down of the Cold War, caught many companies off-guard as they depended on military contracts as their main source of income. There were many companies that closed, but had only themselves to blame as they had spent too much time lobbying Congress and had become comfortable with Cold War cost plus contracts and not enough time fostering greater corporate efficiency. The collapse of the Soviet Union brought the arms race to a halt, especially impacting the space race. And as the priorities shifted within the US Federal budget, other problems arose such as the Challenger disaster that took away the spur JFK's speech caused. Then during this time of government neglect in the American aerospace industry, the European consortia formed, giving companies such as Airbus support by government subsidies.

As companies in today's day-in-age struggle to find their identity and purpose, Kenneth Lipartito reveals that those with new strategies allocating greater attention to the efficiency and marketing, in particular market niches, will succeed. Technology, business, and government need to work hand in hand for the industry to succeed. (Bilstein xii)

Historically, many businesses benefit by sales & production agreements with foreign customers. This can be seen during WWI and the 1930s as many European nations' orders influenced the expansion of American plants. For example, in 1914 only 49 planes were sold by the United States, with 34 of those going abroad. Then in 1916 those numbers grew to 411 planes sold with 269 of them exported allowing US companies to collect \$2,185,000 from foreign buyers (Bilstein 16). Then, as the war raged on in 1917, the joint Army and Navy Technical Aircraft Board placed an order for 8,075 training planes and 12,400 service planes by the end of 12 months. Congress appropriated \$640 million to fund the contracts, being the largest single appropriation legislated in the United States for a specified purpose.

As the demand for planes had increased, manufacturers had to figure out a way to speed up assembly lines and adequate them carefully with all the sensitive instruments that were needed to produce a quality plane. This allowed new industries to emerge, as dials, gauges, and other

accessories needed to be produced at a faster pace. There was a sudden increase in demand for fabric to cover the airframes. As planes were able to reach higher altitudes, conventional oil was obsolete as it froze too quickly. This is where the demand for Castor oil grew, prompting the US to import a shipload of Castor seeds from India (Bilstein 18).

In 1917, the Manufacturer's Aircraft Association was formed after many patents were being filed by manufacturers, undermining the nation's ability to produce the large number of planes that were needed for the war effort. This gave members a cross-licensing agreement, a common pool of patent fees, and a system of equitable fee payments to various aircraft companies.

To get the public more enticed with aviation, there were various competitions in which the US participated. Aeronautical record-setting was interpreted as a barometer of national prowess in the technological market place, boosting national pride. During the Schneider Trophy Race of 1923, the US took first & second place with the Curtiss CR-3 floatplanes (Bilstein 23).

Influential figures in companies believed that participation in such races would encourage American manufacturers to enhance the design and development of their fighter planes. The international exposure of these American planes to foreign countries, brought along more orders for aviation products and planes. Although, glamour was not enough to entice foreign buyers. The industry often needed the help of the US government to secure contracts overseas as well as promoting a favorable environment back home (Bilstein 24).

Between 1926 and 1932, Henry Ford decided to enter the aviation industry with his Stalwart Tri-motor 12-passenger plane. The decision to enter this field gave much prestige to the industry and allowed investors to feel secure about investing in new firms. If Henry Ford believed the industry was profitable, why wouldn't the average joe? They were wrong. Ford lost nearly \$6 million during those years, showing that the industry was nothing easy to conquer (Bilstein 24).

As the Depression faltered sales and the Post-war time decreased government contracts, many companies failed except those who were able to secure venture capital with their exquisite designs such as Boeing, Douglas, Grumman and Lockheed. Even with venture capital, Lockheed's founders Allan and Malcolm were discouraged by post-war surplus and the Detroit Aircraft Corporation, making the decision to leave their company and sell it. One shrewd investment banker, Robert Gross, was able to acquire the company at a bargain price of only \$40,000 (Bilstein 26). With new and knowledgeable aircraft builders, along with his ability to

acquire new financing, the company was able to renew its mystique and attract bold and young designers such as Clarence Kelly Johnson. This new path and preparation set the company up for success by the time WWII came along.

When the Air Mail Act and the Air Commerce Act were implemented in 1925 and 1926 respectively, it allowed commercial carriers to take on government air operations (Bilstein 22). This allowed many companies to now have another source of income and allowing mail to be delivered cross-country at a much higher speed than by train. It also marked an opportunity to build new passenger ventures. Since air mail had become commercialized, the income from Federal airmail contracts allowed these companies to start investing in the passenger ventures. After some modifications to the original contract, airlines began to order new designs built to carry passengers in relative comfort. This is where the Ford Tri-motors came into play and showed their functionality by being able to carry up to 12 passengers (Bilstein 26-27). As this airplane became the flagship to many airline operations, more cities added airline terminals, expanding flying to the public. Celebrities became frequent flyers, adding a sense of glamour and cosmopolitan flavor to air travel. Another big consumer market were business people, who used airplanes for transportation to save time and maximize their effectiveness. Another boost the industry received was from stunt shows and record braking such as Lindbergh's transatlantic flight on 1927, which took Lindbergh from New York to Paris. The public's excitement is evident by the coverage of the New York Times on its May 21<sup>st</sup>, 1927 issue where the first six pages were dedicated to Lindbergh<sup>4</sup>. Aviation stocks also rose due to this high sentiment (Bilstein 34).

Then the industry hit a road bump as the stock market crashed in 1929 and ruined many aviation companies (Bilstein 36). The New Deal showed antipathy towards over integrated business so the revised Air Mail Act of 1934 permanently separated manufacturing and transportation.

By 1940, the industry was on its feet once again as President Roosevelt put high priority on the rapid development of American airpower, setting a production benchmark of 50,000 planes per year (Bilstein 71). During the second World War, the US was the primary producer of airplanes at 257,645 units compared to UK's 117,479, Germany's 111,787 and Japan's 68,057 units (Bilstein 77).

During the World War 2 postwar years, particularly after Korea, the industry underwent four major market changes (Bilstein 83). First, it took off during the 1950s as personal and business flying rapidly expanded (Bilstein 83). Sales doubled between 1955 to 1963, driven mostly by rising demand but also by a diversified catalog of aircraft equipped with improved radio and navigational aids. Second, American airliners and overseas began to purchase jet transports, sales of which were dominated by US-produced jet airliners. Third, during the early 1950s, the development of guided missiles allowed greater income from the Department of Defense, accounting for ¼ of industry sales by the end of 1958. Lastly, the evolution of the space program began to focus on a manned lunar landing. The multibillion-dollar program created new research centers and production facilities across the nation, allowing the aerospace industry to become the largest employer in the US by 1959.

After a couple decades, it could still be seen that the aerospace industry's bread and butter remained to be government contracts, and companies were accused of unethical business arrangement with government officials. During President Eisenhower's farewell address in 1961, he warned the public of the military-industrial complex. The issue was put in the spotlight after controversies surfaced of high-level politics and bribery from top aerospace companies to secure contracts (Bilstein 101). This was then followed by Secretary of Defense Robert McNamara's decision to slash defense costs and moving to establish civilian primacy in weapon's procurement. He also discouraged cost plus fixed fee contracts and replaced them with fixed price contracts with incentive bonuses for good performance.

As the postwar WWII cuts became present, many companies were forced to adapt by shifting their attention to commercial airliners (Bilstein 139). This had a big impact on transportation not only in the US but also across the world. In 1956, more people travelled between Europe and America by plane than by boat. In 1957, domestic US airline miles surpassed both those of trains and busses, making it the nation's leading intercity carrier.

Then began a new era of war fighting. As Operation Desert Storm took place, it allowed the aerospace defense industry to surprise the American public by demonstration high-tech weaponry, proving that it was not only indigenous but the best in the world (Bilstein 202). As different administrations came along, their view on the defense industry changed. For example, the Carter administration preferred the high-quality US equipment and believed that it would

compensate for the quantitative edge enjoyed by the Soviet Union (Bilstein 203). Then during the Reagan administration, quantity as well as quality was pursued and the defense budget was adequately increased. During the Bush administration, George Bush and the secretary of defense changed acquisition procedures by cancelling the controversial A-12 and supported new procurement arrangements based on recommendations from the Packard Commission, a high-level panel, for more realistic specifications and prototype hardware (Bilstein 203). This demonstrates how politics play such a huge role in the success of the aerospace and defense industry. A well-informed investor is up to date on an administration's budgetary plans, as this can influence the stock performance of various companies. The industry is also affected by legislation, as the US Congress enacted a statute of repose, which allowed manufacturers to not be held liable for a product that was in use for more than 18 years (Bilstein 212). This in turn dramatically reduced insurance liability costs and allowed companies to use that money elsewhere, such as R&D departments.

During the 1990s, many companies decided to slim down by selling off some divisions to either raise cash or reduce debt and interest load to be leaner and meaner as the new era approached them (Bilstein 215). An example is that of General Dynamics as it faced a plummeting market for its military products and substantial debt. William A. Anders in turn pulled off a series of sales that restored General Dynamics' financial status and quadrupled the stock value for stockholders (Bilstein 216). A couple of other mergers and acquisitions that happened were Martin Marietta's purchase of GE Aerospace for \$3 billion, Northrop and Grumman in 1994, Lockheed and Martin Marietta with a combined revenue of \$23.5 billion, and McDonnell Douglas and Boeing. Between 1985 to 1994, the defense budget fell by a full 1/3, forcing executives to see merger as the only way for corporate survival (Bilstein 217).

In 1996, Moody's Investors Service predicted the start of a new upcycle in the commercial aircraft industry with a demand of more than 15,000 new jet transports required through to 2014 (Bilstein 218). It stated that 34% of sales would originate from Asia, 33% from North America, and 23% from Europe. Controversy arose over conflict of interest, when Lockheed's arrangement to build a Japanese fighter, the FS-X, was criticized for trading away too much American combat technology. To remain profitable during the restructuring of the aerospace

industry in the early and mid-1990s, it was essential for companies to form foreign partnerships or find essential profit margins from sales overseas.

## 2.2 Current News on Aerospace and Defense

After the 2008 recession, the aerospace industry has faced a slowdown in growth due to reduced military spending for both domestically and foreign companies. Although as global security threats increase, it may force countries to upgrade their weapons and security platforms. Low oil prices and stable gross national product has served to fuel commercial aerospace revenue, as demand will increase to produce the next generational airliner.

The biggest aerospace companies are those that are diversified and do not solely rely on government contracts. Boeing is a good example as it generated \$96.1 billion of revenue in 2015 with only 32% coming from defense contracts. Along with its spread-out customer base in 150 countries, the company is heavily involved in commercial airliners, military aircraft, advanced technology solutions for defense, space and national security. Another company is Airbus Group SE, which with \$70.14 billion in revenue for 2015, makes it one of the largest aerospace and defense companies in the world. Surprisingly, only 18.10% of their revenue comes from defense contracts. United Technologies Corporation gathered a \$56.09 billion revenue in 2015 with 20% coming from defense contracts. Lockheed Martin raked in \$46.13 billion in annual revenue for 2015 with 86% coming from defense contracts. General Dynamics and BAE Systems follow a similar path with defense contracts accounting for 60.2% and 92.80% of their total revenue for 2015 respectively. The biggest danger with strong dependence on government contracts is that in a time of economic instability or no major conflict, companies will suffer due to the cut down of contracts handed to them<sup>5</sup>.

It is interesting to analyze Lockheed Martin due to its high dependence of government contracts. One of the biggest projects that the company is currently dealing with is the F-35 fighter jet. It has caught a lot of criticism as it has gone over budget and has faced many mechanical issues. This delay of delivering a well-functioning aircraft has opened a lot of wounds for the company as governments become wary of the unexpected high cost. For example, Canada's prime minister Justin Trudeau has hinted at cancelling their order of the jets. This would have serious repercussions to the rest of the countries as it would force the price of the jets to rise leading to the project's death spiral if more countries decide to follow Canada's decision. It would also

have a huge impact on the company itself as the project accounts for 20% of its sales. Lockheed Martin is well aware of this danger and its CEO Marilyn Hewson has promised to invest in diversifying the company's services into nondefense areas such as intelligence, training and cybersecurity. As the industry shifts more towards technology and away from hardware, Lockheed acquired Sikorsky, a cyber and logistics company for \$9 billion on July 2015<sup>6</sup>.

In 2011, the Budget Control Act was put in place to take \$500 billion in defense spending off the table from 2011 to 2021. This is a huge amount of potential revenue that is being taken away from aerospace companies. Another alarming risk is that of the new administration as President Trump heavily criticized Lockheed Martin and Boeing of sucking too much money from the defense budget. On December 12, 2016 Trump sent out a tweet claiming that, "The F-35 program and cost is out of control. Billions of dollars can and will be saved on military (and other) purchases after January 20<sup>th</sup>." As a result, Lockheed Martin's stock fell 2.5%.

An investor who is mindful of investing risks, may consider exchange-traded funds (ETFs) as it may bring substantial returns with lower risks. This is because ETFs are spread across different companies within the same industry. Some popular aerospace funds include the SPDR S&P Aerospace and Defense (XAR) and iShares US Aerospace and Defense (ITA), both of whose year-to-date value increased by over 50%. Aerospace & Defense Profile (PFA) is another popular fund as it tracks 51 different securities, with Boeing, Lockheed Martin, and Honeywell being the top three securities held. Even though ETFs offer a lower risk for investors, it is important to keep in mind that the aerospace industry faces supply chain issues, which makes it difficult to upgrade and maintain their factories when demand rises. The industry is also heavily influenced by defense and government contracts, specifically from the United States. This allows the government to hold more leverage over a company's contracts, leading to smaller streams of income depending on the year and administration. This in turn affects the research and development of a company along with the products it creates<sup>7</sup>.

### 2.3 Literature on Investor Sentiment

According to Ian Boyd's *Investment Confidence and Business Cycles*, there are two definitions for confidence. The first being the "Confidence of investors with money to place, in the soundness & future profitability of risky projects whose promoters are looking for investment funds" and "confidence of entrepreneurs in these areas, that share or bond issues will attract

investment money, not only now but also later on when their projects shall need further injections of funds". The book goes on to state a couple of more definitions from other well-known figures such as John Stuart Mill who states that there is higher reward where there is higher risk. He states that people are ready to hear about any "projects which hold out, though at the risk of loss, the hope of a higher rate of profit" (Boyd 22). Walter Bagehot states that confidence of our banking system is based off the interactions between people, where "trust is much weakened by hidden causes, a small accident may greatly hurt it, and a great accident for a moment may almost destroy it" (Boyd 23). The direct impact confidence has on industries is explained by Alfred Marshall, as capital cannot be obtained to start new companies or extend old ones, as "projects for new railways meet with no favor, ships lie idle, and there are no orders for new ships" (Boyd 26).

Professor Pigou presents us with his finding that "wave-like swings in the mind of the business world between errors of optimism and errors of pessimism" is the dominating cause of trade cycles (Boyd 26). F. Lavington reinforces this belief by stating that a confident view of the future of a business is very important as it leads "speculators to create purchasing power and by its means drive up prices on the stock & produce exchanges" (Boyd 28). Hyman Minsky agrees by writing that by changing views of the future, it influences the "relative price of various capital assets and financial instruments, as well as the relation between capital-asset price and the price of current output" (Boyd 32).

One of the most important points from the book is that as time passes from the last panic, the memory of that panic becomes less vivid to investors, encouraging them to "become more willing to look further into the future with confidence that their predictions and expectations will be met" (Boyd 65). All while this increase in confidence in reality runs against the factual situation that as time goes on, the investor is approaching the next crash.

In Hersh Shefrin's book, *Beyond Greed and Fear*, we are presented with the Heuristic-Driven Bias. A heuristic refers to the process by which people find things out for themselves through trial and error, which in turn lead them to develop rules of thumb, consequently leading to other errors (Shefrin 13). Some characteristics of behavioral finance that Shefrin talks about is self-control, or the controlling of emotions. Investors value dividends for self-control reasons. Older investors who finance their living expenditures from their portfolios worry about outliving their



assets. So, in turn companies provide high dividend payouts, making it more enticing for these investors as it now becomes an income stream. This in turn returns the confidence that these old investors won't sell their stock to finance consumer expenditures. Another characteristic is regret, which is the pain associated with feeling responsible for the loss of stock. In the example above, if the investor decides to sell their stock to purchase a new car, but then the stock price soars, the investor is liable to feel considerable regret. It is the responsibility of the company to make investors believe that stock price will soar in the future and convince that investors may regret selling their stocks too early.

#### 2.4 Literature on Stock Return Predictability

Shefrin's book also offers some insight on how investors may attempt to predict the stock market. The book goes over mostly the faulty psychology behind such investors. One fault is the gambler's fallacy, which is a phenomenon where people incorrectly expect the reversal of events. Shefrin explains that "these predictions consistently are overly pessimistic after three-year bull markets and overly optimistic after three-year bear markets" (Shefrin 47).

De Bondt concluded that market predictions are useless as "people tend to formulate their predictions by naively projecting trends that they perceive in the charts" of which they tend to be overconfident in their ability of accurate prediction (Shefrin 51). In fact, he states that the confidence intervals are skewed as the best guesses do not lie midway between the low and high guesses. At the end of the day, De Bondt pointed out that Wall Street strategists are more prone to committing gambler's fallacy, where individual investors tend to bet on trends. These characteristics are based off the concept that "sentiment is the reflection of heuristic-driven bias" (Shefrin 53).

According to the book, there are two kinds of people who attempt to predict the stock market, the technical analysts and the fundamentalists. Technical analysts are able to predict the continuation of trends until a change in the pattern develops. For example, in late July 1998, after two years of successful bullish years, the number of stocks whose prices were on the decline was growing, "leading technical indicators of breadth to signal that a reversal pattern was underway" (Shefrin 53). On the other hand, Fundamentalists are able to predict the market based on the subtle changes of underlying fundamentals. Referring to the 1998 example above, Abby Joseph Chen hotly contested Prudential's Mr. Acampara, believing that there would be no deterioration in

second-quarter earnings for 1998. She believed this because the future seemed to have a justifiable price/earnings ratio given the unusually low inflation and interest rate environment along with the prospect of stabilization in Asia during 1999. When interviewed, she said that “as for other’s more pessimistic views, she professed to pay very little attention to what others may be saying, explaining that she focuses on fundamentals instead of the charts and other statistical material that form the basis for work by technicians like Prudential’s Mr. Acampara” (Shefrin 54).

Richard Russell, editor and publisher of the Dow Theory Letter said that, “Past history suggests that most bear markets wipe out at least half of the preceding bull market”. The point is that markets behave similar to coin tosses, they produce interesting patterns, “but past patterns provide little if no guidance about how to predict the patterns of the future” (Shefrin 57).

## 2.5 Literature on Economic Indicators

There are 5 indicators which investors can use to see how the economy is behaving: economic growth, inflation, unemployment, business confidence, and housing. Using the *Bloomberg Terminals* an investor can look at these indicators to catch a glimpse of future market performance. First, let’s begin by describing each factor.

Economic growth can be measured by a country’s GDP,

$$GDP = C + I + G + (X - M)$$

Where **C** stands for personal consumption such as food, **I** for Private Investment such as factories, **G** for government consumption such as battleships, **X** for exports and **I** for imports. If you want to look at a country’s GDP percentage growth look at the year-over-year real GDP growth not the year-to-year nominal GDP growth which accounts for inflation due to increases in production & prices of goods and services. Real GDP isolates increases in production:

$$Nominal\ GDP\ Growth\ (\%) - Inflation\ (\%) = Real\ GDP\ Growth\ (\%)$$

A way to measure consumer pain is through the “Misery Index”, which is composed by adding the seasonally adjusted unemployment rate to the annual inflation rate. If unemployment remains high while the inflation rate keeps on worsening, it is said to have a negative social and economic cost on a country.

Inflation is when there is a general increase in the prices of goods & services which diminishes the purchasing power of money. Increase in prices mean the same unit of money tomorrow buys less than the same unit of money would buy today. Inflation is the primary driver of pay rises which are needed to counteract rising living costs.

There are two primary sources of inflation data. The quarterly GDP report which contains the “GDP price deflator”, which is the most authoritative number based on the economy. The second is the Consumer Price Index (CPI) which is representative of goods & services such as food, housing, and automobiles. Inflation is also dependent of change in time, tastes, & technology.

Unemployment depresses GDP growth and is strongly correlated with GDP. Since US GDP depends on consumerism by 2/3, spending is driven by salaries. Investors look at nonfarm payroll to see statistical numbers on wages throughout the country.

Business confidence is important because big companies make their decisions based on their confidence in the market. The Institute for Supply Management (ISM) created the Purchasing Manager’s Index (PMI) to survey them about business conditions. If the gauge shows above 50, it means that they are optimistic and if it is below, it means that they are pessimistic. Purchasing managers are an important group of people to survey as they are the ones who decide when to purchase materials for their companies to produce their products. Therefore, if a purchasing manager sees that consumers are willing to purchase products, it is a positive indicator that markets will be rising. Historically the PMI has usually dipped before the GDP declines.

House building accounts only for 3% of the US economy but is considered a strong indicator because it shows that consumers are confident enough to assume a 30-year mortgage. When mortgage rates are at a low and are set to rise, consumerism goes up. In reality, it contributes far more than 3% and also affects other industries because once a homeowner purchases a home, they will most likely also purchase paint, kitchens, lawn mowers, furniture, television sets, etc.

#### *Monitoring GDP:*

If an investor wants to see how the US economy is performing over the first quarter, they can look at the World Economic Calendar (WECO) on a *Bloomberg Terminal* and search for United States. Change the date range to go back to January 1<sup>st</sup> and it will output a chronological list of economic indicators. On the first business day of each month, the PMI is published, telling us

about business confidence. The “actual” column is the published economic indicator value and the “survey” column is a median estimate from analysts of what the economic indicator will be upon release. If the actual is greater than the survey, then it is a good sign, whereas vice versa would be bad.

Here are some of the timelines of when these indicators are released. On the first Friday of the following month, the Nonfarm Payrolls Total Net Change (NFPTCH) is published. Then around the middle of the following month, the US New Privately Owned Housing Units (NHSPSTOT) is published. Also, released around the middle of the following month, the CPI is published. A month after the end of the quarter the GDP Annualized QoQ is released. This last one is not a very useful indicator for investors since it takes 4 months to publish.

#### *Forecasting GDP:*

Using the (WECO) symbol, the “r” column stands for relevance. It indicates the number of alert subscriptions for each indicator. The greater the investor interest, the greater the relevance. In the survey column, if you right-click on an amount and select (ECOS), Economist Estimate, it will show how the consensus was formulated. The “summary” box shows the details and the yellow diamond shows the actual value. By clicking the nearest red bar to the yellow diamond, we can tell which broker came the closest.

Economist generally serve 2 roles when forecasting estimates: to maintain estimates of what they think economic indicator values will be and form opinions on long-term future for GDP, inflation, and unemployment. The Economic Forecast Function (ECFC) also becomes useful as it's an economic consensus estimate for real GDP growth, inflation, and unemployment. The Economic Surprise Monitor, ECSU, includes 40 meaningful leading indicators for US economy. The surprise percentage is by which the actual either exceeded or missed the analyst estimate (survey). This data is aggregated to construct the Bloomberg Surprise Index which is the white number at the top of the terminal screen. The investor can chart the aggregate “surprise” by hovering over the top right graph and clicking on the top right icon. The red area means more unpleasant than pleasant surprises for economy and vice versa for green. The orange line represents the S&P500. There can be seen a predictive correlation from the graphed surprises to the S&P500 but it is important to be aware of such models, as they eventually don't work and break.

### 3 Data and Methodology

During the length of the project, a few key tools were used to gather and analyze data. For stock returns from Boeing, Lockheed Martin and Orbital ATK, we used Yahoo Finance to show and download the historical data into Excel. The data in Excel was then analyzed using various methods to figure out their regression statistics. The Bloomberg Terminal was used to further study economic indicators and dive further into the industry by using its Business Intelligence Company Primer tool to gain insight on what runs a company.

#### 3.1 Nature of Data

The objective of analyzing this data is to be able to see the correlations between the three aerospace companies to the VIX and S&P 500. The purpose of this is to demonstrate that investor sentiment plays a big role in how the share prices fluctuate throughout the market.

##### 3.1.1 Establishing Investor Sentiment Trends

Investor sentiment indeed plays a role on stock market's volatility. This is measured by a monthly report, known as the VIX or CBOE Volatility Index, in which the implied volatilities of a wide range of S&P 500 index options are calculated from both calls and puts<sup>8</sup>. It is widely used to measure market risk and is often referred to as the fear index. It allows for an accurate view of the expectations investors have on the market's future volatility. When the values of the volatility index rise above 30 it signifies a large amount of volatility as a result of high investor fear or uncertainty. A value below 20 corresponds to a more calm and confident market. A trend that has risen is that when the index remains too long at these extremes, it foreshadows a change in economic direction.

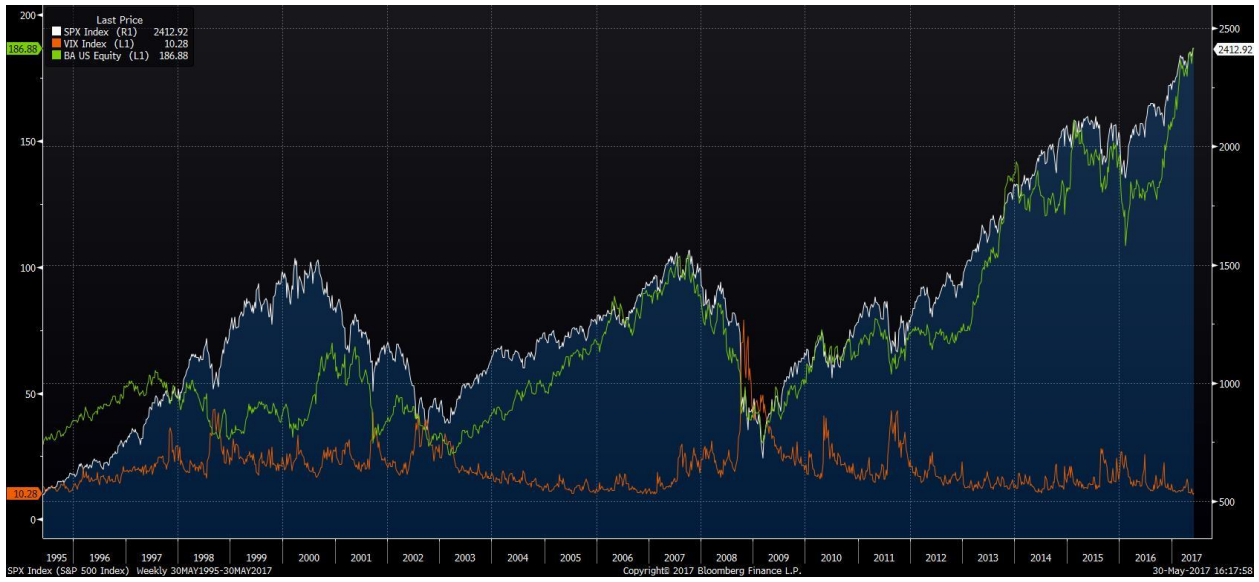


Figure 1: Boeing (green) compared to the S&P 500 (white) and VIX (orange)

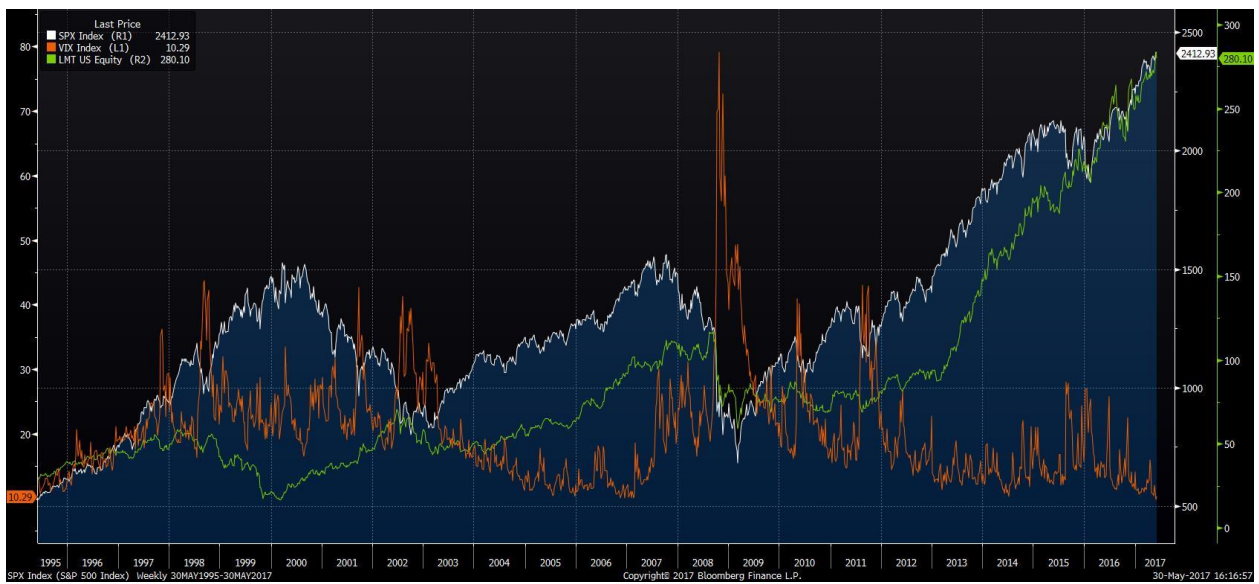


Figure 2: Lockheed Martin (green) compared to S&P 500 (white) and VIX (orange)

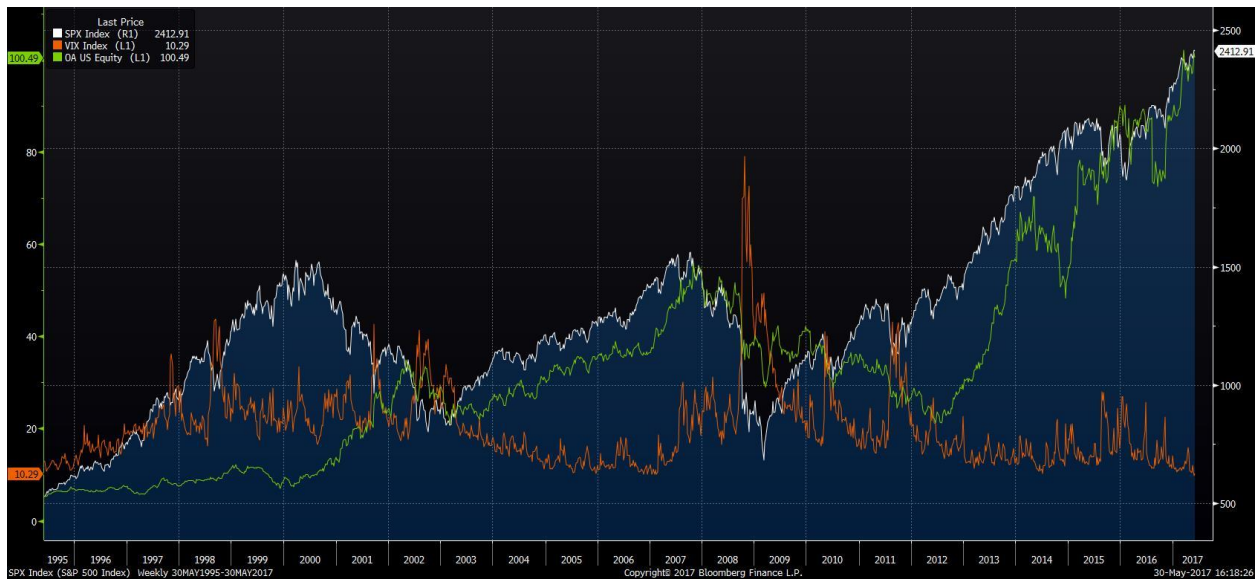


Figure 3: Orbital ATK (green) compared to S&P 500 (white) and VIX (orange)

### 3.1.2 Negative Impacts on the Industry

As technology has expanded, availability of information has also risen. No longer is information held only by those who can afford to pay for it. Now it is readily available with the hundreds of news channels and social media outlets such as Facebook and Twitter. Whenever something negative happened to a company, it would take until the next issue date for a newspaper to release the story or for the next evening news slot for a TV news station to report on their story. Now with the accessibility to mobile phones, many people are a few swipes away from getting the most up to date information. Twitter is an important example that has a huge impact on the stock market. When CEOs or influential people write tweets regarding a certain topic, it influences the decisions market participants make. What better source to get company information than an executive from that company?

A clear example relating directly to the aerospace industry is President Donald Trump's tweets. The president has used in various occasions his influence to target and negatively talk about companies that do not line up with his beliefs. This in turn has caused investors to use social media analytics as red flags, which are triggered when social sentiment detectors cross a certain threshold. This causes algorithm programs to sell those shares. Hedge funds in particular depend on analytics from companies like Dataminr, which are used to uncover trading signals buried in the thousands of tweets posted each day. This feature is even available to individual investors

such as Fidelity customers who can add social market analytics' sentiment indicators to their personalized dashboards<sup>9</sup>.

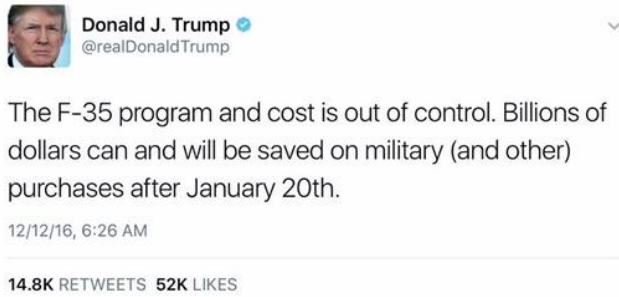


Figure 4: Donald Trump's tweet against Lockheed Martin



Figure 5: The effects of Trump's tweet on LMT stock

Now it is up to the Trump presidency on how their policy will affect the industry. Even with the harsh criticism of LMT and BA, Trump has decided to boost the defense budget by 10% or \$54 billion. This comes after he urges that the country should modernize the military. He aims to fulfill several of the promises he made on the campaign trail to defeat and destroy ISIS by building more US Navy ships and fighter jets to expand the Air Force<sup>10</sup>.



### 3.1.3 Raising Investor Confidence

For companies that are looking to build shareholder confidence, it is important to have a couple of different strategies. First, if a company is suffering from bad returns for a long stretch of period, it should be a priority to review and reconsider its corporate strategy. If current business models are not working, then businesses should focus on reviewing patterns of profitability and improving information for managing internal and external customers.

Getting a third party to evaluate your business unit strategy can be useful as it provides a neutral assessment of a company's capabilities, staffing, and opportunities. Value-based management is also key, as it relates to obtaining reliable funding, lending, and investing all while managing risk successfully. When mergers and acquisitions take place, it is important to keep close attention to strategic and operational costs. Acquisition integration also requires prompt decisions and extra staff to integrate business and measurement processes as well as staff and systems. When divesting of a business or asset, it requires careful and transparent planning. The faster the divestiture occurs, the less distraction it serves to management and helps to ensure that key internal staff stay on board<sup>11</sup>.

### 3.2 Regression Analysis

As mentioned previously, the three aerospace companies that were examined are Boeing, Lockheed Martin, and Orbital ATK. Their ticker symbols are BA, LMT, and OA respectively.

#### BA results:

SUMMARY OUTPUT						Column1			
<b>Regression Statistics</b>						Mean	0.358853868		
Multiple R	0.40733835					Standard Error	0.091331429		
R Square	0.165924531					Median	0.351661672		
Adjusted R Square	0.16531969					Mode	0		
Standard Error	3.80771609					Standard Deviation	3.394041069		
Observations	1381					Sample Variance	11.51951478		
<b>ANOVA</b>						Kurtosis	5.444072733		
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	Skewness	0.331365257		
Regression	1	3977.394197	3977.394197	274.3276084	2.46402E-56	Range	41.62721963		
Residual	1379	19993.70982	14.49870182			Minimum	21.70385347		
Total	1380	23971.10401				Maximum	19.92336617		
						Sum	495.5771912		
						Count	1381		
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>	
Intercept	0.373988605	0.102622921	3.644298982	0.000278076	0.172674684	0.575302526	0.172674684	0.575302526	
Chg VIX = X	-0.128529119	0.00776009	-16.56283818	2.46402E-56	-0.143751978	-0.113306261	-0.143751978	-0.113306261	

Figure 6: Boeing data analysis

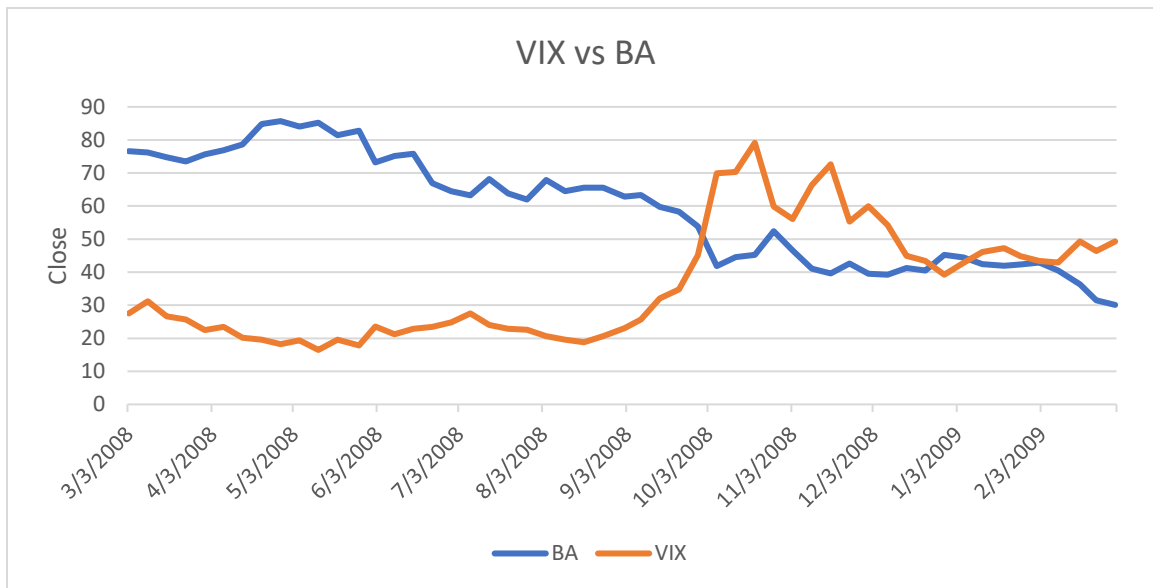


Figure 7: Boeing returns compared to VIX

As what can be seen from the data above, there is an inverse relation between risk, the change in the VIX, and returns. It goes against the theory that “with greater risk comes greater expected returns”. This is indicative from the positive shock in the VIX of 1% returning a drop of 0.1285%. This result is not trivial as we can also come to that conclusion from the t-stat being significant at the 1% level. This echoes through the rest of the results, begging the question: why the counterintuitive result? It is based off the behavioral finance concept that as fear rises, investors sell their positions causing the prices to drop. From a psychology point of view, it demonstrates that the market is very robust.

**LMT results:**

SUMMARY OUTPUT						Column1			
<b>Regression Statistics</b>						Mean	0.358853868		
Multiple R	0.284581708					Standard Error	0.091331429		
R Square	0.080986749					Median	0.351661672		
Adjusted R Square	0.080320314					Mode	0		
Standard Error	3.25488306					Standard Deviation	3.394041069		
Observations	1381					Sample Variance	11.51951478		
<b>ANOVA</b>						Kurtosis	5.444072733		
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	Skewness	0.331365257		
Regression	1	1287.440708	1287.440708	121.5224333	3.84359E-27	Range	41.62721963		
Residual	1379	14609.48969	10.59426373			Minimum	21.70385347		
Total	1380	15896.93039				Maximum	19.92336617		
						Sum	495.5771912		
						Count	1381		
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>	
Intercept	0.412793769	0.087723349	4.705631692	2.7852E-06	0.240708126	0.584879412	0.240708126	0.584879412	
Chg VIX = X	0.073124992	0.006633422	11.02372139	3.84359E-27	0.086137681	0.060112303	0.086137681	0.060112303	

Figure 8: Lockheed Martin data analysis

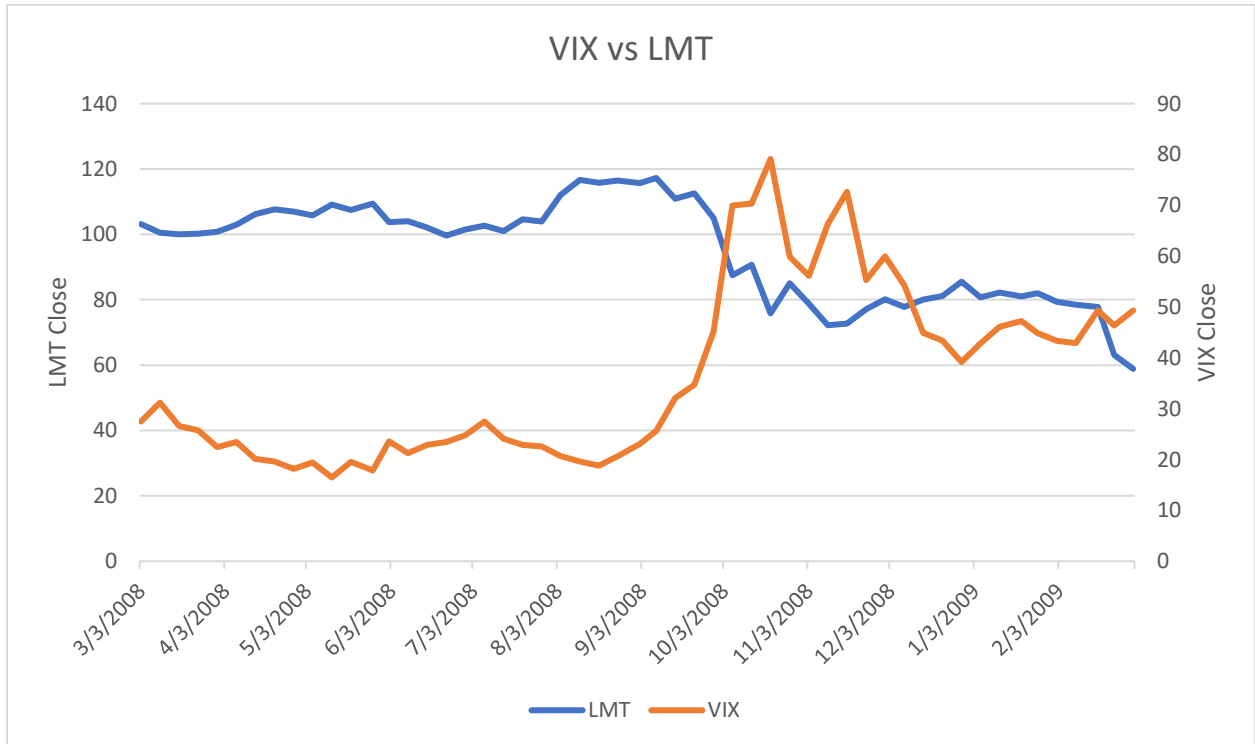


Figure 9: Lockheed Martin returns compared to VIX

**OA results:**

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.230232508
R Square	0.053007008
Adjusted R Square	0.052320283
Standard Error	4.018083267
Observations	1381

Column1	
Mean	0.383822533
Standard Error	0.111068601
Median	0.130615114
Mode	0
Standard Deviation	4.127510053
Sample Variance	17.03633924
Kurtosis	9.329915914
Skewness	1.149017021
Range	57.0297047
Minimum	15.74551085
Maximum	41.28419385
Sum	530.0589185
Count	1381

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	1246.202607	1246.202607	77.18817815	4.52439E-18
Residual	1379	22263.94555	16.14499314		
Total	1380	23510.14815			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.436891528	0.108292591	4.034362137	5.77539E-05	0.224455495	0.64932756	0.224455495	0.64932756
Chg VIX = X	0.071944325	0.008188817	8.785680289	4.52439E-18	-0.08800821	0.05588044	-0.08800821	0.05588044

Figure 10: Orbital ATK data analysis

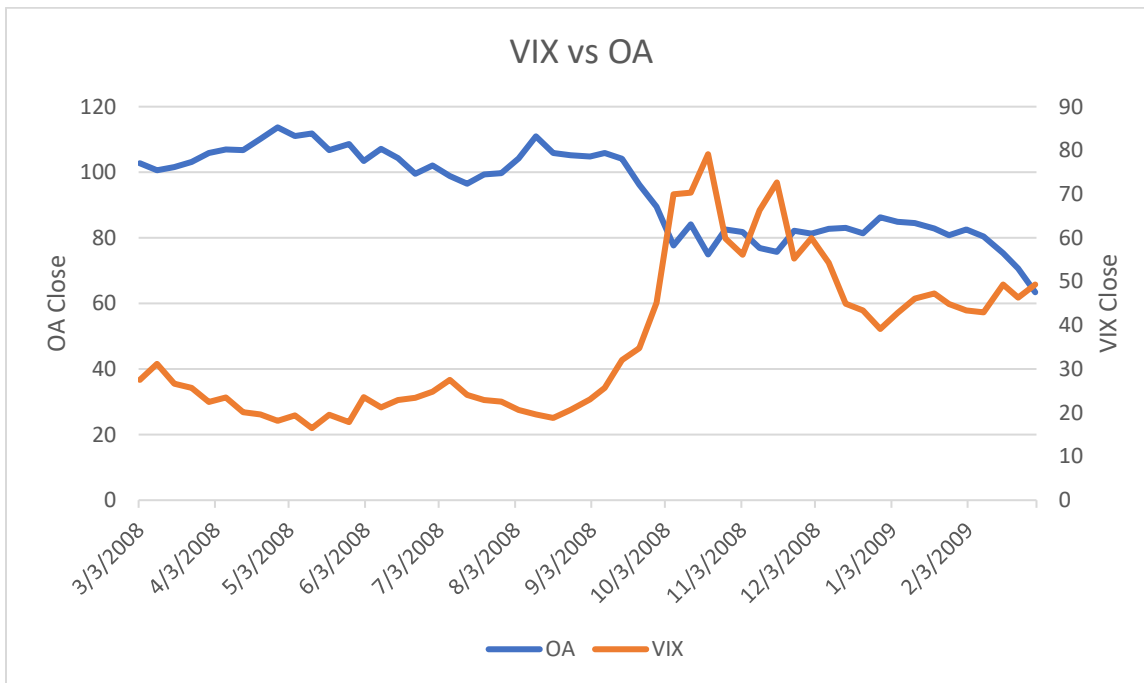


Figure 11: Orbital ATK returns compared to VIX

**The correlation data:**

Correlation	BA	LMT	OA	VIX
BA	1			
LMT	0.350029662	1		
OA	0.269595372	0.334091709	1	
VIX	-0.40733835	-0.284581708	0.230232508	1

Figure 12: Correlation Matrix

## 5 Hypothesis Development

The main hypothesis for this paper was that investor sentiment plays an important role in the returns of not only aerospace companies but all sorts of businesses. If data could be gathered showing that the VIX close went against that of the returns from the three studied companies, then it would be evident that as the VIX rises the shares decline and as the VIX lowers the shares incline. This is because a high VIX value represents uncertainty and a low VIX value represents confidence.

## 6 Conclusion

From the data collected and the graphics above, it is apparent that as a matter of fact investor sentiment plays a huge role on the returns of aerospace companies. Throughout the paper, we have learned from the origins of the American aerospace industry to the weaknesses that plague many companies, such as their heavy reliance on government contracts. Social media now plays a huge role on how the market's sentiment shifts and how it can make a company lose thousands of dollars with a 140-character message.

As market participants and company executives alike adapt to these changes, it is important to be aware of behaviors and psychology of the market. Careful analysis and the ability to quickly make decisions is the difference between making a lot of money or being in financial stress.

## 7 References

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### 7.1 Notes

<sup>1</sup> More information regarding the IQP: <https://www.wpi.edu/academics/undergraduate/project-based-learning/interactive-qualifying-project/outcomes>

<sup>2</sup> Dimon Bloomberg Interview: <https://www.bloomberg.com/news/articles/2017-03-09/dimon-says-trump-has-reawakened-animal-spirits-in-the-u-s>

<sup>3</sup> More on John Maynard Keynes: [https://en.wikipedia.org/wiki/Animal\\_spirits](https://en.wikipedia.org/wiki/Animal_spirits)

<sup>4</sup> Copyright, 1927. "LONE FLIGHT GRIPS FRENCH IMAGINATION." *New York Times (1923-Current file)*: 1. May 21 1927. *ProQuest*. Web. 28 May 2017.

<sup>5</sup> Top 7 aerospace companies: <http://www.investopedia.com/articles/company-insights/082516/top-7-aerospace-companies-world-ba-utx.asp>

<sup>6</sup> LMT risks: <http://www.investopedia.com/articles/markets/020416/biggest-risks-investing-lockheed-martin-stock-lmt.asp>

<sup>7</sup> Most popular aerospace ETFs: <http://www.investopedia.com/ask/answers/041315/what-are-most-popular-etfs-track-aerospace-sector.asp>

<sup>8</sup> What is the VIX? <http://www.investopedia.com/terms/v/vix.asp>

<sup>9</sup> Social media sentiment indicators: <http://fortune.com/2016/12/13/donald-trump-twitter-lockheed-martin-stock-dump/>

<sup>10</sup> President Trump's budget proposal: <http://www.cnn.com/2017/03/16/politics/donald-trump-defense-budget-blueprint/>

<sup>11</sup> How to raise investor confidence: [https://www.atkearney.com/financial-institutions/capability/-/asset\\_publisher/1SoZsulwkC6U/content/strategies-that-build-shareholder-confidence/10192](https://www.atkearney.com/financial-institutions/capability/-/asset_publisher/1SoZsulwkC6U/content/strategies-that-build-shareholder-confidence/10192)

<sup>12</sup> Cover Page Logo: <https://www.wpi.edu>

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