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Socially Responsible Investing

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**Fossil Fuel Divestment:
An Analysis of and Argument for Fossil Fuel Divestment**

A Major Qualifying Project Submitted to the Faculty

of

WORCESTER POLYTECHNIC INSTITUTE

in partial fulfillment of the requirements for the Degree of Bachelor of Science

in Interdisciplinary Studies: Ethical Policy Studies

by

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This report represents work of WPI undergraduate students submitted to the faculty as evidence of a degree requirement. WPI routinely publishes these reports on its web site without editorial or peer review. For more information about the projects program at WPI, see <http://www.wpi.edu/Academics/Projects>.

ABSTRACT

I argue that WPI should divest its endowment fund from fossil fuels. I examine the harmful effects of global climate change, emphasizing WPI's moral obligation to divest and explore the financial efficacy of divestment. Several academic institutions have divested without suffering financial losses, showing that divestment is a feasible investment strategy and an effective way for WPI to combat global climate change.

EXECUTIVE SUMMARY

Global climate change caused by carbon emissions trapped within the atmosphere is one of the biggest environmental problems facing the world today. It is an issue with disastrous consequences for all life on Earth and has been ignored for too long. The planet is already feeling the harmful effects of global climate change and time is running out for something to be done to mitigate them. Action is being taken around the world to raise climate awareness and combat the harmful effects of global climate change. Scientists have been developing technology to minimize the harmful effects of carbon emissions on the planet's atmosphere and produce cleaner energy, politicians have worked to pass environmental legislation to reduce carbon emissions and activists worldwide are protesting environmental degradation and calling for investors and institutions to divest their endowments from fossil fuels. Climate change activists on WPI's campus have repeatedly petitioned the Board of Trustees to divest its endowment to no avail. They argue that divestment is against the financial self-interest of the institution and not aligned with their fiduciary responsibility.

The goal of this project is to disprove the Board of Trustees' argument against divestment and advocate for it as an effective strategy and WPI's moral obligation. By analyzing the performance and volatility of each asset within WPI's endowment portfolio and the portfolio's performance over time I will show how other investments could replace fossil fuels and improve the overall performance of the portfolio. I also compare the performance of divested school's endowments against those of non-divested schools to assess the performance of divested endowments over time. This analysis serves to support my claim that divestment is a financially

valid course of action for WPI and address the Board of Trustees' strongest objection to divestment.

This project addresses divestment as the best option for WPI to actively combat global climate change by approaching the problem from different angles. The first section addresses the negative effects of climate change, emphasizes the need for a global solution and outlines WPI's moral obligation to divest. This leads into a section discussing the environmental movement and the validity of divestment as a tactic. After these topics have been addressed, I discuss financial concepts, endowment regulations and the state of WPI's endowment to give background necessary for my methodology and results sections. These sections address the financial aspect of divestment and demonstrate how other assets are more effective investments than fossil fuels. These points work together to support my argument for divestment and refute the counterpoint that it is not a financially feasible option.

The results of this project show that divestment does not equate to financial loss and divested portfolios have out performed their non divested counterparts. The divested portfolios utilize more productive and less volatile assets and as a result generate a higher rate of return with less risk. Since this project only discusses divestment of academic endowments from fossil fuels which only started in 2009, the lack of available data naturally presents limitations. As more schools divest and more data becomes available for those that already have, the strength of this analysis can be improved. If the new data still supports the argument for divestment, the next step in a practical approach to convince the Board of Trustees to divest would be to develop a divested portfolio and compare its returns and volatility with the non divested portfolio. If the divested portfolio performs better than the current portfolio, the Board of Trustees would be fiducially obligated to divest as it would be shown to be the best financial course of action.

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CHAPTER 1: INTRODUCTION

1.1 WPI's RESPONSIBILITY TO DIVEST

Over the past decade, WPI has implemented many green initiatives on campus including eco-friendly buildings, solar panels, high efficiency lighting and low flow toilets. Though these efforts are not to be discounted, there is a concern among many students, faculty and alumni about WPI's endowment portfolio specifically, its investment in fossil fuels. WPI's environmental sustainability and its investment practices are key issues for student environmental groups, like The Green Team and Students for a Just and Stable Future. With a petition containing over 250 signatures and the support of some faculty members and alumni, Students for a Just and Stable Future has repeatedly requested that the Board of Trustees divests the endowment fund from fossil fuels in an effort to mitigate the effects of climate change and encourage other academic institutions to implement similar strategies. These petitions have been repeatedly rejected in favor of more traditional investment practices for WPI's endowment. While WPI showcases new eco-friendly facilities, the endowment portfolio is still heavily invested in fossil fuels. This is a conflict of interest where WPI prominently displays how eco-friendly its campus is but beneath the surface, their investments are funding the companies responsible for the damaging effects of global climate change.

The harmful effects of carbon emissions on the environment, non human life and human condition are well known. The majority of scientists believe that greenhouse gas (GHG) emissions caused by human kind burning fossil fuels since the Industrial Revolution have contributed to the excessive carbon content of the atmosphere which has been attributed to global warming. Climate change experts agree that an increase in temperature of 2 degrees Celsius will cause

irreversible damage to the planet (Hansen et. al, 82). Shifting weather patterns resulting in floods and droughts, melting ice caps, and natural disasters of increasingly severe magnitude have all been attributed to global climate change (Randall and Schwartz, 320-321). These disasters have occurred with a global temperature increase of less than 1 degree Celsius since the Industrial Revolution.

WPI's founding directive, according to its Mission Statement, is "to create, to discover, and to convey knowledge at the frontiers of academic inquiry for the betterment of society" therefore, it cannot, in good faith invest money in the institutions responsible for greatest causes of global climate change. Doing so is morally objectionable and goes against the founding directives of the institution.

The Board of Trustees holds the ultimate authority over the decision making process and investment practices for WPI's endowment. This is a group of thirty entrepreneurs and business people charged with upholding WPI's Mission Statement, managing its operations and ensuring the institution's longevity. This includes ensuring WPI's endowment provides future students with the same level of benefits it provides its current students. This financial responsibility for the longevity of the institution has been used as an excuse by the Board of Trustees to reject divestment as a viable strategy in favor of their current investment strategy despite growing dissent. Members of the Board of Trustees claim that the primary investment goal of the endowment fund is to maintain a stable portfolio that will generate the best possible returns and the lowest volatility and believe that divesting from fossil fuels is contrary to this objective. By prioritizing their fiduciary responsibilities, they are neglecting their moral duty to the institution. The Board of Trustees actions represent the WPI community, our views, and what we hold important. If their actions are not representative of the community, they are not fulfilling their duty and must amend their actions.

Where investors choose to invest their money impacts their financial future and also reflects the values of the investor. If two investment options are similar in every way except that one is a company that produces clean energy and the other is a petroleum company, the choice of where one invests is a reflection of the investor's opinions on the moral value of fossil fuel investments. Investors with eco-friendly inclinations are more likely to support the clean energy company, where as those with ties to the fossil fuel industry are more likely to associate with the petroleum company. By continuing to invest in fossil fuels, the Board of Trustees is saying that the WPI community supports these companies, what they do and what they represent.

Large institutions like the Rockefeller Brothers Fund, the University of California endowment and the city of Seattle have divested their portfolios from fossil fuels. Additionally, many comparatively smaller institutions like College of the Atlantic, The Ben and Jerry's Foundation and the city of Amherst, MA have also successfully divested their portfolios from fossil fuels (go-fossilfree.org). The variety in size and growing number of divested institutions (499 and counting totaling worth \$3.4 trillion 29 schools worth over \$140 billion) is beginning to show that socially responsible investing is a viable strategy and will not result in a loss of profitability. Socially Responsible Investing has become mainstream to the point where many large financial institutions offer sustainable investment options including WPI's primary advisor, Prime and Buchholz. Divestment strategies have been successfully implemented and the tools to implement such a strategy are readily available to investors. Therefore, no reasonable argument can be made for the continuing lack of serious inquiry into investment options that meet WPI's investment goals and are a proper reflection of the values of the institution.

WPI has the opportunity to be at the frontier of the academic divestment movement as one of the first polytechnic institutes to divest from fossil fuels. The green improvements on campus have left a positive impression on WPI's image but these have a small impact on the global environment. Being part of the growing movement to choose not to fund companies that

pollute the environment and facilitate climate change is more helpful to the environment than lightbulbs and toilets. By taking a stance against fossil fuel companies, WPI would be demonstrating to its community and to the world that they will no longer be part of the problem and are actively working towards the solution. Using analysis of various studies tracking the performance of assets and endowment portfolios over time, I will make a case for divestment as a viable investment strategy for WPI to combat global climate change. WPI's divestment from fossil fuels would be a strong step in the right direction for the climate change divestment movement. As more institutions divest, other schools that had never previously considered divestment are encouraged to begin the inquiry process. Presently, the problem is that WPI is acting against its founding principles by continuing to invest in companies associated with the fossil fuel industry despite overwhelming evidence testifying to their harm and growing opposition to this practice. Discussion regarding the institution's investment options must be promoted and feedback must be taken seriously. This is a problem that is too important to ignore and there are solutions that are effective. The only reason not to pursue a new, socially responsible financial course of action is lack of desire. The investments of the institution speak to its values and there are many financial options that are available. If those responsible for an institution's investments choose to invest in assets that are not reflective of the institution's values, those values are merely word on paper. It is time for WPI's investment actions to align with Their Mission Statement.

1.2 THE SCOPE OF THE PROJECT

This project explores the likely ramifications of a WPI divestment plan by investigating the problems of global climate change and what can be done to mitigate them. I will begin by briefly explaining the science of climate change, expand upon the harmful effects it is already having on the planet and describe what the world might look like if action is not taken. I will go on to discuss the Environmental Movement and how it has influenced the modern Climate Change Divestment Campaign. Next, I will discuss divestment as a tactic and demonstrate its past success with an analysis of the divestment from apartheid South Africa. Then I will discuss relevant financial terms and discuss endowments regulations and the current state of WPI's Endowment portfolio. This leads into the description of the methods used in my analysis of WPI's endowment portfolio. Finally, I will present my results, give my conclusions and offer ideas for the continuation of this work in the future.

CHAPTER 2: BACKGROUND

2.1 CLIMATE CHANGE

2.1.1 Overview

Ninety-seven percent of climate change scientists agree that the global temperature increase over the past 300 years is the result of humankind emitting carbon into the atmosphere through aggressive animal agriculture, deforestation and burning fossil fuels (Oreskes, 76). The gases produced from industrial agriculture, transportation and manufacturing are becoming trapped in the atmosphere at a rate faster than they dissipate. The chemistry of the atmosphere is very delicate and disruptions of its chemical composition effect the planet's temperature, climate stability, weather patterns and ocean levels. According to a study referenced by Kahn, carbon dioxide (77%), nitrous oxide (8%) and methane (14%) are the gases that were found to be the main contributors to climate change (Kahn, 337). These GHGs prevent infrared radiation from leaving the atmosphere which causes the surface temperature of the Earth to rise. Methane is the most potent greenhouse gas but it and nitrous oxide combined only account for "one-fifth of the annual increase in radiative forcing of climate change" (Kahn, 338). In the fight against climate change, triage must be done. Though the other gases are harmful and their production has ethical implications of their own, the focus of this project is the reduction of the most abundant GHG, carbon dioxide. If climate change is to be effectively managed the largest sources of pollution must be addressed before other sources can be considered.

According to Paul Crutzen, a Nobel prize winning atmospheric chemist, and researcher, Eugene Stoermer, for the past 10,000 years, the Earth has maintained a relatively constant temperature with minor variations of plus or minus 1 degree Celsius (Crutzen and Stoermer, 70-

71). Until the Industrial Revolution, the atmosphere's carbon content had been relatively stable, hovering around 275 parts per million but that would change in the late 1700's (IPCC Working Group I, 57). British inventor, James Watt's, invention of the steam engine in 1781 is considered to mark the dawn of the Industrial Revolution in England which eventually spread to the rest of Europe then the rest of the world (Mumford, 3). This is about the time humankind shifted from an agriculture based economy to an industrial economy. Fossil fuels like coal and eventually oil were extracted from the earth and burned to power the machines of the new industrial economy. With this shift in economic production came a new view of nature. Previously, the natural world was seen a sacred entity and its destruction was considered a violation of Nature but once capitalists began exploiting the natural world for economic gain, this point of view changed. The value of Nature had been reduced to the value of the revenue it could generate for a capitalist. Over the 150 year span of the Industrial Revolution, the British economy's industrial production increased by 160%, the British population more than tripled, and industrial production per capita quadrupled due to the mainstream use of fossil fuels (Jackson, 3).

The ability to extract these resources and emit them into the atmosphere is held by a small group of capitalists who have little incentive to reform their ways. They have made their money by exploiting the environment and as long as these practices continue to be profitable, they will not change their ways. Without consequences for their actions, they had no incentive to stop their practices and continue to exploit the environment for profit to this day. Today, the harmful effects of carbon emissions are well known and cannot be ignored. In a 2009 interview, Lord David Puttnam, an author, environmental activist and member of the British House of Lords, accuses this generation of capitalists of making decisions that were, "not inhuman but not particularly human under the guise of shareholder value" (Johnson and Mitleton-Kelly,72). Despite their knowledge of the negative impact of global climate change capitalists continue to extract carbon from the earth, emit it into the atmosphere and are knowingly contributing to the

destruction of the planet. Capitalism has created a systemic problem by commodifying nature. This attitude has dangerous consequences for humanity and places the value of capital ahead of the value of nature, nonhuman life and the human condition.

The planet has already begun to feel the effects of global climate change from the carbon that has already been emitted into the atmosphere. Since the Industrial Revolution, the average global temperature has risen 0.8 degrees Celsius and has already had disastrous consequences (Cornell et. al, 42-43). In 2012, 40,000 heat records were set across the United States and across the globe, including 111 degrees in Russia, 118 degrees in Niger, and over 130 degrees in Pakistan (Mckibben, 251) (Easterbrook, 112-114) (Masters, 90-91). According to the global analysis conducted annually by the National Oceanic and Atmospheric Administration (NOAA), July 2014 saw Earth's 355th consecutive month (29 years) where the average global temperature is higher than predicted (NOAA, 2014). As the planet's temperature increases, the polar ice caps melt at an increasingly faster rate. According to some estimates, there is a chance that this past September could have been the first ice free Arctic in history (Kerr, 1591). Ice caps are frozen fresh water and when they melt, more water is added to the oceans causing the sea-level to rise. When fresh water from the ice caps melts, it changes the pH of the ocean. As a result of global climate change, the oceans are 30% more acidic than they were prior to the Industrial Revolution (Kolbert, 380). Since their environment no longer maintains the pH level to which they have adapted, ocean acidification has been a contributing factor to the massive losses of aquatic biodiversity. To compound the problem, the ice caps are white, a color that does not absorb much sunlight while the oceans are much darker and thus absorb more energy from the Sun (Kolbert, 384). As the white ice melts, the dark ocean takes its place meaning that as the ice caps melt, the Earth's surface absorbs more energy from the Sun because there is more dark area due to the melting ice. This causes the planet to heat up at an accelerated rate and starts a negative feedback loop. As the planet warms, so too does the air in the at-

mosphere. Warm air absorbs more water than cooler air, the atmosphere is 5% more moist than it was 40 years ago (Groisman, 1857). This gives rise to shifting weather patterns, higher ocean temperatures and larger more severe oceanic storms. As a result of shifting weather patterns, people are being displaced or dying and nonhuman species like the Costa Rican Golden Toad, the Ring-tailed Opossum and countless others are being driven to extinction at an alarming rate. Traditionally arid regions like Pakistan are experiencing record breaking floods and traditionally fertile places like Russia are experiencing horrific wildfires caused by horrible droughts (Masters, 91). Before the 2010 drought, Russia was the third largest exporter of grain in the world but as the drought progressed, the Russian government decided that they would no longer export grain and the price of food skyrocketed across the globe.

To support life as we know it, there is a limited amount of carbon that can exist within the atmosphere before the global temperature change would make the planet inhospitable to humans and non humans alike. The general consensus among climate change researchers is that this will occur if the global temperature increases 2 degrees Celsius above the temperature before the Industrial Revolution (Hansen et. al, 82). If left unchecked, this global temperature increase of 2 degree Celsius would lead to continuing and more severe desertification, species loss, fresh water shortages, famine, natural disasters and war (Cornell et. al, 184-185). Hansen and his team estimated the maximum amount of carbon that can be contained in the atmosphere before, "the planet to which life has adapted will cease to exist" to be 350 parts per million. Meaning if the atmosphere were to contain over 350 carbon parts per million, the global temperature change of over 2 degrees Celsius would be imminent.

As of 2008, it estimated that the atmosphere contains approximately 385 parts of carbon per million (ppm) and more recent estimates guess that it is closer to 400 ppm, implying that the atmosphere's carbon threshold has already been exceeded (IPCC Working Group I, 58-59) (Hansen et. al, 83). Globally, humankind is emitting carbon into the atmosphere at an annual

rate of 2 parts per million which is increasing at an average annual rate of 4.3% (Kellogg, 315). The most conservative estimates state that globally, humankind can emit only 595 more gigatons of carbon into the atmosphere before there is nothing that can be done to slow or reverse the effects of climate change. At the current rate, humankind will have exceeded the 595 gigaton limit by 2028. More disturbingly, the amount of carbon that exists in current fossil fuel reserves is about 5 times (2795 gigatons) this limit and the capitalists who control these reserves have no incentive not to extract and sell these fossil fuels (McKibben, 746).

If carbon emissions do not peak and then dramatically decline by 2028, scientists predict that by 2100 the average global temperature could increase by up to 6 degrees Celsius from pre Industrial Revolution levels which would be the hottest the planet has been in 30 million years (Zachos, 688) (Easterbrook, 45-46). Humankind has never existed at a temperature greater than +3.3 degrees Celsius above the Industrial Revolution baseline and many members of the scientific community believe that a 4 degree Celsius increase would be an extinction level event for humankind and most of the species on Earth (Zachos, 688) (DeMenocal, 541) (Randall and Schwartz, 333 and 339) (Kellogg, 316). If global temperatures were to increase by 4 degrees Celsius, "sea levels would rise 3-6 feet, there would be a drought over 40% of the inhabitable land leading to food shortage, global hunger and war (Cornell, 148-149). Half of the known species on Earth would go extinct" and the world would be left in a state that is, "incompatible with an organized global society" (Hansen, 81). Mass exodus from the worst afflicted regions, particularly sub Saharan Africa and South America, would lead to an unprecedented refugee crisis and an overpopulation problem for the countries that open their borders to them. Food and water will become more scarce due to the lack of farmable land and fresh water melting from the glaciers and ice caps and disappearing from newly formed deserts. By 2025, an estimated 1.8 billion people in the most impoverished parts of the world would be living in regions of "absolute water scarcity" (Sivakumar, 585). These people and the nonhuman life around them

would suffer the worst consequences of climate change. If the world continues to accept the consequences of current practices as the price of “progress”, this will be the cost of their poor investment.

In a 2014 article published in *The Guardian*, Desmond Tutu calls it “our duty to persuade our leaders...to help us abandon our collective addiction to fossil fuels” (Tutu, 2014). Climate change has caused billions of dollars in property damage, loss of income, species destruction, loss of habitat, desertification and loss of human life with a temperature increase of under 1 degree Celsius (Randall and Schwartz, 333 and 339) (Cornell, 184). Renowned British economist, Nicholas Stern, estimates costs related to climate change could eventually exceed the combined cost of both World Wars and the Great Depression and calls climate change a, “... market failure on the greatest scale the world has ever seen” (Haq and Paul, 67) (McKibben, 36-37). International policies have not yet been strong enough to impact the profitability of these companies and lack adequate enforcement mechanisms. Therefore, it is up to the citizens of the world to apply their own pressure to these institutions. This is the first generation that will feel the effects of climate change and is the last generation that can do anything about it. Effective action against climate change will require a global effort and no small expense but the cost of inaction could very well be the end of life as we know it.

2.1.2 Possible Solutions

As I just described, the effects of climate change will be inevitable and disastrous if action is not taken soon to reduce, mitigate and eliminate carbon emissions. Though some corporations are fined and ordered to clean their pollution, they largely face very few consequences for the pollution they cause so they have no incentive to stop generating profit at the expense of the Earth and its inhabitants. Since the capitalists are unwilling to stop their profitable yet destructive practices, many climate change scientists and activists have developed solutions to mitigate the negative effects of climate change. Four of the most common solutions to combat climate change are **carbon sequestration, carbon commodification and taxation, international action** and **divestment**. Scientists are continuing to develop technology to capture and store carbon, lawmakers have proposed and enacted policies to commodify and tax carbon emissions on national and international levels and activists are calling for institutions to divest their investment portfolios from the fossil fuel industry. In this section, I will address each of these solutions in detail and analyze their strengths and weaknesses. Each strategy addresses the problem differently but I will show how, of the available options, divestment is the most effective way WPI can combat global climate change.

I will be discussing the strategies mentioned above in greater depth later in this section but before doing so, I must again address the fact that carbon emissions are not the sole cause of global climate change. Greenhouse gas pollution from sources other than carbon dioxide pose a similar threat to the chemical composition of the atmosphere. Prolific use of fertilizers containing nitrous oxide for agriculture and methane from large scale animal agriculture also produce harmful GHGs and have ethical implications of their own that should not be ignored (Kahn, 337) (Rosas, 354) (Andrade, 124). These fertilizers are used on industrial farms to promote crop growth but they also pollute the atmosphere and water supply and contribute to the breakdown of ecosystems and climate change. Fertilizer runoff contaminates the water supply

exposing non human and human life to harmful chemicals, causing loss of biodiversity, disease and death. Animal agriculture completely disregards the value of non human life and raises animals for the sole purpose of killing them for their meat. Worldwide, these facilities pack billions of animals together in inhumane conditions that facilitate disease, pump them with growth hormones and antibiotics to promote unnatural growth and subject them to abuse in the name of profit (Andrade, 105). Collectively, these animals produce enough methane (22%, 32 billion tons of all GHGs that trap infrared radiation) to have an impact on the chemistry of the atmosphere (Kahn, 337) (Lohmann, 100). These practices are morally objectionable and must also be stopped but as mentioned before, the fight against climate change is in triage mode so the largest problems with greater potential to cause harm must be addressed before the other comparatively smaller problems. Since carbon dioxide accounts for 77% of GHGs and methane and nitrous oxide only account for 14% and 8% of GHGs respectively, the issue of carbon dioxide emissions must be resolved before the other sources of GHGs can be considered (Kahn, 337). However, these major pollutants have a common theme. They are all the product of capitalism's exploitation of the environment. Disregard for non human life, the planets ecosystems and its climate have all contributed to the climate crisis we face today. These are all important issues that must be addressed in their time but the scope of this project is centered around the reduction and elimination of carbon emissions.

Policies to commodify and tax carbon were considered by members of the United Nations during the discussion around the Kyoto Protocol in 1997 but were ultimately left out of the final agreement. The concept of commodifying and taxing carbon was first proposed in the 1960's to serve as another commodity in the emerging futures market pioneered by Richard Sandor and others (Lohmann, 86). When these policies were enacted, they were seen as a means of reducing carbon emissions by financially incentivizing the worst polluters by making them pay for the right to pollute. The hope was that the worst polluters would have to pay so

much for emissions permits that it would affect their profit margins creating a gap in the market for competitors and forcing the offending institutions to either reform their practices or go out of business. Commodifying carbon emissions, meant ownership of carbon emissions could be established giving the owners the ability to buy and sell these permits at any time and to any entity (Lohmann, 91). This allows countries and institutions with emissions permits in excess of their actual emissions to sell their remaining permits to buyers who produce more emissions than their permits allow (Yamin, 27). Since owners can now freely trade the rights to their carbon emissions, a carbon trading market is created that undermines the spirit of the original policy. The institutions responsible for the greatest amount of pollution are often given permits at little or no cost and have sufficient cash reserves to purchase any additional permits they might need (Lohmann, 92-93). They have purchased the legal right to pollute the atmosphere which eliminates any incentive they would have had to change and encourages business as usual. Though carbon commodification was introduced with the intentions of reducing carbon emissions, it has only truly succeeded in producing licenses to pollute (Lohmann, 101-102). Substantial overhauls of the policies and enforcement mechanisms are needed for carbon commodification to be an effective means of reducing carbon emission. As it stands now, it has simply made carbon another commodity that can be bought and sold and no tangible effort has been made by the worst polluters to amend their ways.

The shortcomings of carbon cap and trade legislation were acknowledged during the climate talks in Paris in December 2015. These talks resulted in an international agreement to prevent global temperatures from rising past 1.5 degrees Celsius past preindustrial levels. Though the talks were hailed as a success by politicians and diplomats, climate change scientists and activists saw the resolutions reached as too little too late. According to McKibben and Hansen, the resolutions reached would cause the global temperature to rise past 1.5 degrees Celsius to 3.5 degrees Celsius which would have disastrous consequences (McKibben, A23).

In an article in CounterPunch, Brian Tokar emphasizes the effects felt from a 1 degree Celsius increase (Tokar, 2015). He further critiques the resolution's lack of a binding enforcement mechanism and the voluntary commitments made by countries. McKibben argues that these commitments are just enough to prevent undeveloped countries from walking away from the talks but not enough for developed countries to make the necessary impact on global climate change (McKibben, A23). These talks did not save the planet from the effects of climate change but it did buy humanity a little more time in the fight against global climate change. McKibben and Tokar both call for activists to continue to raise climate change awareness and encourage divestment to target the sources of global climate change, the fossil fuel companies. Like most international discussions, it is difficult to get the countries of the world to reach a consensus about anything and when they do, it is rarely substantial. Though the resolution has many flaws it is a crucial step towards international agreement and action to combat climate change.

Technological optimists view climate change as a classic neo-Malthusian problem. In his 1798 essay titled, "An Essay on the Principles of Population", Malthus discusses the problem of food shortage due to lack of farmable land and a growing population. He believed that there was a point at which the population of England would exceed its ability to produce food, leading to starvation. However, he failed to account for advances in technology which increased food production. Techno-utopians believe climate change is a similar problem and the solution lies in the development of new technology. New forms of energy that do not involve the burning of fossil fuels have already been developed and implemented. There are "transition towns" across the globe that have replaced fossil fuels with these greener alternative fuel sources (Haq and Paul, 23). However, until these become more commonplace their impact on global climate change is comparatively negligible. In addition to green alternative energy sources technology has been developed to capture carbon from the atmosphere, neutralize it and safely store it (Gibbins, 4318-4319). The process the carbon dioxide molecules go through, called carbon se-

questration, minimizes their harmful effects and decreases the damage they can do to the planet and the atmosphere. Captured carbon can be injected into depleted aquifers and oil wells, called carbon sinks, to prevent it from entering the atmosphere but this has potentially dangerous consequences to local ecosystems and marine life if the carbon were to leak (Gibbins, 4319, 4320). This technology has the potential to reduce the carbon content of the atmosphere in the future but as it currently stands, will not be widely implemented until 2050 and even then, there is no scientific consensus about its likely efficacy in dealing with global climate change. (Gibbins, 4320). This is too long of a time table and by the time this technology is ubiquitous, it could be too late. Some climate change prediction models state that if this technology is not implemented by 2020, it will not have the desired effect (Haszeldine, 1651). Also, there are still questions about how effective it can be and if it creates more problems than it solves. Storing carbon dioxide beneath the Earth's surface or in its oceans could have dangerous consequences on non human life and could create more GHG problems for future generations when storage limits are reached. Though still in its infancy, carbon capture and storage technology shows some promise in the fight against climate change but it is far from the cure all solution technological utopians hope it to be.

Divestment is a tactic that activists have successfully used in the past to apply social, political and financial pressure to offending institutions by encouraging investors to remove their investments from these entities in an effort to combat a social injustice. Institutions who associate with or commit social injustices receive negative attention and the public begins to view them unfavorably. The negative attention is magnified by international political pressure which creates a climate of instability within the offending institution. Investors see their investments as volatile and view divestment as an opportunity to escape a declining investment, gain favorable attention and in their best self interest. The goal of the activists is to facilitate this climate of instability around an offending institution by raising social awareness and promoting action. The

theory is that the mounting social and political pressure coupled with financial destabilization will coerce the offending institution to end its socially destructive practices. The consequences of climate change are the ultimate social injustice because those responsible are left unaccountable and the most disadvantaged people and non human life bear the bulk of the burden. Divestment is the result of social pressure from activists calling for the end of an injustice, increasing awareness of the injustice and international action against it. Its effects increase dramatically as more investors and institutions commit to divest. For example, in 2015, the year following Stanford's commitment to divest from coal, academic divestment commitments more than doubled (gofossilfree.org). It was highly publicized and received national media attention which showed other academic institutions that even schools with endowments as large as Stanford's could divest effectively.

Today, climate change activists are involved in a campaign to encourage institutions to divest from fossil fuel companies as a way to protest the harmful effects they have on the environment. To date, 499 total institutions of all sizes including educational endowment funds, municipalities religious organizations and governments have divested their portfolios of approximately 3.4 trillion dollars worth of fossil fuel investments¹. Other instances where divestment has proven to be an effective strategy will be discussed in a later section.

These are four of the most common strategies proposed to combat global climate change but there are many others each with their own strengths and weaknesses. Carbon commodification has become an ineffective strategy and has moved away from its initial purpose (Lohmann, 101). Instead of reducing carbon emissions, they have become like any other commodity and are readily bought and sold by the largest offenders giving them the license to pollute. There are still many questions surrounding carbon capture and storage technology. It

¹A full accounting of all divested institutions can be found at gofossilfree.org/commitments, a website that promotes divestment and tracks divested institutions. A list of all divested schools and available endowment information can be found in Appendices A and B

may not be safe for the environment, is still decades of development away from being an effective strategy and if its development is not accelerated, it will cease to be an effective way to reduce atmospheric pollution (Gibbins, 4321). The Paris climate talks have shown how international action has proven to be slow and unaligned with the most recent science. It is difficult for international bodies to reach agreement and these agreements are flimsy at best.

Though international action is important, the process to accomplish a resolution takes more time than the planet has to spare. Divestment is the only strategy that can be implemented independently of other entities and in a timely manner and though it has its flaws, is the most effective tactic available to WPI to combat global climate change. Individual and institutional investors do not need to wait for legislators to enact policies to combat climate change or for new technology to be invented to counteract climate change. Divestment is also a strategy activists have successfully used in the past to combat social injustice by refusing to fund and support destructive practices. For these reasons, divestment is the most effective strategy an academic institution can implement to leverage its influence within the academic community to fight global climate change.

2.2 THE CLIMATE CHANGE MOVEMENT

As I argued in the previous sections, climate change is a global problem that will continue to get worse with time. The window to mitigate the effects of climate change is closing and the consequences for human and non human life alike will be disastrous. The world can no longer stand idly by and wait for a solution to manifest itself. Worldwide, millions of people are in agreement and have taken action. On September 21, 2014 over 400,000 people in 162 countries engaged in a worldwide march against the harmful effects climate change and 2015 saw a substantial increase in academic institutions committing to divest their endowments from fossil fuels (350.org) (gofossilfree.org). These modern activists are continuing the legacy of many generations of activists that came before them and have learned from their successes and shortcomings. They are utilizing tactics and following strategies that were effective in the past and have learned from those that were not. This section will discuss the origins, effectiveness and shortcomings of the Climate Change Movement and of divestment as an effective tactic. I will analyze the successes and failures of social movements that have successfully implemented divestment tactics in the past, discuss counterarguments for divestment and address them accordingly, and will argue for the implementation of a divestment strategy as the best strategy for a university to combat global climate change.

2.2.1 History of the Climate Change Movement

The Climate Change Movement and divestment campaign have their roots in the Environmental Movement that emerged in the 1960's amidst a growing counterculture but the origins of these movements can be traced back to the Romantic Period of the late 1700's and 1800's (Haq and Paul, 3 and 7). Romanticism emphasized the value of the natural world in a time when the mentality of the Industrial Revolution devalued it to the revenue it can generate. Modern activists are following in the footsteps of the Romantics by showing the value of Nature beyond its value as a commodity. Both Romantics and modern activists believe that Nature has inherent value and seek to demonstrate this to the world. Modern activists see the consequences of the destruction of Nature and engage in collective action to promote awareness and change while the Romantics did the same by creating beautiful works of art and literature depicting and describing Nature's beauty and condemning the destruction of the natural world. They both understand that the planet is shared by all creatures and all damage it sustains impacts us all to varying degrees. These ideas are radically different from the industrial mentality promoted by capitalism and are the founding beliefs of the Environmental Movement which lead into the Climate Change Movement.

Though the Environmental Movement as it exists today has been around since the 1960's, it has only recently focused on the issue of global climate change and adopted divestment as a tactic. Feelings of environmentalism, as we know it today, have been around since the late 1800's. Most mark the beginnings of modern environmentalism with John Muir's formation of the Sierra Club in 1892 or the founding of the National Trust in the United Kingdom in 1895 (Haq and Paul, 6). During the early 1900's and throughout the World Wars, the main focus of environmental activists was preservation of natural beauty. The decades between the turn of the century and the end of World War II saw the formation of groups like The National Audubon Society (1905), the Izaak Walton League (1922), the Wilderness Society (1935) and

the National Wildlife Federation with the mission of protecting and preserving Nature. In the decades following World War II, environmental activism began to take on a new form. After World War II, there was a revitalized sense of the value of Nature. The mid 1940's through the late 1950's and into the 1960's saw an increase in protests against environmental and social injustices. Activists rallied against causes like the use of chemical pesticides like DDT, the herbicide Agent Orange, nuclear weapons testing, air pollution and the Vietnam War (Haq and Paul, 7). Isolated groups of grassroots activists protested local environmental injustices like the construction of incinerators and offshore drilling . The decade following World War II also saw the first wave of environmental legislation with the passing of the Federal Water Pollution Control Act (1948) and the Air Pollution Control Act (1955) with the Clean Air Act (1963), the Wilderness Act (1964) and the Land and Water Conservation Act (1965) following shortly thereafter. In addition to new environmental legislation and grassroots activism, thinkers like Rachel Carson (*Silent Spring*, 1962), Kenneth Boulding (*The Economics of the Coming Spaceship Earth*, 1966), Garrett Hardin (*The Tragedy of the Commons*, 1968) and Paul Elrich (*The Population Bomb*, 1968) published books and papers about the harmful implications of environmental degradation and addressed these issues from an intellectual standpoint and brought environmental issues to the public's attention (Haq and Paul, xii). Particularly, Carson's *Silent Spring* raised public awareness of the harmful effects of pesticides and eventually lead to the banning of DDT.

These activists used the contacts they made in previous movements to recruit new members to their causes and to promote environmental activism (Tokar, 43). As a result, long standing organizations like the Sierra Club (founded in 1892) saw their membership swell from its original 1000 to 7000 by 1950 as activists felt the need to affiliate with organizations in an effort to establish an environmentally friendly collective identity. The Sierra Club's mission is to protect the wild places of the earth, practice and promote responsible use of the earths ecosys-

tems and resources, protect and restore the quality of the natural and human environment. However, since so many causes fell under the umbrella of environmentalism and there was disagreement regarding issue priority and tactics resulting in the formation of many more organizations. Organizations like the World Wildlife Fund (1961), the Environmental Defense Fund (1967), Friends of Earth (1969) and Greenpeace (1971) were established to accommodate the diverse interests of environmental activists. Greenpeace in particular was founded in response to mainstream environmental organizations aversion to direct action and preference for political lobbying. By the late 1980's, over 300 different environmental groups from diverse backgrounds had been established each of which with their own priorities and repertoire of preferred tactics. The interests of these organizations include wildlife protection, the efficacy of environmentally harmful projects, greenhouse gas emissions, climate change, corporate responsibility and many more. These large centralized entities lent credibility to the Environmental Movement but also made it difficult for the movement as a whole to establish its priorities (Haq and Paul, 11). Sources of funding and choice of tactic have been points of contention within the Environmental Movement since its inception (Tokar, 46).

The over saturation of environmental organizations, causes and tactics lead to stiff competition for scarce resources forcing activists to seek funding through other avenues. Diverse causes, scarce funding and growing membership stretched the available resources thinly and made outside funding critical to the success of an environmental organization (Summerfeldt, 429-430). One way environmental organizations acquired outside funding was through partnerships with corporations who might sympathize with their cause (Haq and Paul, 18-19) (Kohl-Arenas 482-483 and 495-496). Though it had some financial benefits, corporate sponsorship was not always welcomed by environmental activists. This was part of the reason for the formation of the organization, Earth First! (1980). To achieve these alliances, organizations had to weaken their stance in some key issues particularly with the use of disruptive and public tactics

which corporations saw as a potential liability in a partner (Haq and Paul, 20-21). These tactics were most commonly deployed by grassroots activists who believed that environmental problems could not be legislated away and that the best course of action was to combat the problems directly. Mainstream lobbying organizations believed the exact opposite, believing that the most pragmatic way to influence mainstream institutions was through politics (Tokar, 44). This led to the formation of Green Party in 1985 and became a way for the Environmental Movement to express its ideas in politics by attempting to produce electable political candidates in all levels of government.

These varying approaches to environmental issues caused a schism within the Environmental Movement which was magnified by the political climate of the 1980's. Where the previous decades saw the passing of environmental legislation and an increase in environmental awareness the 1980's saw a new level of environmental destruction. The pro capitalist anti regulatory position of the Reagan Administration stressed the importance of economic progress even at the expense of the environment (Reagan, 115-116). The Administration enacted policies that undermined environmental legislation and advocated for unregulated economic growth which led to environmental atrocities throughout Reagan's time in office. Hazardous waste dumps like the one proposed in Afton, North Carolina (1981), a predominately black community were being built around the country and caused to health problems in the surrounding neighborhoods (Haq and Paul, xiii). The country was suffering from an acid rain problem and Monsanto was given the green light to begin field trials on their genetically modified crops in 1987 (Haq and Paul, 51). The end of his second term saw one of the worst environmental disasters of its time when the Exxon Valdez spilled oil off the Alaska coast in 1989, killing millions of non-human beings (Haq and Paul, xiii,xiv and 80). The culture of greed, militarism and consumption disregarded these disasters and allowed them to continue in the name of economic progress and prosperity (Reagan, 114-118). Capitalists exploited the environment at unprecedented

rates and with impunity while efforts to regulate the unfettered growth of capitalism to preserve the natural world were continually ignored leaving the Environmental Movement with little to show for during this decade (Rootes, 843).

Towards the end of the Reagan Administration and after Reagan left office, there was a change in environmental awareness. During this time, the Green Party began to rise to a new level of political prominence. Their mission was to combat environmental issues through political influence and in 1986, David Conley and Frank Koehn were elected to the County Board of Supervisors and became the first Green Party candidates to be elected in the United States. Their political platform opposed the commodification of air and water, denounced sexism and racism and advocated for Native American sovereignty, a 75% reduction in military spending and decentralized control of healthcare, banking, insurance, energy and transportation (Tokar, 45). This and other elections paved the way for Ralph Nader's 1996 and 2000 failed presidential campaigns. Though unsuccessful in the United States, the European green parties upon which the US party was modeled, were much more successful. The mid 1990's and into the 2000's saw an increase in international discussion regarding environmental issues, strong environmental legislation being passed in Europe and annual conferences on the topic of climate change. These talks have led to implementation of international legislation like the Kyoto Protocol. Adopted in 1997 and implemented in 2005, it called for countries to reduce their carbon emissions by 20% of the baseline established in 2005 by 2020 but was not ratified by the United States (van der Heijden, 3).

By 2005, most people in the US and the UK believed climate change was the origin of all other problems facing the environment and therefore, the most important environmental issue (Haq and Paul, 21 and 88). In an effort to combat climate change, activist and climate change writer, Bill McKibben and his supporters founded the organization 350 in 2007 with the goal of determining the maximum amount of carbon that can be emitted into the atmosphere and ensur-

ing this limit is not exceeded by calling institutions and municipalities to divest their holdings from fossil fuels (Haq and Paul, 23). In 2009, the organization coordinated 5200 rallies across 181 countries and promotes the use of divestment as a tactic to combat climate change (McKibben, 256). To date, of the 499 institutions that have divested approximately \$3.4 trillion, 29 are academic institutions in the United States and have divested over \$140 billion from fossil fuel assets since 2009 (gofossilfree.org). In 2009, Hampshire College continued its tradition of divesting from social injustices like South African apartheid and nuclear proliferation when it became the first school to commit to divestment. In 2014, Stanford University committed to divest its \$21 billion endowment from coal and the following year, large state universities like University of Washington, University of Hawaii and Syracuse University all committed to divestment². Almost every year since 2009, more schools have committed to divesting their endowments than the previous year, suggesting that divestment is a viable strategy and a growing trend. Though Climate Change Divestment is a relatively new movement, it is progressing similarly to divestment movements of the past like the movement to divest from South Africa's apartheid regime. Social and financial pressures are being applied to the institutions responsible for the worst pollution and they are beginning to be seen as an investment that is a poor reflection of personal and institutional values. The financial impact of divestment on the offending institutions is up for debate but as social pressure builds and more people begin to see the investment as a social pariah, the institution is encouraged to amend its offensive practices or continue to be a social liability to investors. Thus far, the Climate Change Divestment Movement has shown itself to be effective with annual increases in divestment commitments and many more institutions and municipalities recognizing fossil fuel divestment as an effective and necessary strategy to combat climate change.

²Details regarding all divested schools can be found in Appendices A and B and will be discussed in more detail in the Results section.

2.2.2 Divestment as a Historically Successful Tactic

Though the Environmental Movement has only recently adopted divestment as a tactic, social movements of the past have used divestment to combat social injustices on several occasions. As mentioned before, divestment is a tactic activists use to encourage investors to avoid specific assets or securities for moral reasons in an effort to restrict the funding to the causes of social injustice. This limits the offending institutions ability to generate profit and causes their securities to become socially and financially unattractive investments. The hope is that the lack of capital and social stigma attached to the institution due to its association with a social injustice will encourage the offending institution to mend its ways or force it to revise its operations. Movements like the South African Anti-Apartheid Movement successfully employed divestment tactics as part of their efforts to end the apartheid regime in South Africa. In this section, I will discuss the South African Anti-Apartheid Movement and the role divestment played in meeting the movement's goals.

Widespread social injustice, discriminatory regulations and open racism were commonplace in South Africa from the earliest interactions between Dutch colonists and the natives in 1658 well before the official rise of apartheid (Worden, 75). Indigenous people were subjected to different laws than whites and enslaved until 1834. The Caledon Code of 1809 forced slaves to carry passes to prove their identity, subjected to arrest if caught without them and was enforced well after the end of slavery. These and other discriminatory laws were passed and by the 1900's, segregation was a common part of life. Black and white South Africans did not mix socially, in the workplace or in schools and a clear divide between white haves and the black have nots was deeply ingrained in society (Adam and Moodley, 14). The circumstances bred mistrust between black and white South Africans which resulted in varying degrees of conflict throughout the nation's history (Ross, 88). This came to a head in 1948 when the National Par-

ty came to power under the apartheid platform subjecting black South Africans to more discriminatory laws, harsh punishment and rigid enforcement.

The laws established prior to the National Party's rise to power oppressed black South Africans by paying them lower wages than their white counterparts, restricting their access to education and segregating all parts of society. The National Party took this a step further by passing the Population Registration Act (1950), the Group Areas Act (1950) and the Reservation of Separate Amenities Act (1953) (Worden, 104-105). In addition to the institutional racism and oppression of the past, the government issued new laws legally classifying South African citizens as white, colored, Indian or Native, and no longer permitted interracial marriage. The Caledon Code was strictly enforced, black South Africans were not allowed to travel outside their region without the proper paperwork, and the police had the authority to forcibly detain and relocate any citizen for any reason (Ross, 146). The 1950's and the decades to follow saw a rise in civil disobedience and political protests for fair wages, better working conditions and freedom from white oppression by black South Africans (Worden, 109). The African National Congress (ANC) urged participants to utilize nonviolent tactics in their protests. Despite the nonviolent nature of protests, political organizers were routinely arrested, detained and tortured and relocated while the protests were met with lethal force. On March 21, 1960 during a peaceful march protesting the Caledon Code, a police force of white South Africans fired upon the activists killing 69 and wounding 180 in what became known as the Sharpeville Massacre (Worden, 116). After this incident, the ANC reluctantly abandoned their peaceful tactics in favor of a more violent approach in 1961 (Sparks, 73). The apartheid government met resistance with brutality and conflict between the government and its citizens continued to escalate.

The conflict gained international attention in 1976 after a group of 20,000 black South African students were fired upon in Soweto, killing at least 176 and possibly as many as 700 (Ross, 153). People around the world began to speak out against the atrocities committed by

the South African government and the events in South Africa began to receive more media attention. The situation in South Africa was incredibly volatile with centuries of racism, tyranny, forced poverty and oppression leading to violent revolutionary action by black South Africans. Increased media coverage of the violence in South Africa, international outcry and the threat of economic sanctions magnified the already volatile situation in South Africa. In 1982, loans made to South Africa by international banks came due and the banks, including Barclay's Bank, chose not to allow them the option to renew them which temporarily shut down the Johannesburg Stock Exchange (Worden, 145). Countries ceased trade engagements with South Africa and large corporations like I.B.M., Kodak and Revlon divested their pension funds. In the United States, students built shanties on college campuses, engaged in sit ins and called for their schools to divest their endowments from South Africa and companies that do business there (Broadhurst, 11). Between 1977 and 1989, 167 academic institutions over 200 US companies and 20 countries severed business ties with South Africa (Soule, 4). These institutions included high profile schools like Harvard and Colombia and collectively divested over \$1 billion of direct investment from South Africa (Welch and Wazzan, 79-83). After nearly fifty years of apartheid and over 300 years of oppression, international economic sanctions, mounting social pressure, and divestment contributed to the collapse of South African apartheid in 1994.

Though divestment was a contributing factor it alone did not cause the end of apartheid in South Africa. Without the non violent demonstrations, violent responses to brutality, increased media coverage and international political and social pressure that preceded it, divestment could not have occurred. The ANC's initial strategy of nonviolent campaigns against apartheid was not effective and resulted in violent tactics from both sides and an increase in media coverage. Activists speaking out against apartheid were making their voices heard and as more became known about the situation in South Africa, the more clear it became that it must stop. Working with the volatile situation in South Africa, activists encouraged divestment as a

way to deal a crippling blow to the apartheid government. The decision to divest from South Africa would not even have been considered by investors if there was not substantial media coverage outlining the atrocities committed on behalf of the South African government. All of these events had to occur before the world could take take a stand against South African apartheid. Divestment was the straw that broke the camel's back but the contributions made by groups like the ANC to organize and mobilize black South Africans must not be minimized (Ross, 196-197). Without proper organization, visible tactics and proper media coverage, the international pressure for divestment might not have had the same effect on the South African government.

2.3.3 Counterarguments and Summary

Though the South African case shows that divestment can be an effective tactic to combat social injustice, it has also received some valid criticism. The three main points made by critics of divestment are: that divestment does not make a substantial financial impact on the offending institution, other tactics are more effective and that divestment is against the institution's financial self interest. In this section, I will address these counterarguments against divestment and advocate for its implementation as the most effective strategy an academic institution can employ to combat global climate change.

A 1999 study analyzed the financial impact divestment from South Africa made on the targeted companies and South African markets. The researchers found that when socially responsible investors divested from the South Africa and those who did business there, more indifferent investors stepped in to take advantage of the new investment opportunity (Welch and Wazzan, 79-83). The indifferent investors replace the investments of those who divested and Welch and Wazzen determined that this made divestment an ineffective tactic because it did not make a substantial financial impact on the offending institutions. However, this study neglects to account for the increased media attention and global sympathy for black South Africans that shed an unfavorable light on the South Africa government. Large amounts of negative publicity discouraged further investment in South Africa and encouraged those with existing investments to consider other alternatives. Divestment is just one tool to fight social injustice which happened to occur towards the end of a movement during the height of its publicity. Though it was not entirely responsible for the end of apartheid in South Africa, the fact that it was a contributing factor cannot be denied. There will always be indifferent investors ready to capitalize on the misfortunes of others but this does not reduce the impact of the tactic. The effectiveness of divestment is not judged solely on the financial impact it has on the offending institutions. The united social and political pressure from the international community was more important than

destabilizing the financial situation in South Africa. Together, the countries and people of the world took a stand against the social injustice of apartheid and decided it could no longer be allowed to continue. Though the financial impacts of divestment were mitigated, as a tactic, it certainly contributed bringing an end to the apartheid regime in South Africa.

Another criticism of divestment involves the voice of shareholders in the operations of publicly traded companies. When an investor purchases common stock in a company they are entitled to voice their opinions about the company's direction. Some critics of divestment argue that it would be more effective to purchase more shares of common stock in these companies to increase the opposition among the shareholders. These companies are obligated to generate a profit for their shareholders and usually only listen to them or the government when dictating the direction of the company. The idea is that increased shareholder opposition will create pressure from within the organization to move the institution away from its objectionable course. Though shareholders are entitled to voice their opinion, this does not guarantee that the institution will listen to it. If the opposition does not hold the majority of the common stock of the company, they cannot force it to do anything. Additionally, common stock does not generate as much revenue as preferred stock because you pay for the voting rights. To reallocate assets to common stock in fossil fuel companies means that these assets are either taking on unnecessary additional risk or underperforming. Neither outcome is ideal for an endowment portfolio and therefore makes this a legitimately poor investment option. Furthermore, purchasing common stock in fossil fuel companies is still funding the institutions that are destroying the planet and allowing them to continue their practices. The dissenting shareholder voices will be ignored and business as usual will continue.

The most common objection to divestment, is also WPI's position on divestment. While the institution and the Board of Trustees recognize the contributions fossil fuel emissions have made to global climate change, they are unwilling to take a financial loss to stand against these

practices. In later sections I will show how divestment does not imply assuming more risk or financial loss and can actually be a strategy to mitigate risk and increase returns. The point of divestment is to send the message that this institution will not tolerate the offending Institution's actions. Regardless if it may cost the institution in the short term, if the message is important enough to the it, the financial cost would not matter. To invest in an asset is to tacitly condone the practices that generate capital for it. By holding assets in fossil fuels, WPI is condoning the destructive practices of fossil fuel companies and contributing to the causes of global climate change. If WPI were to divest, in addition to the potential for higher returns and lower risk that I will demonstrate later, it would also show the world that it will no longer stand idly by as the planet is destroyed. Rather than being a part of the problem, they would be part of the solution.

There are several ways to address the environmental issues plaguing the planet today but I believe that divestment carries the least risk and is the most effective way for WPI to combat climate change. It has shown itself to be an effective tactic in the past and contrary to the belief of the members of the Board of Trustees does not carry a large risk of financial risk as I will prove later. Divestment would send a powerful message to the rest of the academic community by becoming the first polytechnic to divest from fossil fuels and would open the door for similar schools to inquire into divestment as a viable financial strategy. Finally, if WPI knowingly continues its current investment practices, it is actively condoning the destruction of Nature despite knowledge of better alternatives. This would be in blatant disregard of the values of the institution and its community and must not be allowed to happen. The Board of Trustees must answer the community's call to divest and align its endowment portfolio with its founding values.

2.3 FINANCIAL TERMS AND CONCEPTS

To address the fiduciary concerns of WPI's Board of Trustees and reassure them of the validity of divestment as a financially reasonable course of action, the sections to follow will discuss relevant financial terms and concepts which will lead into a financial argument for divestment. These sections will discuss **Risk, Investment Vehicles, Diversification** and **Portfolio Design**. This will lead into a section regarding the specifics of endowment portfolios and WPI's finances. These concepts must be introduced before the methodology and results to give relevant background information about the financial reality of divestment. If divestment is seen to be a financially risky proposition, the Board of Trustees will take no action and continue business as usual. The following sections and the rest of this project will demonstrate how investments in fossil fuels can be replaced with other assets and achieve better results.

2.3.1 RISK

It is important for investors to understand the different investments available to them, how they work, and the benefits of each. Some assets involve more risk than others and understanding how these assets vary is crucial when determining the asset allocation that meets the investors goals. A portfolio that properly allocates its funds in diverse assets guards itself against unnecessary risk while meeting the goals of the investor.

A **portfolio** consists of different investments and is constructed with the intent to increase the investor's wealth. The different assets each have advantages and disadvantages, including receiving different rates of return. The expected rate of return is what analysts predict for the performance of the investment. It is an educated assumption based on the risk taken and will usually not be equal to the actual rate of return which is how the investment actually performs. The return is calculated by subtracting the initial price of the investment from the

price of the investment at its sale, adding all the dividends that have accumulated while holding the investment and dividing that number by the initial price of the investment (Bodie et.al, 111).

The capital generated by a portfolio are the **portfolio returns** which are based on the performance of the portfolio based on its asset allocation. The advantages and disadvantages of the different investments reflect the desired level of risk to the investor and the return they will receive given the risk. A portfolio that carries more risk has the potential to earn higher returns but also the potential for more loss. More stable investments do not generate as high of a return due to their lower level of risk but there is less likelihood of loss. The combination of high risk and low risk investments in a portfolio generate the portfolio's overall return.

Risk is the likelihood that an asset will decrease in value. It is based on the price volatility of the asset. The more volatile an asset is, the higher the risk of loss but this is typically accompanied by the potential for higher gains. Understanding the risk return tradeoff is essential when determining one's investment goals. Investors must know the level of risk they are willing to accept (Black, 95). The rate of return for every asset is different and is based on the level of risk associated with each asset, on average, the more risk taken the larger the reward. To earn high returns, risk is unavoidable but some can be mitigated through proper diversification (Bodie et.al, 149).

Risk premium is a statistic that is calculated by comparing the rate of return for an investment to the rate of return of a low risk asset. This determines the "upside" of taking on the additional risk as opposed to investing in a low risk option. For example, if an investor had a higher tolerance for risk, he or she would invest in the stock of a company and if the same investor had a lower tolerance for risk, they would invest in the same company's bonds. A diversified portfolio consists of a mixture of stable and risky assets. The combination of these assets allows the investor to maximize returns while limiting risk. Typically with endowment funds, the objective is to produce the maximum income possible while limiting exposure to only moderate

risk (Bodie et.al, 721). This investing style ensures the endowment fund generates sufficient capital to maintain the institution and still be solvent for generations to come.

2.3.2 INVESTMENT VEHICLES

A properly allocated portfolio will contain of a variety of investments. These include stocks, bonds, United States Treasury Bills, and commodities. Each asset has advantages and disadvantages. When properly allocated, the advantages and disadvantages of the different assets produce returns without taking on more than the desired amount of risk. Below, I explain three different securities and their advantages and disadvantages.

United States Treasury Bills (T-Bills) are considered to be nearly risk free assets. They are short term government securities sold at less than face value and returning the face amount upon maturity (Bodie et.al, 27). The only risk they carry is the unlikely event that the United States Treasury defaults. The pricing of T Bills is based on how long it will take for them to reach maturity. Since they are a very low risk asset, their return is not very high but investors do not buy them for the return on investment. They use them as a safety net that will allow them to take on risks on other assets that would otherwise be considered too volatile for their investment goals.

Stocks are shares of a company that are sold at market and purchased by investors with the hope of high returns on their investment. Investors can purchase either preferred or common shares of stock in a company. Purchasing shares of a company makes you a partial owner of the company thus not obligating the company to pay the investor. The benefit to owning stock is the income stream generated by the dividends, shares of the profit of the company distributed among the shareholders, and the potential for capital gains on the sale of the stock in the future. Preferred shares pay out a stream of dividends and do not give their owners the right to vote on matters concerning company affairs. Common shares may pay a dividend, but likely will not, but they do allow the owner the right to vote on company affairs. Stocks are more risky than assets like bonds so they typically offer a higher average rate of return (Bodie et.al, 37-40). According to a study conducted by New York University, between 2005 and 2014, the

average return on investment in shares of companies on the S&P 500 was between 9.37% and 9.7%. The average risk premium as compared to T-Bills was between 6.18% and 7.94% and between 2.73% and 4.06% as compared to United States Treasury bonds (Damodaran). Meaning, that stocks in the S&P 500 performed about 6% to 8% better than T-Bills and about 3%-4% better than US Treasury bonds.

Bonds are shares of debt that can be bought and sold in a marketplace. Companies, municipalities, institutions, and governments issue bonds as a way to increase capital for a new venture. When investors purchase the bond, part of the contract is when the bond reaches maturity it will compensate the investor with a payout. Purchasing a bond, the investor becomes a creditor to the institution that sold the bond thus obligating them to pay the investor back. They can also be set up to produce an income stream similar to preferred stock (Bodie et.al, 31-37). According to the same New York University study, the average return on investment for United States Treasury bonds was between 4.88% and 5.31% between the years 2005 and 2014. The risk premium was between 3.45 and 3.88 as compared to T-Bills and between -2.73% and -4.06% as compared to stocks in S&P 500 companies (Damodaran). Meaning, that US Treasury bonds performed about 5% better than T-Bills but performed about 3%-4% worse than stocks in the S&P 500.

2.3.3 DIVERSIFICATION

Diversification is the process by which assets in a portfolio are balanced according to the level of risk they carry. More risky assets are held in addition to less risky assets and stable assets. For an endowment, much like for personal investors, the trustees want the portfolio to have high expected rates of return and low volatility. By properly diversifying their portfolio, investors can earn a higher rate of return with less risk than they could in a portfolio that was not properly diversified. Adding different assets to your portfolio actually lowers the volatility of the portfolio even if the assets added are more risky (Bodie et.al, 157).

Diversifying a portfolio spreads the risk of each asset throughout the entire portfolio instead of relying on the success or failure of one particular asset. If an investor invests all of their capital in one asset and that asset performs worse than expected, the investor will take a loss. The investor has put all their eggs into one basket with the hope of reward but also an elevated risk of loss. There are no other assets in the portfolio with the potential to over perform that could have mitigated the investor's losses. If the investor invested in multiple assets, the risk of this happening is greatly reduced. When one asset is performing poorly, another might be performing well and having investments in multiple assets allows for one investment to balance the other. Some investments will perform well and others will not but having multiple investments helps protect against major losses that become a greater possibility with fewer investments.

Every portfolio has an ideal level of risky assets that relates to the investor's goals. Some investors, particularly young professionals, want to earn as high of a return as they can while they are young and still have time to rebound from a large loss. Investors like the trustees of an endowment want a more stable portfolio that generates the optimal return for the low level of risk (Bodie et.al, 162-163). Both portfolios have an ideal level of risk that will align with the investor's goals and generate the highest rate of return. The reward to volatility ratio (Sharpe

ratio) is used to rank portfolios in terms of the risk return tradeoff (Bodie et.al, 125). This ratio takes the portfolio's expected return in excess of that on risk free securities and divides it by the standard deviation of the rate of return in excess of the risk free rate (Bodie et.al, 122-125). A higher Sharpe ratio means that the portfolio will produce a higher reward per unit of volatility and is a good way to compare the efficiency of different portfolios.

The capital allocation line (CAL) is used in conjunction with the Sharpe ratio to determine the proper asset allocation for the risk tolerance of the investor. The CAL is the result of adding low risk assets (United States Treasury Bills) to the portfolio. Adding these assets to a portfolio will give it a higher expected rate of return than a portfolio that consists of high and low risk assets (stocks and bonds) (Bodie et.al, 162). The CAL with the highest Sharpe ratio will produce a portfolio with the best combination of risky assets mixed with safe assets otherwise known as the optimal risky portfolio because it generates the highest rate of return per unit of risk (Bodie et.al, 161-165).

Once the CAL with the highest Sharpe ratio is established, one can then find the optimal composition of the rest of the portfolio. The ideal percentages of the portfolio invested in stocks and bonds have the highest Sharpe ratio (Bodie et.al, 162). Since there are only two types of assets that carry risk, one can solve for the weights each asset holds once they know what percentage of the total investment will be allocated to risk free assets. Once they know the weights and the percentage they choose to allocate to risk carrying assets, all that is left to be done is to multiply each weight by the percentage allocated to each risk carrying asset. This will yield the the optimal composition of the portfolio.

For example, if an investor decided to build a portfolio with an initial investment of \$50,000 and the goal to have stable growth over the long term, they would need to determine the ideal composition of risky and non risky assets to meet their investment goals. The investor has the option to invest in income or growth stocks, bonds, and T Bills. The income stocks earn

an average rate of return of 5%, the growth stocks earn a rate of return of 9%, the bonds earn 4%, and the T Bills earn 0.5%. For the portfolio to align with the investor's goals for stable long term growth, it would likely consist of more bonds than stocks. Bonds are less volatile asset compared to stocks thus making them a better option for investors who seek to mitigate risk. The money that is invested in stocks would likely be more heavily invested in income stocks than growth stocks. Growth stocks have a higher rate of return due to their volatility. They typically perform exceptionally well or incredibly poorly but they help increase the possibility for a higher rate of return from the entire portfolio. A fair portion of the portfolio would likely also be allocated to T Bills. They are a very low risk investment and thus will not generate a very high return but they are also incredibly stable investments which allows the investor to accept more risk in other areas. For an investor who is focused on long term investment and mitigating risk, T Bills will generate a steady but small return on investment. Their real value is the stability they offer to the portfolio as a whole. The incredibly low risk associated with T Bills allows for more risk to be taken in other investments in the pursuit of optimal returns. They are a risk management tool that allows for more risk in the portfolio and a higher possible rate of return. Investing the incorrect amount in any asset class causes the portfolio to fall short of the investor's goals and not perform at the optimal efficiency that is the product of proper diversification.

2.3.4 PORTFOLIO DESIGN

When designing a portfolio for an endowment, there are many factors that must be considered. The typical investment goal for endowment funds is “to provide at least the same level of support from the endowment to future generations that the current beneficiaries enjoy.” (Fogler, 1994). The responsibility of those who manage the endowment funds is to ensure that the portfolio performs just as well if not better than its current performance. This responsibility falls to the institution’s Board of Trustees. To accomplish this, they must consider the asset allocation that will best meet their investment goal, how they plan to spend the capital generated from the fund and plan a strategy for periodically rebalancing the portfolio (Fogler, 1994).

To determine the appropriate asset allocation for a portfolio, it is important to know the risk tolerance of the investor. The composition of assets is reflective of the investor’s appetite for risk. How much risk they are willing to accept gives parameters for the allocation of investment capital. After determining the asset allocation, the spending policy for the endowment must be addressed (Fogler, 1994). How much of the earnings of the endowment fund should be spent to ensure that it is meeting its investment goals but also providing the maximum possible benefit to its institution is an important question when assessing asset allocation. The investment goals for endowments are to produce capital for institutional operation, increase capital to replace what is taken out each year, and keep pace with inflation. How much a portfolio needs to grow to meet its goals depends on how much of the portfolio is needed for operational expenses. A large portfolio generating a smaller rate of return can produce sufficient funding for their budget so anything extra is seen as unnecessary risk. Smaller portfolios do not have this luxury. They will need to assume more risk to have the same capital return as the larger portfolio because they have less capital to invest. Historically, endowment funds typically spend 5.5% of the five year moving average of the annual gains each year (Fogler, 1994). This helps re-

duce volatility in capital available for spending due to market fluctuations and usually equates to about 5% of the return on investment (Green, 2009). For example, an institution with an endowment fund of \$389,310,000 that is averaging a 7.4% return on investment over the past 5 years, should be spending 5.5% of their five year moving average annual return of 7.4%. This is about 0.04% of the total investment (about \$1.6 million) that needs to be made back to meet the endowment's investment goals.

Without any other diversified assets, a 60/40 split between stocks and bonds would produce a sufficient return to meet the investment objectives. According to Fogler's data, the average real return on investment between the years 1924 and 1991 for US stock was 7% and 2% for US Treasury bonds (Fogler, 1994). This is a simple example to show that an endowment can easily maintain its value with a very low risk portfolio. The 60/40 split is enough to average a 5% return, covering the operational expenses for the institution. However, this example is not a diverse portfolio and is vulnerable to market volatility. If Treasury bonds or US stocks have a bad year, so will the endowment fund.

More diversity within the portfolio helps protect the entire investment from volatility risk. The risk is spread among many different asset classes and allows for more risk to be taken within the portfolio. The success of the portfolio independent on the average success of many asset classes rather than the likelihood of success or failure of a few assets. Fogle diversified his sample further by examining the average asset allocation for equities, fixed income and real estate. He found that on average, endowment funds were invested 52% in equities, 2% in real estate and 46% in fixed income. These categories were broken down to show their composition. Equities consisted of S&P 500 stock, US Small-Cap Stock, Venture Capital, and International Equity and Fixed Income assets were divided between 1 year, 5 year and 20 year US Treasury bonds (T-Bonds), HiGrade and HiYield Corporate bonds and International bonds (Fogler, 1994). According to NACUBO, it was found that on average, an endowment fund held

49% in S&P 500 stock, 1% in Venture Capital and 2% in International Equity, 2% in Real Estate, 13% in 1 year T-Bonds, 22% in 5 year T-Bonds and 11% in 20 year T-Bonds. This average portfolio produced a 10.13% average return with a Standard Deviation of 8.38% (Fogler, 1994). Using these average numbers, Fogler developed 3 options for a better diversified endowment with a comparable level of risk. Of the three options he produced, the best was allocated as follows: 36% in S&P 500 stock, 7% in US Small-Cap stock, 12% in Venture Capital and 11% in International Equity, 9% in Real Estate, 5% in 5 year T-Bonds, 15% in 20 year T-Bonds and 5% in International Equity. In total, there is 66% of the portfolio in Equity, 25% in Fixed Income and 9% in Real Estate. This portfolio is more diversified produces a 12.33% average return with a Standard Deviation of 10.01%. This more diversified portfolio is heavier on equities than the average portfolio and can afford to accept more risk because the fixed income portion is better diversified. This added risk produces a higher return while only slightly increasing the risk.

The goal of the endowment fund is to replace what is withdrawn from it and to keep pace with inflation. By properly diversifying assets, this goal can easily be exceeded while assuming minimal risk (Bhatti, 89-90). Diversifying and properly allocating assets is crucial for any portfolio and must be seriously considered before investing. Investment goals must be defined and the allocation strategy must be aligned with these goals. If the strategy and goals are not in alignment, the portfolio is not accomplishing its objective and must be adjusted accordingly.

2.4 INVESTMENT PRACTICES FOR WPI'S ENDOWMENT

2.4.1 ENDOWMENT REGULATIONS

Endowment funds are also subject to certain laws to which they must adhere. In his article in the *Pennsylvania CPA journal*, Lee Sullivan discusses various laws that affect the investment of money for an endowment. One such law is the 1983 Uniform Management of Institutional Fund Act (UMIFA) which regulates institutional funds and how they are to be managed. This in conjunction with the 2006 Uniform Prudent Management of Institutional Funds Act (UPMIFA) establish measurable investment standards for funds invested in an endowment but still allows for the institution to have some flexibility around how much can be invested in a certain asset class and what the expected return on investment will be (Sullivan, 22). Sullivan goes on to state that these laws place the fiduciary responsibility of the endowment in the hands of the institution's governing board. They alone have the ability to adjust the underlying investments of the endowment but are subject to investing laws that manage gift intent and spending ability (Sullivan, 22).

2.4.2 WPI'S ENDOWMENT

Between the years of 2009 and 2013 WPI's endowment fund was valued between \$290 million and \$380 million with an average annual value of \$351 million during this time period (Bass et.al). The money is invested with over 60 money managers in mutual funds and hedge funds. One of their biggest managers is Prime Buchholz, a money management firm that specializes in academic endowment investing (Solomon). The money is spread between several investment firms and is allocated to several different funds, each with different investment goals as a way to diversify its holdings and mitigate risk. Some are mutual funds, where their investment and the investments of all other investors are pooled and allocated within a portfolio with a

set investment goal. The asset allocation for a particular fund is usually available to the investor so they have a general idea where their capital is being invested but WPI is unwilling to share that information. A sizable portion of the endowment fund is invested in hedge funds but the specific percentage was not allowed to be disclosed (Solomon). These are individual funds managed by aggressive professional investors with their own strategies they developed to produce the investor's desired outcome. These funds do not disclose their investment practices because they are "trade secrets" so even if WPI was willing to allow public access to their investments, they would not have that information (Solomon).

WPI's investments are overseen by the Board of Trustees. Their purpose is to ensure that the institution's finances are achieving their investment goals to ensure the longevity of the school. They are also charged with maintaining the school's Mission Statement, "to create, to discover, and to convey knowledge at the frontiers of academic inquiry for the betterment of society". This is not a legal or fiduciary charge but if they fail to uphold the school's Mission Statement, they are not properly representing the WPI community. Their investment goals must fall within the boundaries of very specific laws and the Board of Trustees is responsible for ensuring the investment goals of the institution are met but the choice of investment goals and priorities is still ultimately their decision. If they are truly investing the endowment fund according to the mission statement, the Board of Trustees must realize that they are approving of a destructive practice that is causing irreparable damage to the planet and make changes accordingly. Since it is their decision, their investment practices are a reflection of the values of the institution and the WPI community. By approving of business as usual, the Board of Trustees is saying that the WPI community approves of the environmental destruction in which they invest the endowment. They have their reasons for prioritizing one investment practice over another just as any other investor or set of investors would and are concerned with setting and meeting

the financial goals of the institution. However, their investment choices must be evaluated on both a financial level and a moral level to ensure WPI is truly practicing what it preaches. Many people associated with the institution including faculty, students and alumni are in agreement that WPI's investments in fossil fuels are not reflective of their mission statement. By investing in companies that are actively polluting the environment by pumping carbon into the atmosphere, WPI is giving its seal of approval for this practice to continue. With the destructive effects of climate change widely accepted to be the result of humankind burning fossil fuels for 300 years, WPI has an obligation to consider if investments that encourage the continuation of these practices are truly something they and the institution support. Assets that are harmful to the betterment of society should be reallocated promptly but as is financially prudent towards assets that are actually reflective of the strong moral principles to which the institution espouses.

CHAPTER 3: METHODOLOGY

Calling for an institution to divest requires a plan to reallocate the capital in an effective manner to meet the institution's fiduciary responsibilities. This section sets out how I went about investigating the specific composition of an educational endowment portfolio that is as similar to WPI's as possible and how these investments performed in order to determine the best reallocation strategy for the divested fossil fuel assets. To find the best reinvestment strategy, I found the typical asset classes in which educational institutions invest their endowment funds to find the average return and standard deviation for each asset class. This information allowed me to match the average returns and standard deviation of fossil fuels to a combination of other asset classes to mimic their performance³. This strategy removes one asset class from the portfolio and redistributes those assets to other asset classes to match the returns and volatility.

The nature of WPI's finances is such that even if the administration wanted to, they could not give me the necessary information to conduct a thorough analysis of the institution's endowment portfolio. WPI's endowment portfolio is managed by sixty different teams of financial advisors and fund managers, many of whom claim their investment practices as "trade secrets" (Solomon, 2013). Thus, the institution knows with whom their money is invested but not where these managers invest the money. This makes it difficult to tailor my analysis specifically to WPI. This being the case, I examined the portfolio performance and asset allocation of endowment portfolios that were similar in size to WPI's endowment portfolio⁴. Working with the

³ Information regarding returns and standard deviation for each asset class can be found in Appendix D

⁴ Information regarding the performance and asset allocation of endowments similar in size to WPI can be found in Appendix C

averages for a portfolio of WPI's size allowed me to establish a baseline upon which I could base a hypothetical portfolio that approximated WPI's as closely as possible.

A series of longitudinal studies, conducted by NACUBO (National Association of College and University Business Officers) provided the average returns and asset allocation data for over 800 endowment portfolios from 2008 to 2013 (the most recent study available) (Bass et. al)⁵. These schools were a mix of public and private institutions varying in size from small colleges with very few students to large state universities. Their endowments ranged from \$50 million and under to over \$1 billion. To accommodate for the variation in investing power, the portfolios were further categorized based on size. These categories were portfolios with assets totaling over \$1billion, \$501 million-\$999 million, \$251 million-\$500 million, \$100 million-\$250 million and under \$99 million. Another study by NACUBO provided the total annual assets of WPI's endowment portfolio and the annual market value change. This allowed me to determine which category in the first study was best representative of WPI's portfolio. The first study documented the annual, 3 year, 5 year and 10 year returns of portfolios within this range and included the annual asset allocation for an average portfolio within that range⁶. The NACUBO study on asset allocation tracked what percentage the average portfolio for each endowment category held in domestic equity, fixed income, international equity, "alternative strategies" and short term securities/cash/other⁷.

The alternative strategies asset class is further broken down into sub classes which showed where these assets are invested. These categories are: private equity, marketable alternative strategies, venture capital, private equity real estate, distressed debt, and energy and natural resources. The NACUBO study provided the data for the value of WPI's portfolio each

⁵ See Figure 1 in the Results section and Appendix C for more information.

⁶ Findings in Appendix C.

⁷ See Figures 1 and 2 in Results section and Appendix C for more information.

year. It also provided the average asset allocation for institutions with endowments of similar size. This data showed the annual percentage of the endowment portfolio and dollar value WPI allocates to each asset class⁸. These numbers are approximations of how much capital WPI invests in each asset class based on the investment behavior of the average institution with a comparable endowment portfolio. With this baseline, the percentage of the endowment portfolio that is allocated to fossil fuels can be estimated providing an approximation of the dollar value that must be reallocated to different asset classes. For the sake of this project, the Energy and Natural Resources asset class is taken to represent investments in fossil fuels. Taking the percentage of the endowment allocated to this asset and multiplying it by the total value of the endowment estimates the dollar value of WPI's investment in fossil fuels⁹.

Colleges have only been divesting their endowments from fossil fuels since 2009 with most of them divesting within the past three years. To compensate for the lack of data, I conducted additional research on the historical returns of each asset class¹⁰. INVESCO, an investment institution, provided the returns for each asset class for the past twenty years. This data was used to calculate the average percentage return and the standard deviation for each asset class. The standard deviation represents the volatility of each asset class. The data was tracked for US Large Cap Growth Stocks, US Large Cap Value Stocks, US Mid Cap Stocks, US Small Cap Stocks, Fixed Income, International Equity, Real Estate and Commodities. These were tracked based on the Russell 1000 Growth Index, Russell 1000 Value Index, Russell Mid-Cap Index, Russell 2000, Barclay's US Aggregate Index, MSCI EAFE Index, FTSE NAREIT All Equity Index and S&P GSCI Index respectively. The S&P GSCI Index was further analyzed by

⁸ See Figures 2 and 3 in the Results Section and Appendix C for more information.

⁹ See Figure 2 in the Results Section and Appendix C for more information.

¹⁰ See Table 1 in the Results section. Detailed information can be found in Appendix D

reviewing the Annual Report to determine the percentage allocated to fossil fuels. This number was used to determine the performance of fossil fuel commodities over the past twenty years.

To understand the effects of divestment on institution's endowment portfolios, I researched divested schools in the United States. By referring to the NACUBO studies and investigating the annual financial statements for each institution, I collected data on the annual value of each portfolio from 2006 to 2014. Some of the data were unavailable and incomplete so the linear average was taken for the years before and after the missing year to make an assumption about the portfolio's value for the missing years. This provided data prior to the first school divesting to help show how the endowments performed post divestment¹¹. Also, it allowed for the returns of divested schools to be compared to those of non divested schools to determine if a divested endowment can perform as well or better than the endowments of the non divested schools. I calculated the annual percentage change for each portfolio by subtracting the returns from the past year from the current year, dividing that number by the previous year's returns and multiplying by 100. All the schools that are now divested did not divest at the same time. Over time, more schools divested but some of the schools that are currently divested were not divested for most of the time period. The average annual percentage change was calculated for divested and non divested institutions. From 2006 to 2009, all the schools were non divested, from 2009 to 2011 only one school was divested, from 2011 to 2013 only two schools had divested and from 2013 to the end of my dataset in 2014, only four schools had divested. Most of the schools that are currently divested did so in 2014 and 2015, meaning that more complete data will be available upon the publishing of the 2014-2015 endowment figures. As institutions divested, i calculated the average of their returns separately from the returns of the non divested schools.

¹¹ See Figures 4 and 5 in the Results section. Complete data can be found in Appendix D

CHAPTER 4: RESULTS

The value of WPI’s endowment portfolio has ranged from \$290 million to \$380 million between the years of 2009 and 2013 and fluctuates from year to year based on the performance of the investments. The average holdings for the portfolio between these years was \$351 million. The estimated asset allocation for WPI during this time period is included in **FIGURE 1**.

FIGURE 1: Average Asset Allocation for WPI’s Endowment from 2009 to 2013

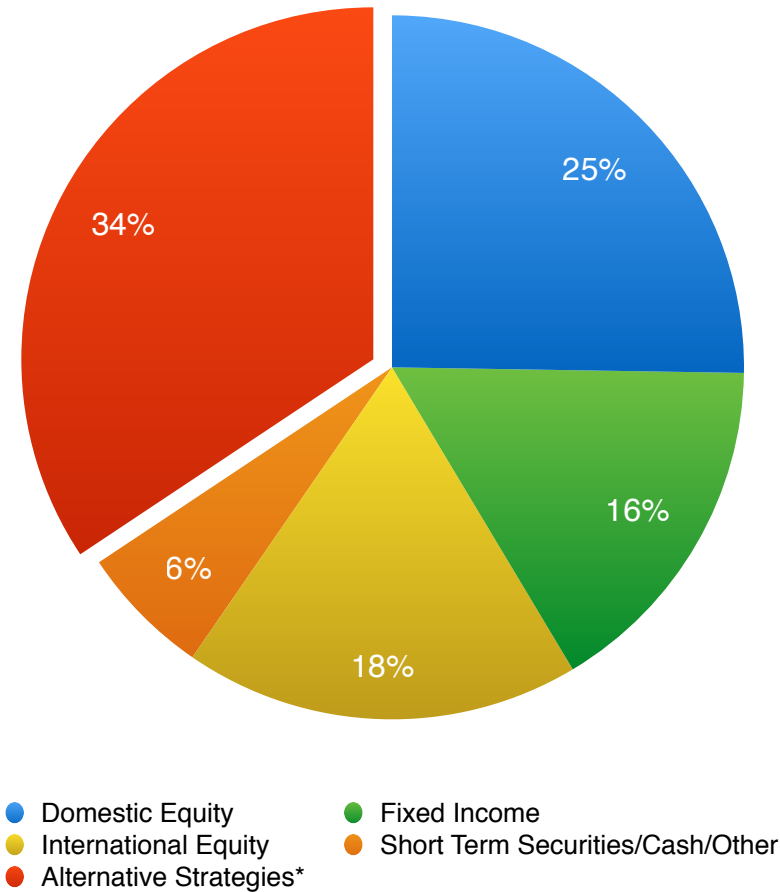
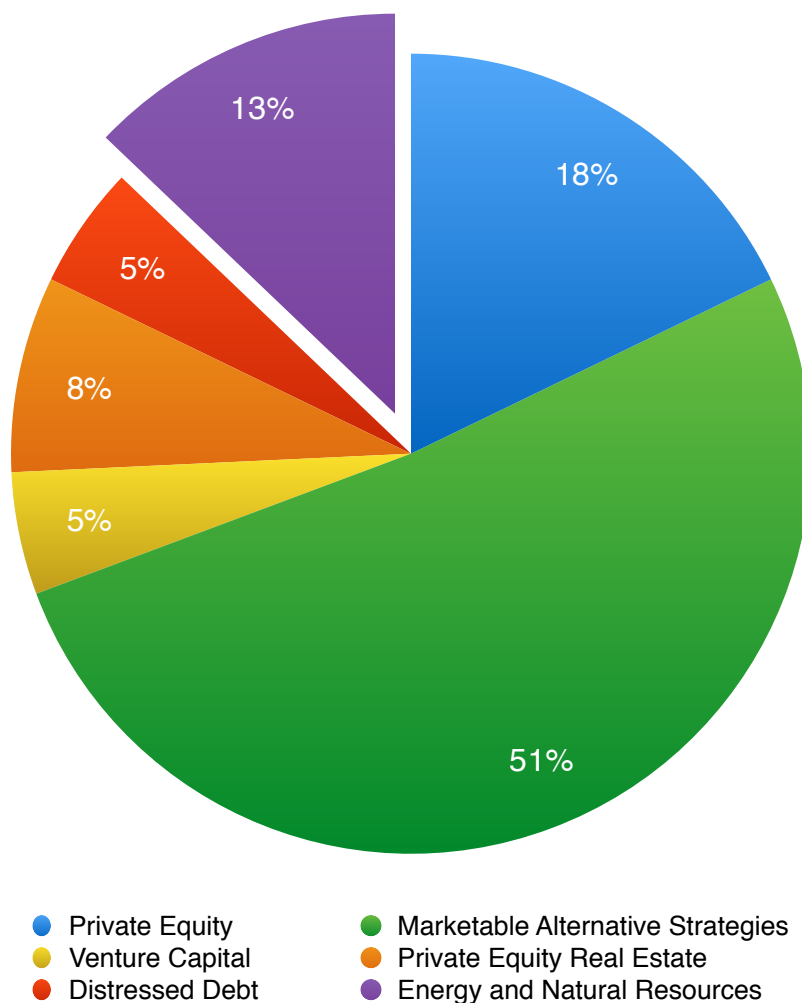


FIGURE 1 shows that over this five year span, it is estimated that on average, WPI invested about 25% (\$87 million) of the endowment in domestic equity, about 16% (\$56 million) in

fixed income, about 18% (\$63 million) in international equity, about 6% (\$21 million) in short term securities/cash/other and about 34% (\$119 million) in various alternative strategies.

FIGURE 2 shows the asset allocation of the Alternative Strategies asset class over the same time period.

FIGURE 2: Alternative Strategies Asset Allocation for WPI from 2009 to 2013



Of these alternative strategies WPI invested about 18% (\$21 million) in private equity, about 52% (\$62 million) in marketable alternative strategies, about 5% (\$6 million) in venture

capital, about 8% (\$9.5 million) in private equity real estate, about 5% (\$6 million) in distressed debt, and about 13% (\$15.5 million) in energy and natural resources. This equates to about 6% of the total portfolio invested in private equity, about 17% in marketable alternative strategies, about 2% in venture capital, about 3% in private equity real estate, about 2% in distressed debt and about 4% in energy and natural resources. The average returns and standard deviation for each asset class over a 20 year period is available in **TABLE 1**.

TABLE 1: AVERAGE ANNUAL RETURNS AND STANDARD DEVIATIONS FOR ASSET CLASSES FROM 1995 TO 2014

Asset Class	Average Annual Return	Standard Deviation	n
Large Cap Growth	12.19%	23.33	20
Large Cap Value	12.60%	17.92	20
Mid Cap	10.99%	18.53	20
Small Cap	10.91%	18.12	20
International Equity	8.69%	20.15	20
Real Estate	13.51%	19.63	20
Commodities	7.30%	27.67	20
Fixed Income	5.80%	4.77	20

Over the last twenty years, Domestic Large Cap Growth investments earned an average of 12.19% with a standard deviation of 23.33. Domestic Large Cap Value investments earned

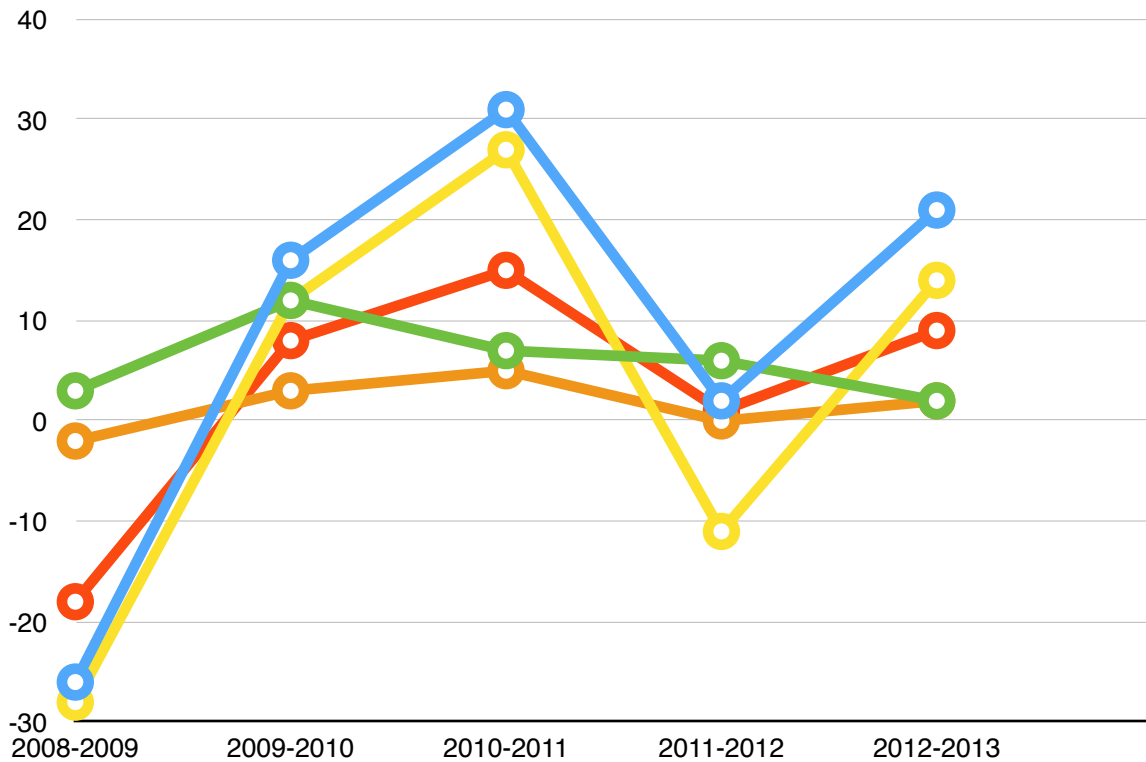
an average of 12.60% with a standard deviation of 17.92. Over the past twenty years, Large Cap Value investments have outperformed Large Cap Growth investments with less volatility making them strong investments over time. Domestic Mid Cap and Small Cap earned an average annual return of 10.99% and 10.91% with standard deviations of 18.53 and 18.12 respectively. Investments in Domestic Mid Cap equity earn a slightly higher return with a slightly higher volatility over the past twenty years and they do not perform as well as Domestic Large Cap Value so they are not likely to be good candidates for reallocating fossil fuel assets. International Equity has a comparatively low return of 8.69% and a relatively high standard deviation of 20.15. This is a fairly unstable investment but might help add volatility in an otherwise conservatively constructed portfolio to maximize returns. Real Estate offers an interesting option. It earned a 13.51% return with a 19.63 standard deviation over the past twenty years. Fixed Income is a strong option to reduce the volatility of the portfolio with the lowest standard deviation of 4.77 and earning an average annual return of 5.80%. Finally, Commodities earned a 7.30% average annual return with a volatility of 27.67, making them volatile investments similar to International Equity. Further research into the actual fund being tracked showed the fossil fuel assets held by the S&P GSCI Index, which tracked Commodities, are as follows: Brent Crude Oil, 21.67%, Crude Oil 18.38%, Gas Oil, 7.07%, Unleaded Gas, 6.08%, Heating Oil, 5.84%, and Natural Gas, 3.03% totaling 62.07% of the Index¹².

The past decade has seen substantial volatility for investments. Institutional divestment coincided with the recession and the recovery, which skewed the data on the performance of endowment portfolios during this time. **FIGURE 3** shows the annual returns for the asset classes over the past five years to demonstrate how the dataset was too small to make an accurate

¹² <http://quote.morningstar.com/etf-filing/Prospectus/2015/5/26/t.asp?t=GSG&ft=424B3&d=e9b9bd0591ecccfc94698246091cfb30>

assumption which is why it was necessary to investigate the twenty year returns for each asset class.

FIGURE 3: Asset Class Returns from 2009 to 2013

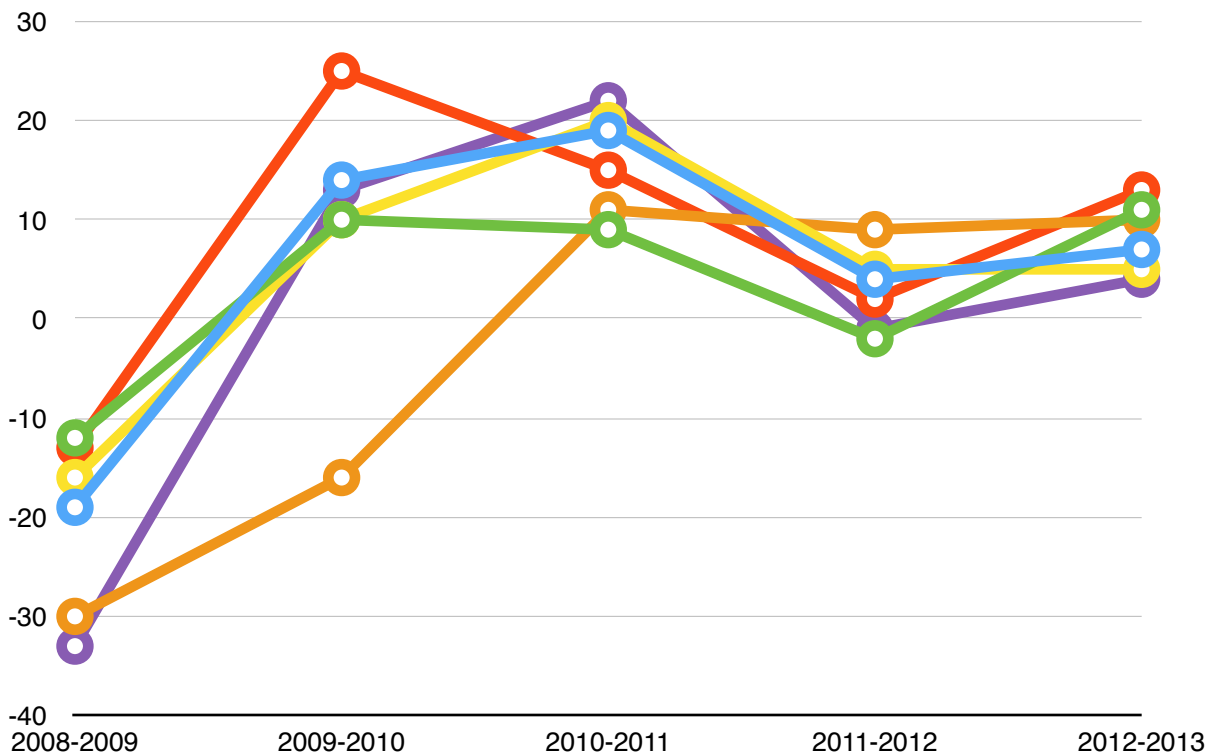


● Domestic Equity ● Fixed Income ● International Equity
● Short Term Securities/Cash/Other ● Alternative Strategies*

Investments in Domestic Equity have been particularly volatile since the 2008 recession and the recovery that followed. Like most asset classes, it performed very poorly in 2008-2009, rebounded the following year, peaked the year after, performed poorly again and rebounded. This volatility is due to the state of the US economy during the recession and recovery. However, this was a global recession and International Equity was similarly volatile and nearly mirrored the performance of Domestic Equity. Fixed Income remained relatively stable during this time, as expected but it did see a slight increase in 2009-2010 during the early recovery effort. Like-

wise, Short Term Securities/Cash/Other was similarly stable throughout this time. These are low risk investments with typically low volatilities so this is to be expected. Alternative Strategies were volatile but less so compared to Domestic and International Equity, though it followed the same general trend. **FIGURE 4** shows the returns for the same years for each asset class in the Alternative Strategies class.

FIGURE 4: Returns for Alternative Investment Asset Classes from 2009 to 2013



- Private Equity
 ● Marketable Alternative Strategies
● Venture Capital
- Private Equity Real Estate
 ● Distressed Debt
● Energy and Natural Resources

The assets that make up the Alternative Strategies asset classes performed relatively similarly. Like the other asset classes, they performed poorly during the 2008-2009 recession

and rebounded strongly in 2009-2010. Distressed Debt had the largest rebound that year while Private Equity Real Estate had the smallest. Private Equity, Venture Capital, Marketable Alternative Strategies and Energy and Natural Resources followed a generally similar trend. They each peaked in 2010-2011, declined slightly and rebounded the next year. After its meteoric rise in 2009-2010, it peaked and declined until 2011-2012 when it eventually began a gradual rebound. Private Equity Real Estate plateaued in 2010-2011 and has remained unchanged since then.

The average annual percentage change for divested and non divested schools for 2006 to 2014 can be found in **FIGURE 5**. It depicts the average annual returns for divested and non divested institutions from 2006-2007 to 2013-2014. As mentioned in Section 3, prior to the 2009-2010 year, there were no divested schools. From 2009-2010 on, the returns of the schools that had divested were averaged and compared to the average returns of the schools that have currently divested but were not divested at the time.

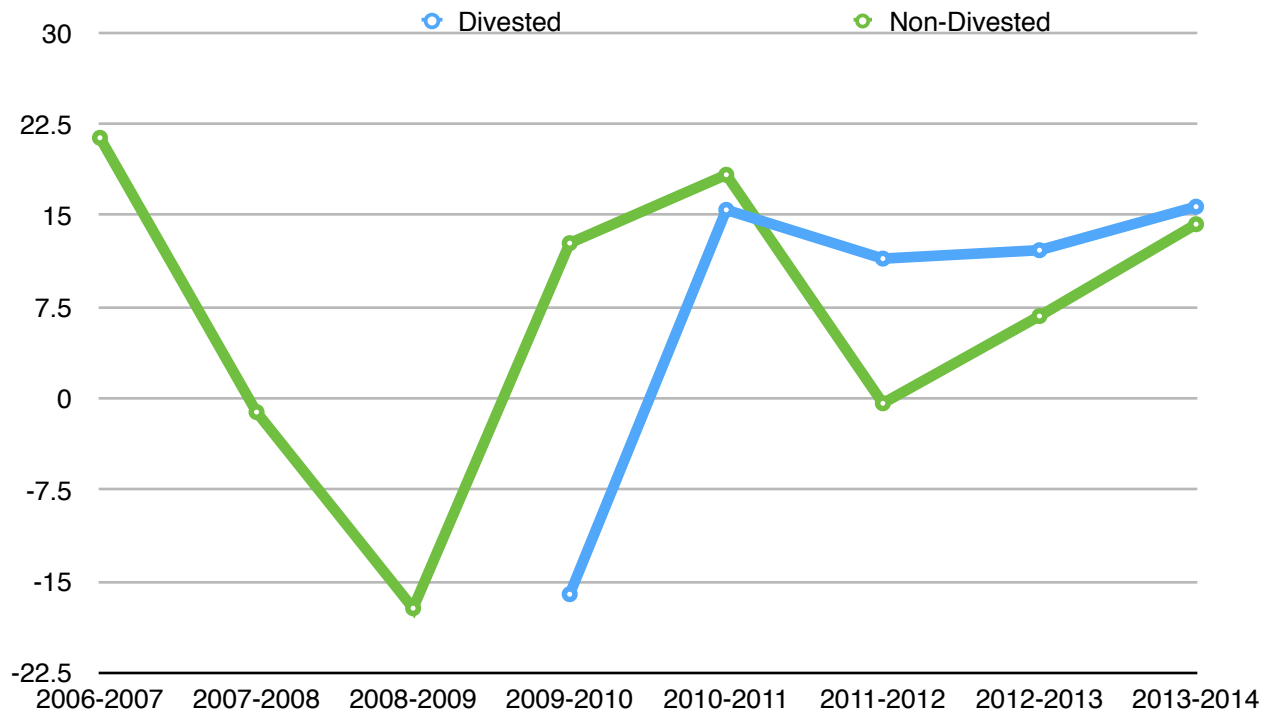


FIGURE 5: Average Annual Percentage Change for Divested v.s. Non-Divested Schools from 2006-2014

Prior to the 2009-2010 fiscal year, there were no divested institutions and therefore no data. This also coincides with the beginning of the recovery from the Recession of 2008. Understandably, the first divested school, Hampshire College, did not perform well in the year of their divestment but this year was very volatile. In the following years, the divested portfolio rebounded and ultimately surpassed the performance of the non divested portfolios. Since the 2011-2012 year, divested portfolios have continued to outperform the non divested portfolios though the two were close in 2013-2014. As more data becomes available for the divested schools and more schools divest, the average annual percentage change will be more representative of the performance of the divested portfolios. Though more complete data could change these results, excluding the year following the recession, divested portfolios produce a comparable and in many cases better returns than non divested portfolios.

CHAPTER 5: CONCLUSIONS AND FUTURE WORK

5.1 SUMMARY

The goal of this project was to develop a strong fact based argument surrounding the moral value of WPI's fossil fuel investments, the harmful effects of carbon emissions on the planet's atmosphere, divestment as an effective tactic and the financial feasibility of divesting an endowment portfolio from fossil fuels. The studies and data referenced throughout this project support my argument for divestment as a financially feasible and historically effective tactic. From the results of this project, it is clear that fossil fuels are under performing and volatile and have been this way over the past twenty years. Other assets are more productive and less volatile, making them suitable replacements for fossil fuel investments. Additionally, the endowment portfolios of divested schools have performed better than those of non divested schools on average though there is limited data due to the small timeframe and number of divested academic institutions. These financial figures reinforce the moral argument for divestment and must be brought to the attention of the Board of Trustees during the next petition for divestment. Since climate change is a global problem, a collective effort towards a global solution must be made. Though WPI is putting forth the effort to make its campus more environmentally friendly, divestment would have a further reaching effect. As part of a growing movement and as the first polytechnic institute to divest, WPI is in a unique position to demonstrate to other schools that divestment is possible without financial loss. WPI has the option to actively be part of the solution to global climate change or continue to contribute to the problem. The argument against the financial feasibility of divestment has been invalidated and divestment has been proven to be financially effective. Therefore, with the primary concern about the effectiveness of divestment addressed, the only excuse not to divest is now apathy.

5.2 DISCUSSION

Though the data I have shown supports my argument for divestment, there are some areas where it can be improved. If the divestment trend continues, 2016 will see more schools divest than any year prior (hopefully WPI) and more data will become available to continue this analysis. Data for schools that divested in 2014 and 2015 were not yet released during the completion of this project and that data would also be helpful in continuing this research. Divestment as a tactic also has limitations as discussed above. Divestment cannot have the desired impact without the movement that accompanies it. If more institutions do not continue to divest, the social injustice will fall from the attention of the public and the efforts of the movement will go unnoticed. Carbon emissions from fossil fuels are doing irreparable damage to our planet and the situation will only grow worse if no action is taken. As a responsible member of the academic and scientific community, it is WPI's duty to continue the movement and divest its endowment from fossil fuels.

Due to the limitations presented by the lack and large amount of data soon to be released, improvements can be made on this research. Future projects could use the data presented in this project and the new data to continue the analysis and determine if it is still valid. Additionally, to aid in the divestment process, it would be prudent to present the Board of Trustees with a reallocation strategy to redistribute the assets held in fossil fuels. This would give the Board of Trustees a guideline for divestment to consider and adjust accordingly. This information and the results of my project should address the biggest fiduciary concerns of the Board of Trustees and convince them to consider divestment as a legitimate option.

New climate data for 2015 has shown that it has been the hottest year on record. Time is running out and action must be taken to combat global climate change. The fate of the planet lies in the hands of this generation and the consequences of inaction are too great to continue

to ignore. Global action must be taken to combat climate change and WPI is not excluded from this. It is time to take a stance against climate change and become part of the solution instead of continuing to be part of the problem.

APPENDICES

APPENDIX A: LIST OF DIVESTED SCHOOLS

Divested School	State	Type of Divestment	Year Divested
Brevard College	NJ	Full	2015
California Institute of the Arts	CA	Full	2014
Chico State University	CA	Full	2014
College of the Atlantic	ME	Full	2011
ESF College Foundation Inc.	NY	Full	2015
Foothill-De Anza Community College Foundation	CA	Full	2013
Georgetown University	DC	Partial	2015
Goddard College	VT	Fossil Free	2015
Green Mountain College	VT	Full	2013
Hampshire College	MA	Full	2009
Humboldt State University	CA	Partial	2014
Naropa University	CO	Full	2013
Peralta Community College	CA	Full	2014
Pitzer College	CA	Full	2014
Prescott College	AZ	Partial	2014
Rhode Island School of Design	RI	Full	2015
San Francisco State University Foundation	CA	Coal and Tar Sands Only	2013
Stanford University	CA	Coal Only	2014
Sterling College	VT	Full	2013
Syracuse University	NY	Full	2015
The New School	NY	Full	2015
Unity College	ME	Full	2012
University of California	CA	Full	2015
University of Dayton	OH	Full	2014

Divested School	State	Type of Divestment	Year Divested
University of Hawaii	HI	Full	2015
University of Maine System	ME	Coal Only	2015
University of Massachusetts Foundation	MA	Coal Only	2015
University of Washington	WA	Coal Only	2015
Warren Wilson College	NC	Full	2015

Year	Number of New Divested US Schools
2009	1
2010	0
2011	1
2012	1
2013	5
2014	8
2015	13
Total	29

APPENDIX B: SELECTED DIVESTED SCHOOLS AND THEIR ANNUAL RETURNS FROM 2006 TO 2014

2006 to 2007

Divested School	Endowment Size 2006	Endowment Size 2007	Percentage Change
California Institute of the Arts	\$91,752,000	\$108,932,000	18.7%
Chico State University*	30,840,000	\$35,741,000	15.9%
College of the Atlantic*	N/A	\$19,999,000	N/A
Foothill-De Anza Community College Foundation	\$457,093,000	\$737,470,000	61.3%*
Georgetown University	\$834,497,000	\$1,059,343,000	26.9%
Hampshire College*	\$31,404,000	\$33,018,000	5.1%
Humboldt State University	\$16,083,000	\$18,797,000	16.9%
Pitzer College	\$86,336,000	\$106,364,000	23.2%
Rhode Island School of Design	\$304,729,000	\$380,033,000	24.7%
San Francisco State University Foundation	\$29,761,000	\$41,202,000	38.4%
Stanford University	\$14,084,676,000	\$17,164,836,000	21.9%
Syracuse University	\$908,371,000	\$1,086,143,000	19.6%
The New School	\$199,087,000	\$232,239,000	16.7%
University of California	\$5,733,621,000	\$6,439,436,000	12.3%
University of Dayton	\$353,424,000	\$410,355,000	16.1%
University of Hawaii	\$43,886,000	\$40,361,000	-8.0%

Divested School	Endowment Size 2006	Endowment Size 2007	Percentage Change
University of Maine	\$123,991,000	\$163,474,000	31.8%
University of Washington	\$1,794,370,000	\$2,184,374,000	21.7%

2007 to 2008

Divested School	Endowment Size 2007	Endowment Size 2008	Percentage Change
California Institute of the Arts	\$108,932,000	\$103,197,000	-5.3%
Chico State University*	\$35,741,000	\$34,656,000	-3.0%
College of the Atlantic*	\$19,999,000	\$19,480,000	-2.6%
Foothill-De Anza Community College Foundation	\$737,470,000	\$733,243,000	-0.6%
Georgetown University	\$1,059,343,000	\$1,059,075,000	-0.03%
Hampshire College*	\$33,018,000	\$34,632,000	4.9%
Humboldt State University	\$18,797,000	\$18,447,000	-1.9%
Pitzer College	\$106,364,000	\$100,131,000	-5.9%
Rhode Island School of Design	\$380,033,000	\$374,651,000	-1.4%
San Francisco State University Foundation	\$41,202,000	\$47,179,000	14.5%
Stanford University	\$17,164,836,000	\$17,200,000,000	0.2%
Syracuse University	\$1,086,143,000	\$984,779,000	-9.3%
The New School	\$232,239,000	\$213,986,000	-7.9%
University of California	\$6,439,436,000	\$6,217,340,000	-3.5%
University of Dayton	\$410,355,000	\$391,101,000	-4.7%

Divested School	Endowment Size 2007	Endowment Size 2008	Percentage Change
University of Hawaii	\$40,361,000	\$42,421,000	5%
University of Maine	\$163,474,000	\$159,033,000	-2.7%
University of Washington	\$2,184,374,000	\$2,262,149,000	3.6%

2008 to 2009

Divested School	Endowment Size 2008	Endowment Size 2009	Percentage Change
California Institute of the Arts	\$103,197,000	\$89,592,000	-13.2%
Chico State University*	\$34,656,000	\$36,807,000	6.2%
College of the Atlantic*	\$19,480,000	\$14,292,000	-26.6%
Foothill-De Anza Community College Foundation	\$733,243,000	\$716,013,000	-2.4%
Georgetown University	\$1,059,075,000	\$883,182,000	-16.6%
Hampshire College*	\$34,632,000	\$29,838,000	-13.8%
Humboldt State University	\$18,447,000	\$15,700,000	-14.9%
Pitzer College	\$100,131,000	\$77,414,000	-22.7%
Rhode Island School of Design	\$374,651,000	\$273,806,000	-26.9%
San Francisco State University Foundation	\$47,179,000	\$43,731,000	-7.3%
Stanford University	\$17,200,000,000	\$12,619,094,000	-26.6%
Syracuse University	\$984,779,000	\$658,248,000	-33.2%
The New School	\$213,986,000	\$176,078,000	-17.7%

Divested School	Endowment Size 2008	Endowment Size 2009	Percentage Change
University of California	\$6,217,340,000	\$4,937,483,000	-20.6%
University of Dayton	\$391,101,000	\$319,997,000	-18.2%
University of Hawaii	\$42,421,000	\$42,637,000	0.5%
University of Maine	\$159,033,000	\$112,956,000	-29.0%
University of Washington	\$2,262,149,000	\$1,649,159,000	-27.1%

2009 to 2010

Divested School	Endowment Size 2009	Endowment Size 2010	Percentage Change
California Institute of the Arts	\$89,592,000	\$98,201,000	9.6%
Chico State University*	\$36,807,000	\$38,958,000	5.8%
College of the Atlantic*	\$14,292,000	\$19,594,000	37.1%
Foothill-De Anza Community College Foundation	\$716,013,000	\$714,825,000	-0.2%
Georgetown University	\$883,182,000	\$1,009,736,000	14.3%
Hampshire College*	\$29,838,000	\$25,044,000	-16.1%
Humboldt State University	\$15,700,000	\$18,512,000	17.9%
Pitzer College	\$77,414,000	\$94,237,000	21.7%
Rhode Island School of Design	\$273,806,000	\$286,464,000	4.6%
San Francisco State University Foundation	\$43,731,000	\$49,019,000	12.1%

Divested School	Endowment Size 2009	Endowment Size 2010	Percentage Change
Stanford University	\$12,619,094,000	\$13,851,115,000	9.8%
Syracuse University	\$658,248,000	\$849,157,000	29.0%
The New School	\$176,078,000	\$187,346,000	6.4%
University of California	\$4,937,483,000	\$5,441,225,000	10.2%
University of Dayton	\$319,997,000	\$346,582,000	8.3%
University of Hawaii	\$42,637,000	\$46,747,000	9.6%
University of Maine	\$112,956,000	\$123,236,000	9.1%
University of Washington	\$1,649,159,000	\$1,829,868,000	11.0%

2010 to 2011

Divested School	Endowment Size 2010	Endowment Size 2011	Percentage Change
California Institute of the Arts	\$98,201,000	\$118,865,000	21.0%
Chico State University*	\$38,958,000	\$43,021,000	10.4%
College of the Atlantic*	\$19,594,000	\$25,390,000	29.6%
Foothill-De Anza Community College Foundation	\$714,825,000	\$889,633,000	24.5%
Georgetown University	\$1,009,736,000	\$1,160,291,000	14.9%
Hampshire College*	\$25,044,000	\$28,917,000	15.5%
Humboldt State University	\$18,512,000	\$22,007,000	18.9%
Pitzer College	\$94,237,000	\$113,731,000	20.7%

Divested School	Endowment Size 2010	Endowment Size 2011	Percentage Change
Rhode Island School of Design	\$286,464,000	\$318,678,000	11.2%
San Francisco State University Foundation	\$49,019,000	\$48,954,000	-0.1%
Stanford University	\$13,851,115,000	\$16,502,606,000	19.1%
Syracuse University	\$849,157,000	\$913,662,000	7.6%
The New School	\$187,346,000	\$216,082,000	15.3%
University of California	\$5,441,225,000	\$6,342,217,000	16.6%
University of Dayton	\$346,582,000	\$414,504,000	19.6%
University of Hawaii	\$46,747,000	\$67,189,000	43.7%
University of Maine	\$123,236,000	\$149,060,000	21.0%
University of Washington	\$1,829,868,000	\$2,154,494,000	17.7%

2011 to 2012

Divested School	Endowment Size 2011	Endowment Size 2012	Percentage Change
California Institute of the Arts	\$118,865,000	\$113,190,000	-4.8%
Chico State University*	\$43,021,000	\$42,174,000	-2.0%
College of the Atlantic*	\$25,390,000	\$29,288,000	15.4%
Foothill-De Anza Community College Foundation	\$889,633,000	\$854,043,000	-4.0%
Georgetown University	\$1,160,291,000	\$1,141,752,000	-1.6%
Hampshire College*	\$28,917,000	\$31,103,000	7.6%

Divested School	Endowment Size 2011	Endowment Size 2012	Percentage Change
Humboldt State University	\$22,007,000	\$22,270,000	1.2%
Pitzer College	\$113,731,000	\$110,203,000	-3.1%
Rhode Island School of Design	\$318,678,000	\$297,207,000	-6.7%
San Francisco State University Foundation	\$48,954,000	\$49,003,000	0.1%
Stanford University	\$16,502,606,000	\$17,035,804,000	3.2%
Syracuse University	\$913,662,000	\$940,056,000	2.9%
The New School	\$216,082,000	\$204,783,000	-5.2%
University of California	\$6,342,217,000	\$5,962,906,000	-6.0%
University of Dayton	\$414,504,000	\$397,794,000	-4.0%
University of Hawaii	\$67,189,000	\$84,669,000	26.0%
University of Maine	\$149,060,000	\$148,298,000	-0.5%
University of Washington	\$2,154,494,000	\$2,111,332,000	-2.0%

2012 to 2013

Divested School	Endowment Size 2012	Endowment Size 2013	Percentage Change
California Institute of the Arts	\$113,190,000	\$115,310,000	1.9%
Chico State University*	\$42,174,000	\$48,498,000	15.0%
College of the Atlantic*	\$29,288,000	\$35,751,000	22.1%
Foothill-De Anza Community College Foundation	\$854,043,000	\$919,455,000	7.7%

Divested School	Endowment Size 2012	Endowment Size 2013	Percentage Change
Georgetown University	\$1,141,752,000	\$1,286,323,000	12.7%
Hampshire College*	\$31,103,000	\$31,795,000	2.2%
Humboldt State University	\$22,270,000	\$24,427,000	9.7%
Pitzer College	\$110,203,000	\$118,358,000	7.4%
Rhode Island School of Design	\$297,207,000	\$313,194,000	5.4%
San Francisco State University Foundation	\$49,003,000	\$55,201,000	12.6%
Stanford University	\$17,035,804,000	\$18,688,868,000	9.7%
Syracuse University	\$940,056,000	\$1,053,214,000	12.0%
The New School	\$204,783,000	\$213,863,000	4.4%
University of California	\$5,962,906,000	\$6,377,379,000	7.0%
University of Dayton	\$397,794,000	\$442,252,000	11.2%
University of Hawaii	\$84,669,000	\$59,601,000	-29.6%
University of Maine	\$148,298,000	\$162,835,000	9.8%
University of Washington	\$2,111,332,000	\$2,346,693,000	11.1%

2013 to 2014

Divested School	Endowment Size 2013	Endowment Size 2014	Percentage Change
California Institute of the Arts	\$115,310,000	\$137,535,000	19.3%
Chico State University*	\$48,498,000	\$52,563,000	8.4%

Divested School	Endowment Size 2013	Endowment Size 2014	Percentage Change
College of the Atlantic*	\$35,751,000	\$45,295,000	26.7%
Foothill-De Anza Community College Foundation	\$919,455,000	\$915,680,000	-0.4%
Georgetown University	\$1,286,323,000	\$1,461,276,000	13.6%
Hampshire College*	\$31,795,000	\$37,567,000	18.2%
Humboldt State University	\$24,427,000	\$27,724,000	13.5%
Pitzer College	\$118,358,000	\$134,289,000	13.5%
Rhode Island School of Design	\$313,194,000	\$337,954,000	7.9%
San Francisco State University Foundation	\$55,201,000	\$65,385,000	18.4%
Stanford University	\$18,688,868,000	\$21,446,006,000	14.8%
Syracuse University	\$1,053,214,000	\$1,183,244,000	12.3%
The New School	\$213,863,000	\$299,890,000	40.2%
University of California	\$6,377,379,000	\$7,384,410,000	15.8%
University of Dayton	\$442,252,000	\$510,107,000	15.3%
University of Hawaii	\$59,601,000	\$52,742,000	-11.5%
University of Maine	\$162,835,000	\$189,151,000	16.1%
University of Washington	\$2,346,693,000	\$2,832,753,000	20.7%

APPENDIX C: AVERAGE ASSET ALLOCATION AND RETURNS FOR ACADEMIC INSTITUTIONS WITH ENDOWMENTS VALUED BETWEEN \$101 MILLION and \$500 MILLION FROM 2009 TO 2013

**Returns for Endowments Valued Between \$101 Million and \$500 Million From 2008-2009
to 2012-2013**

	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013
Total Annual Net Return	-20%	12%	20%	-1%	12%
3-Year Net Return	-3%	-4%	3%	10%	10%
5-Year Net Return	3%	3.0%	4%	1%	4%
10-Year Net Return	4%	3%	5%	6.0%	7.0%

**Average Asset Allocation for Endowments Valued Between \$101 Million and \$500 Million
From 2008-2009 to 2012-2013**

	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013
Domestic Equity	26%	25%	27%	25%	27%
Fixed Income	17%	17%	15%	16%	15%
International Equity	17%	17%	18%	18%	19%
Short-Term Securities/ Cash/Other	7%	6%	5%	5%	5%
Alternative Strategies*	33%	35%	35%	36%	34%

**Average Allocation of Alternative Strategies Assets for Endowments Valued Between
\$101 Million and \$500 Million From 2008-2009 to 2012-2013**

	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013
Total Percentage of the Endowment	33%	35%	35%	36%	34%
Private Equity	17%	17%	18%	19%	17%
Marketable Alternative Strategies	54%	55%	53%	50%	50%
Venture Capital	5%	4%	4%	5%	6%
Private Equity Real-Estate	7%	6%	7%	8%	9%
Distressed Debt	5%	5%	4%	4%	6%
Energy and Natural Resources	12%	13%	14%	14%	12%

**Average Returns by Asset for Endowments Valued Between \$101 Million and \$500 Million
From 2008-2009 to 2012-2013**

	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013
Domestic Equity	-26%	16%	31%	2%	21%
Fixed Income	3%	12%	7%	6%	2%
International Equity	-28%	12%	27.0%	-11%	14%
Short-Term Securities/ Cash/Other	-2%	3%	5%	0%	2%
Alternative Strategies*	-18%	8%	15%	1%	9%

Average Returns For Alternative Strategies Investments for Endowments Valued Between

\$101 Million and \$500 Million From 2008-2009 to 2012-2013

	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013
Private Equity	-19%	14%	19%	4%	7%
Marketable Alternative Strategies	-12%	10%	9.0%	-2%	11%
Venture Capital	-16%	10%	20%	5%	5%
Private Equity Real-Estate	-30%	-16%	11%	9%	10%
Distressed Debt	-13%	25%	15%	2%	13%
Energy and Natural Resources	-33%	13%	22.0%	-1%	4%

WPI's Endowment From 2008-2009 to 2012-2013

	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	Average
Annual Value	\$384,753- \$291,603	\$291,603- \$307,680	\$307,680- \$374,430	\$374,430- \$358,640	\$358,640- \$389,310	
Change in Market Value	-24%	6%	22%	-4%	9%	1%
Dollar Value of Investments in Energy and Natural Resources	\$11,547,478. .00	\$13,999,440 .00	\$18,347,070 .00	\$18,075,456 .00	\$15,883,848 .00	\$15,570,658 .40
Percentage of Endowment Invested in Energy and Natural Resources	4%	5%	5%	5%	4%	5%

APPENDIX D: ASSET CLASS HISTORICAL RETURNS FROM 1995 TO 2014

Historic Asset Performance From 1995 to 1999

1995	1996	1997	1998	1999
Large Cap Value 38.36%	Real Estate 35.27%	Large Cap Value 35.18%	Large Cap Growth 38.71%	Commodities 40.92%
Large Cap Growth 37.18%	Commodities 33.92%	Large Cap Growth 30.49%	International Equity 20.00%	Large Cap Growth 33.16%
Mid Caps 34.45%	Large Cap Growth 23.12%	Mid Cap 29.01%	Large Cap Value 15.63%	International Equity 26.96%
Small Cap 28.45%	Large Cap Value 21.64%	Small Cap 22.36%	Mid Cap 10.09%	Small Cap 21.26%
Commodities 20.33%	Mid Cap 19.00%	Real Estate 20.26%	Fixed Income 8.69%	Mid Cap 18.23%
Fixed Income 18.47%	Small Cap 16.49%	Fixed Income 9.65%	Small Cap -2.55%	Large Cap Value 7.35
Real Estate 15.27%	International Equity 6.05%	International Equity 1.78%	Real Estate -17.50%	Fixed Income -0.82%
International Equity 11.21%	Fixed Income 3.63%	Commodities -14.07%	Commodities -35.75%	Real Estate -4.62%

Historic Asset Performance From 2000 to 2004

2000	2001	2002	2003	2004
Commodities 49.74%	Real Estate 13.93%	Commodities 32.07%	Small Cap 47.25%	Real Estate 31.58%
Real Estate 26.37%	Fixed Income 8.44%	Fixed Income 10.25%	Mid Cap 40.06%	International Equity 20.25%
Fixed Income 11.63%	Small Cap 2.49%	Real Estate 3.82%	International Equity 38.59%	Mid Cap 20.22%
Mid Cap 8.25%	Large Cap Value -5.59%	Large Cap Value -15.52%	Real Estate 37.13%	Small Cap 18.33%
Large Cap Value 7.01%	Mid Cap -5.62%	International Equity -15.94%	Large Cap Value 30.03%	Commodities 17.28%
Small Cap -3.02%	Large Cap Growth -20.42%	Mid Cap -16.19%	Large Cap Growth 29.75%	Large Cap Value 16.49%
International Equity -14.17%	International Equity -21.44%	Small Cap -20.48%	Commodities 20.72%	Large Cap Growth 6.30%
Large Cap Growth -22.42%	Commodities -31.93%	Large Cap Growth -27.88%	Fixed Income 4.10 %	Fixed Income 4.34%

Historic Asset Performance From 2005 to 2009

2005	2006	2007	2008	2009
Commodities 25.55%	Real Estate 35.06%	Commodities 32.67%	Fixed Income 5.24%	Mid Cap 40.48%
International Equity 13.54%	International Equity 26.34%	Large Cap Growth 11.81%	Small Cap -33.79%	Large Cap Growth 37.21%
Mid Cap 12.65%	Large Cap Value 22.25%	International Equity 11.17%	Large Cap Value -36.85%	International Equity 31.78%
Real Estate 12.16%	Small Cap 18.37%	Fixed Income 6.97%	Real Estate -37.73%	Real Estate 27.99%
Large Cap Value 7.05%	Mid Cap 15.26%	Mid Cap 5.60%	Large Cap Growth -38.44%	Small Cap 27.17%
Large Cap Growth 5.26%	Large Cap Growth 9.07%	Large Cap Value -0.17%	Mid Cap -41.46	Large Cap Value 19.69%
Small Cap 4.55%	Fixed Income 4.33%	Small Cap -1.57%	International Equity -43.38%	Commodities 13.48%
Fixed Income 2.43%	Commodities -15.09%	Real Estate -15.69%	Commodities -46.49%	Fixed Income 5.93%

Historic Asset Performance From 2010 to 2014 and Average

2010	2011	2012	2013	2014	Average
Real Estate 27.95%	Real Estate 8.28%	Real Estate 19.70%	Large Cap Growth 38.82%	Real Estate 28.03%	Mid Cap 13.96%
Large Cap Growth 26.85%	Mid Cap 7.84%	International Equity 17.51%	Large Cap Value 34.76%	Large Cap Value 13.45%	Real Estate 13.51%
Large Cap Value 25.48%	Small Cap 2.84%	Commodities 17.32%	Small Cap 33.48%	Mid Cap 13.22%	Large Cap Value 12.10%
Small Cap 16.71%	International Equity 0.39%	Large Cap Value 17.28%	International Equity 32.53%	Large Cap Growth 13.05%	Large Cap Growth 11.70%
International Equity 15.51%	Fixed Income -1.18%	Large Cap Growth 16.35%	Commodities 22.78%	Fixed Income 5.97%	Small Cap 11.40%
Fixed Income 9.03%	Large Cap Value -1.55%	Small Cap 15.26%	Real Estate 2.86%	Small Cap 4.89%	International Equity 7.19%
Commodities 7.75%	Large Cap Growth -4.18%	Mid Cap 4.22%	Fixed Income -1.22%	International Equity -4.90%	Fixed Income 6.29%
Mid Cap 6.54%	Commodities -12.14%	Fixed Income 0.08%	Mid Cap -2.02%	Commodities -33.06%	Commodities 5.85%

Annual Returns and Standard Deviations for Large Cap Growth and Large Cap Value Assets From 1995 to 2014

	Large Cap Growth Returns	Large Cap Growth Variance	Large Cap Value Returns	Large Cap Value Variance
1995	37.18	624.5001	38.36	663.5776
1996	23.12	119.4649	21.64	81.7216
1997	30.49	334.89	35.18	509.8564
1998	38.71	703.3104	15.63	9.180900000000001
1999	33.16	439.7409	7.35	27.5625
2000	-22.42	1197.8521	7.01	31.2481
2001	-20.42	1063.4121	-5.59	330.8761
2002	-27.88	1605.6049	-15.52	790.7344
2003	29.75	308.3536	30.03	303.8049
2004	6.30	34.69	16.49	15.1321
2005	5.26	48.0249	7.05	30.8025
2006	9.07	9.7344	22.25	93.1225
2007	11.81	0.14439999999999999	-0.17	163.0729
2008	-38.44	2563.3969	-36.85	2445.3025
2009	37.21	626.0004	19.69	50.2681
2010	26.85	214.9156	25.48	165.8944
2011	-4.18	267.9769	-1.55	200.2225
2012	16.35	17.3056	17.28	21.9024

	Large Cap Growth Returns	Large Cap Growth Variance	Large Cap Value Returns	Large Cap Value Variance
2013	38.82	709.1569	34.76	491.0656
2014	13.05	0.7396000000000002	13.45	0.7224999999999999
Average	12.1895	544.460835	12.5985	321.303525
Standard Deviation		23.3336845568804		17.9249414224984

Annual Returns and Standard Deviations for Mid Cap and Small Cap Assets From 1995 to 2014

	Mid Cap Returns	Mid Cap Variance	Small Cap Returns	Small Cap Variance
1995	34.45	550.3716	28.45	307.6516
1996	19.00	64.16	16.49	31.1364
1997	29.01	324.7204	22.36	131.1025
1998	10.09	0.8100000000000001	-2.55	181.1716
1999	18.23	52.4176	21.26	107.1225
2000	8.25	7.5076	-3.02	194.0449
2001	-5.62	275.8921	2.49	70.8964
2002	-16.19	738.7524	-20.48	985.3321
2003	40.06	845.0649	47.25	1320.5956
2004	20.22	85.1929	18.33	55.0564
2005	12.65	2.7556	4.55	40.4496
2006	15.26	18.2329	18.37	55.6516
2007	5.60	29.05	-1.57	155.7504
2008	-41.46	2751.0025	-33.79	1998.09
2009	40.48	869.6601	27.17	264.3876

	Mid Cap Returns	Mid Cap Variance	Small Cap Returns	Small Cap Variance
2010	6.54	19.8025	16.71	33.64
2011	7.84	9.9225	2.64	68.3929
2012	4.22	45.8329	15.26	18.9225
2013	-2.02	169.2601	33.48	509.4049
2014	13.22	4.9729	4.89	36.2404
Average	10.9915	343.269185	10.9145	328.251995
Standard Deviation		18.527525064077		18.1177259886554

**Annual Returns and Standard Deviations for International Equity and Real- Estate From
1995 to 2014**

	International Equity Returns	International Equity Variance	Real-Estate Returns	Real-Estate Variance
1995	11.21	6.3504000000000001	15.27	3.0976
1996	6.05	6.9696	35.27	473.4976
1997	1.78	47.7481	20.26	45.5625
1998	20.00	127.92	-17.50	961.62
1999	26.96	333.7929	-4.62	328.6969
2000	-14.17	522.5796	26.37	165.3796
2001	-21.44	907.8169	13.93	0.1764
2002	-15.94	606.6369	3.82	93.8961
2003	38.59	894.01	37.13	557.9044
2004	20.25	133.6336	31.58	326.5249
2005	13.54	23.5225	12.16	1.8225
2006	26.34	311.5225	35.06	464.4025
2007	11.17	6.1504	-15.69	852.64

	International Equity Returns	International Equity Variance	Real-Estate Returns	Real-Estate Variance
2008	-43.38	2711.2849	-37.73	2625.5376
2009	31.78	533.1481	27.99	209.6704
2010	15.51	46.5124	27.95	208.5136
2011	0.39	68.89	8.28	27.3529
2012	17.51	77.7924	19.70	38.32
2013	32.53	568.3456	2.86	113.4225
2014	-4.90	184.69	28.03	210.8304
Average	8.689	405.96555	13.506	385.44323
Standard Deviation		20.148586799078 5		19.632708167749

Annual Returns and Standard Deviations for Commodities and Fixed Income Assets

From 1995 to 2014

	Commodities Returns	Commodities Variance	Fixed Income Returns	Fixed Income Variance
1995	20.33	169.7809	18.47	160.5289
1996	33.92	708.6244	3.63	4.7089
1997	-14.07	456.6769	9.65	14.8225
1998	-35.75	1853.3025	8.69	8.3521
1999	40.92	1130.3044	-0.82	43.8244
2000	49.74	1801.1536	11.63	33.9889
2001	-31.93	1538.9929	8.44	6.9696
2002	32.07	613.5529	10.25	19.8025
2003	20.72	180.0964	4.10	2.89
2004	17.28	99.6004	4.34	2.1316
2005	25.55	333.0625	2.43	11.3569

	Commodities Returns	Commodities Variance	Fixed Income Returns	Fixed Income Variance
2006	-15.09	501.3121	4.33	2.1609
2007	32.67	643.6369	6.97	1.3689
2008	-46.49	2893.3641	5.24	0.3136
2009	13.48	38.1924	5.93	0.0169
2010	7.75	0.2025	9.03	10.4329
2011	-12.14	377.9136	-1.18	48.7204
2012	17.32	100.4004	0.08	32.7184
2013	22.78	239.6304	-1.22	49.2804
2014	-33.06	1628.9296	5.97	0.0289
Average	7.3	765.43649	5.798	22.72088
Standard Deviation		27.6665229112731		4.76664242418078

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