THESIS

BUILDING EQUITY IN ADDICTION: IS THERE POTENTIAL FOR HIGHER RETURNS

FROM STOCKS WITH PRODUCTS AND SERVICES ASSOCIATED WITH ADDICTION?

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ABSTRACT

BUILDING EQUITY IN ADDICTION: IS THERE POTENTIAL FOR HIGHER RETURNS

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Industries associated with addiction have long been some of the most profitable

businesses on the planet. In both good times and bad, human beings seem to be drawn to

activities – whether having a drink, smoking a cigarette, or venturing to the local casino – that

fall into the category of vice and have a history of being associated with addiction. An

individual going through tough times may be sitting in their apartment drinking the same scotch

as persons celebrating a colleagues' promotion in the pub across the street. Merriam-Webster

defines vice as 'a moral depravity or corruption, a moral fault or failing, or a habitual and usually

trivial defect or shortcoming' (Merriam-Webster, 2020). As societal norms become more

relaxed with time, some activities previously considered to be controversial, reflective of bad

habits, or provided with the risk of developing a dependency are becoming more tolerated. In

some cases, even previously illegal products are becoming legalized. This gives some

companies with products and services considered potentially addictive in nature the opportunity

to enter new markets and yield potentially higher returns for investors, albeit at the cost of

promoting and providing the means to participate in socially harmful activities. What level of

possible investment returns can investors taking equity in alcohol, tobacco, gambling, and

cannabis companies expect?

As far back as 2001, a report commissioned by Credit Suisse First Boston found that vice

as a market sector outperformed the market as a whole and held up particularly well during past

recession periods[1]. If investing in companies associated with addiction and vice has produced

attractive market returns for investors in the past, will a portfolio of investments in stocks

specifically offering potentially addictive products and services produce similar results? Can

investors taking equity in companies associated with potentially addictive products such as

alcohol, tobacco, gambling, and cannabis expect higher returns versus investing in the S&P500

market index?

      The goal of this thesis is to explore whether investors can expect higher returns from

investments associated with potentially addictive products and human vices when compared with

returns of the broader market represented by the S&P500 index. We will construct an

investment portfolio of stocks based on addictive products, and study how individual stocks in

the portfolio correlate to overall market performance (betas vs benchmarks) by completing both

equally weighted and market value-based analysis. We also perform regressions with the

CAPM, Fama-French three-factor, and several control variable augmented models to analyze

return performance of the addiction portfolio as compared to the S&P500.

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[1]*Waxler, C. "How to Crush the Market with Vice-Based Investing." John Wiley & Sons. Published 2004.*

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CHAPTER 1 – INTRODUCTION

Industries associated with addiction have long been some of the most profitable

businesses on the planet. In both good times and bad, human beings seem drawn to activities –

whether having a drink, smoking a cigarette, or venturing to the local casino – that fall into the

category of vice and have a history of being associated with addiction. An individual going

through tough times may be sitting in their apartment drinking the same scotch as persons

celebrating a colleagues' promotion in the pub across the street. Merriam-Webster defines vice

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As far back as 2001, a report commissioned by Credit Suisse First Boston found that vice

as a market sector outperformed the market as a whole and held up particularly well during past

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has produced attractive market returns for investors in the past, will a portfolio of investments in

stocks specifically offering potentially addictive products and services produce similar results?

Can investors taking equity in companies offering products and services associated with

addiction such as alcohol, tobacco, gambling, and cannabis expect higher returns versus investing in the S&P500 market index?

It is important to note for those in the investment community that there are alternatives to investments in both the broader market, and those related to addiction and vice. These alternative investment options are rooted in principles based on Socially Responsible Investing (SRI), Corporate Social Responsibility (CSR), as well as ratings based on Environmental, Social, and Governance (ESG) criteria. SRI and CSR standards are satisfied by screening stocks using a subjective process that weeds out those participating in socially irresponsible or deviant activities. SRI screening processes vary between organizations, for example, with differing religious backgrounds or political beliefs. This technique allows individual investors, mutual funds, and other institutions to put their money in publicly traded companies that have business practices they respect and do not participate in activities considered by some to be destructive to society. ESG criteria includes factors that take into consideration a company's approach to mitigating their environmental impacts, enhancing shareholder rights, installing performance-based executive compensation, and managing relationships with the communities where they operate. These stock screening processes allow the socially responsible or ethical investor to accomplish their goals, although expenses such as management fees being charged by these fund managers may be higher due to more rigorous selection requirements.

Although producing mixed performance results over time, the benefits of investing in companies with high SRI or ESG ratings has proven beneficial for investors in recent performance periods. A 2012 study by Deutsche Bank Group's Climate Change Investment Research Team came to the following conclusion regarding companies with high ESG and CSR ratings: "There is overwhelming academic evidence, within all (100%) of the studies that we

have found showing that firms with high ratings for CSR and ESG factors have a lower (ex-ante) cost of capital in terms of debt (loans and bonds) and equity" (Deutsche Bank Climate Change Advisors (DBCCA), 2012). However, the discussion also notes "Looking at SRI securities studies, we find a less compelling story at the security level, although more positive and neutral than negative – 42% of studies that we have found show that high-scoring firms in terms of SRI exhibit higher market-based performance relative to lower-scoring sectors" (DBCCA, 2012). Like the mixed performance results of SRI investments, some of the stocks we consider for this project may be open to debate regarding social desirability and acceptance. For example, recent research highlights the medical benefits of products offered by cannabis companies to be less socially harmful than previously thought, as they often provide positive medical benefits regarding management of anxiety, pain, and seizures.

For our study on addiction related equity performance, we will construct an investment portfolio of companies offering products or services affiliated with addiction, and study how individual stocks in the portfolio correlate to overall market performance (betas vs benchmarks) by completing both equally weighted and market value-based analysis. We also perform regressions with the CAPM, Fama-French three-factor, and several control variable augmented models to analyze return performance of the addiction portfolio as compared to the S&P500. The investigation will attempt to determine if investors will experience a potentially higher return on investment from companies affiliated with addiction when compared with a more traditional investment in the broader United States (U.S.) economy represented by the S&P500 market index.

Overview of Vice Industries in United States

Opinions of what is considered a vice – and potentially addiction – related investment vary across individuals, communities, and societies. For example, an individual investor in Europe may consider an investment in a tobacco firm morally acceptable while at the same time deeming an investment in a company associated with weapons production and/or defense contracts a sin stock. An individual investor in the U.S., however, may have the exact opposite opinion. For the purposes of this thesis, we will limit the stocks considered addiction or vice driven to companies in four categories – alcohol (brewers, distillers & vintners), casinos & gaming, cannabis, and tobacco, as presented in *Table #1*.

Table #1: Addiction Stock Portfolio qualifying criteria

Addiction Portfolio sector	Qualifying criteria
Alcohol - *brewers*	Producers of beer and malt liquors. Includes breweries not classified in the Restaurants Sub-Industry.
Alcohol - *distillers & vintners*	Distillers, vintners and producers of alcoholic beverages not classified in the Brewers Sub-Industry.
Cannabis	Produces, distributes, or consuming cannabis products, or any ancillary products and services concerning cannabis.
Casinos & gaming	Owners and operators of casinos and gaming facilities. Includes companies providing lottery and betting services.
Tobacco	Manufacturers of cigarettes and other tobacco products.

Note: GICS Map 2018 - Definitions of Investment Sectors by Industry, Industry Group, and sub-Industry (Published by MSCI Inc., September 28, 2018)

Consumer interest in addictive products has provided sources of possible growth for their providers over the long-term. Companies delivering conceivably addictive products to the marketplace are often accused of knowingly marketing to an underage audience, and the resulting consumption may point to this strategies effectiveness. "Every day in America, about 20,000 people over the age of twelve try drugs or alcohol for the first time. Nine out of ten addicts started using before the age of eighteen" (Sheff, 2014). As consumers age, gain work

experience and develop their careers, personal income potential often increases. This provides

consumers more disposable income to spend on addictive products if they so choose, potentially

driving up investment returns for these companies. In the U.S. alone, retail alcohol sales –

including beer, wine, and distilled spirits – exceeded $252 billion in 2019 (Statista.com online,

Total alcoholic beverage sales in the U.S. 2006-2019, published 2020). *Figure #1* shows

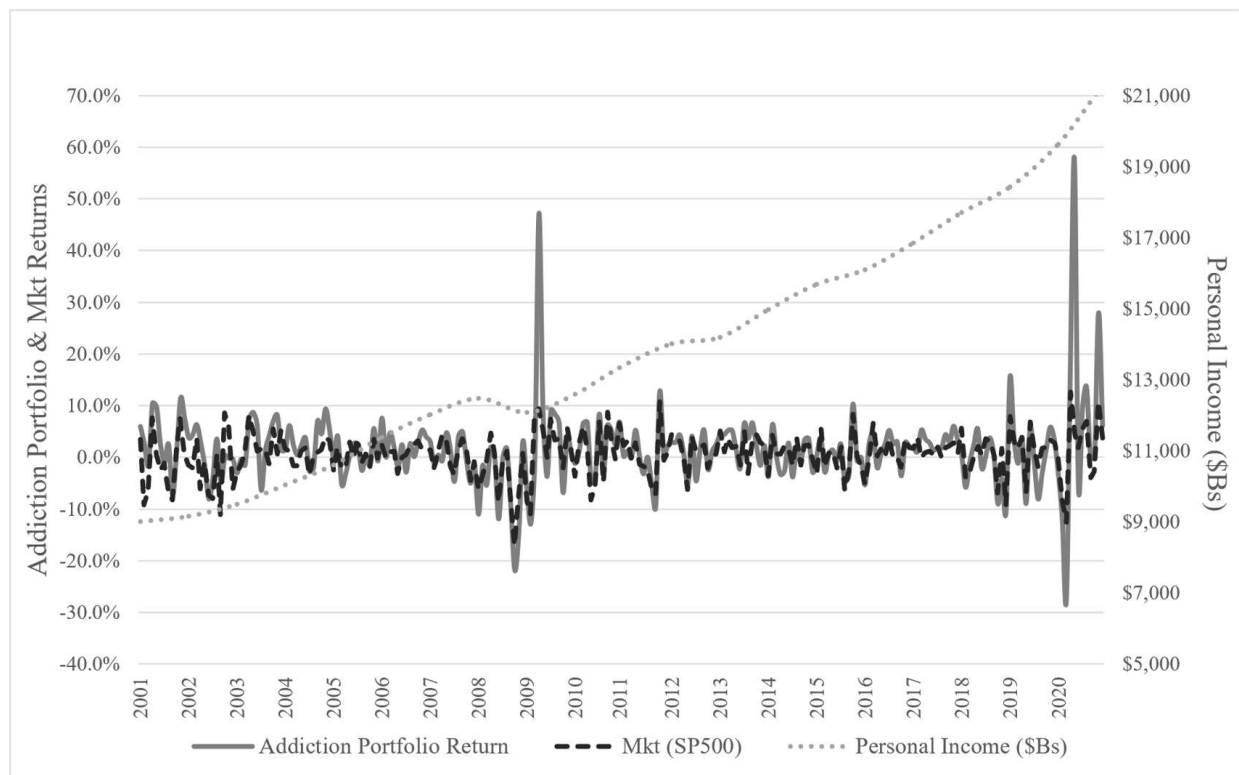consumer personal income (in $Bs) presented alongside returns for the addiction portfolio

***Figure #1: Personal Income ($Bs), Addiction Portfolio & S&P500 Returns (month-to-month %
change) from 2001-2020. Notes: Personal Income data per U.S. Bureau of Economic Analysis.***

and S&P500. Looking at *Figure #1*, we see small correlations between drops in personal income

from 2008-2009 and deteriorated investment performance for the addiction portfolio from 2009-

2010, as well as periods displaying little correlation with drops in expendable income such as

2018-2020 during which personal income increased consistently and addiction portfolio returns

varied widely. If the addictive nature of products and services helps sustain revenues for

companies in the addiction portfolio, this impact may be a factor driving higher returns for investors.

Another line of business often associated with addiction is the U.S. gambling industry. Investing in casinos and gaming provides an avenue to potential profits from the addictive personality traits of consumers. Although technically a different category of addiction versus struggling with substances, "The current diagnosis for pathological gambling includes several criteria similar to alcohol and drug dependence: increasing tolerance (i.e., needs to gamble more money to achieve the desired excitement); symptoms of withdrawal if gambling stopped or reduced; and inability to stop or reduce gambling" (American Psychiatric Association (APA), 1994). The steady increase in personal income shown in *Figure #1* provides consumers the means to support hobbies such as casinos and sports gambling, increasing the economic value of those activities and potential investment returns. A study examining the performance of gaming stocks over a twenty-year period 1973-1992 concluded gaming stocks tend to be more volatile than the overall market and provided greater returns than the overall market over that time span (Goodall, 1994). *Figure #2* shows returns for the addiction portfolio and S&P500 along with GDP yearly percentage change from 2001-2020. During extended periods of GDP growth, consumers tend to spend more on entertainment and frivolous activities, providing the potential for increased sales and profits for the gambling industry and increased returns for investors.

As shown in the *Figure #2,* there is a positive relationship between the growth in value of economic activity as represented by GDP and increased investment returns. In early 2009 and 2020 when GDP began to increase sharply, we see a corresponding spike in return on investment
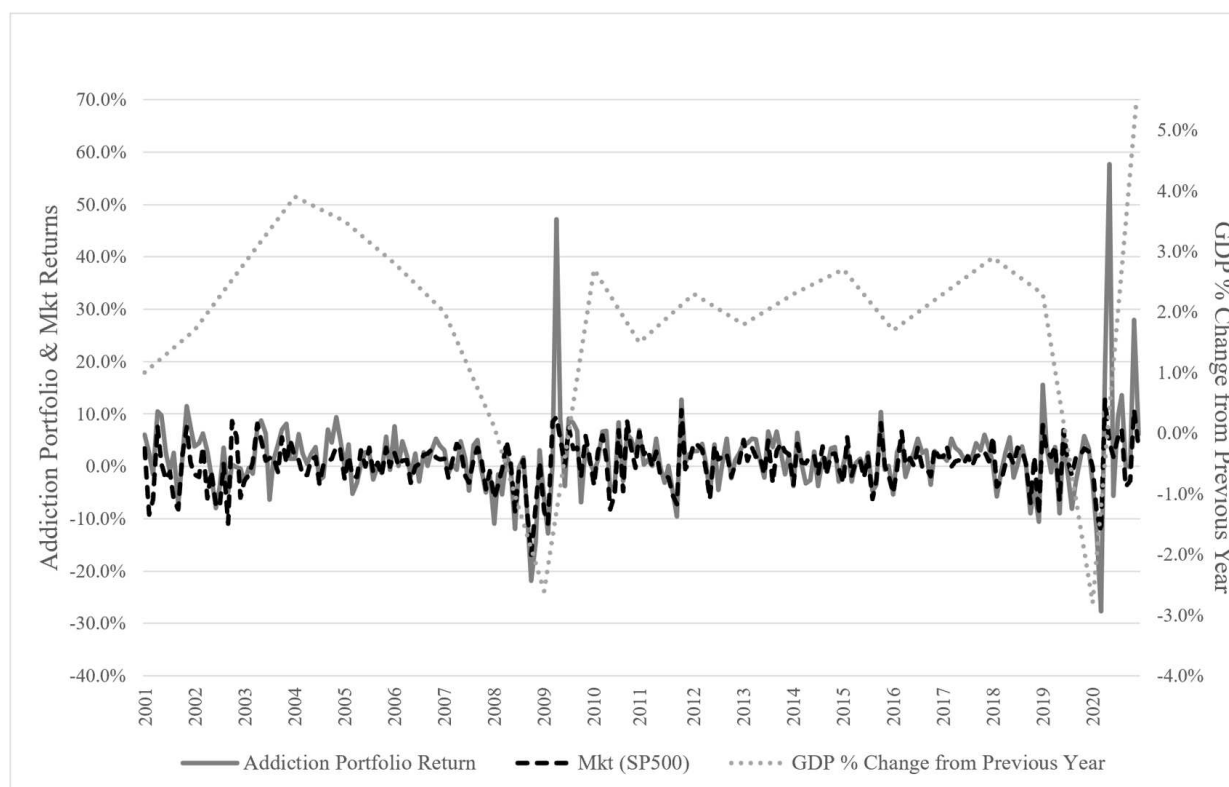
Figure #2: GDP Change from Previous Year (%), Addiction Portfolio & S&P500 Returns (month-to-month % change) from 2001-2020. Notes: GDP data per U.S. Bureau of Economic Analysis.

for the addiction portfolio thereafter. Investors taking positions in publicly traded casino & gaming companies have experienced consistent returns on their investments going back decades. Cities such as Las Vegas and Atlantic City are popular destinations for people looking to celebrate and get festive, providing easy access to a variety of gaming and gambling opportunities. This environment provides even higher potential for investor profits as many of the individuals vacationing in these destinations are also drinking, smoking, and attending adult shows and strip clubs in addition to gambling. The most popular U.S. gaming destinations are a one-stop-shop for everything vice, resulting in potentially attractive investment opportunities for investors taking stake in sports gaming companies and casinos.

In addition to alcohol and gambling, other products considered to be addictive in nature – the tobacco and cannabis industries – have provided some of the most volatile and lucrative

profits for investors in recent history. With an estimated over one billion people (approximately

19% of the adult population worldwide) actively participating in this vice (Statista.com online,

Smoking - Statistics & Facts, 2020), there are ample opportunities for companies to pursue

profits. *Figure #3* shows returns for the addiction portfolio and S&P500 along with annual

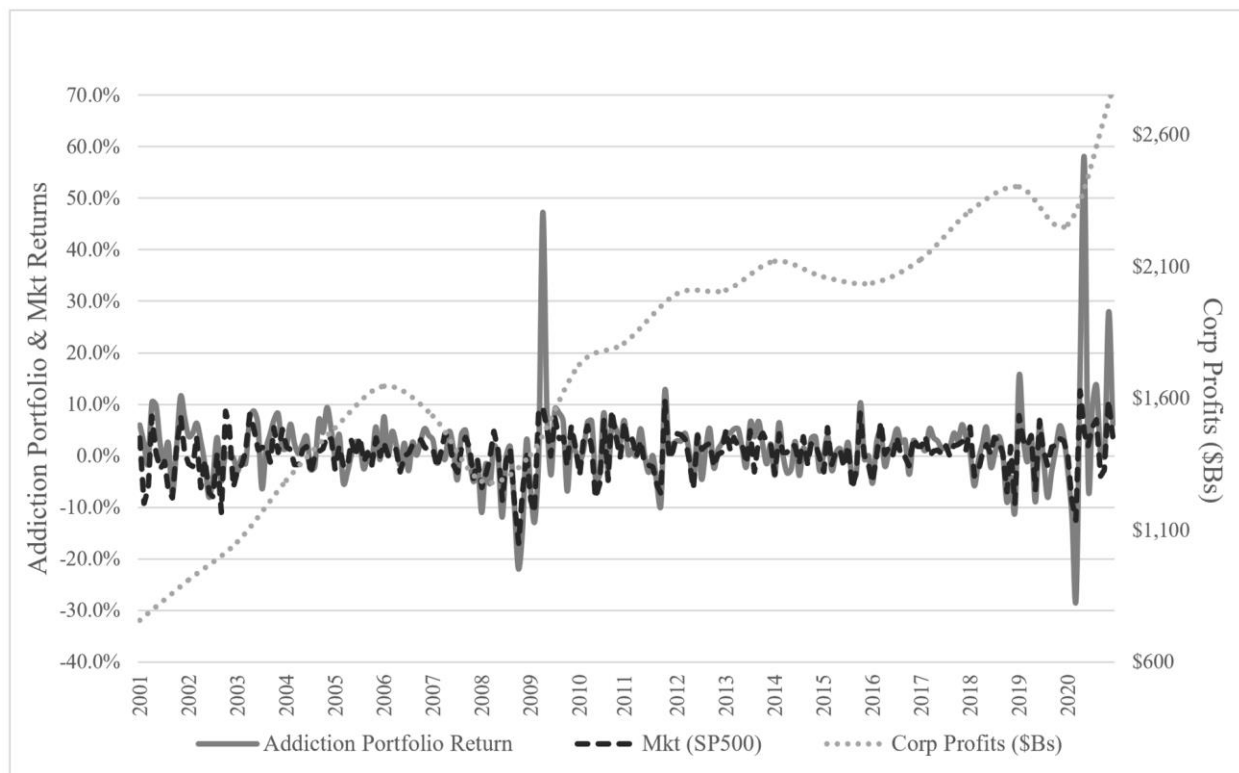corporate profits (in $Bs) from 2001-2020. As seen in *figure #3*, investors can expect the

Figure #3: Corporate Profits ($Bs), Addiction Portfolio and S&P500 Market Returns (%) from 2001-2020. Notes: Corporate Profits data per U.S. Bureau of Economic Analysis.

addiction portfolio to provide an exaggerated level of returns when compared to the market

regardless of corporate profit levels. Based on this behavior we would expect the portfolios beta[2]

to be greater than one as it outperforms the market during periods of positive investment returns

and underperforms the market during periods of negative returns. Some analysts tie periods of

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[2]*Beta accounts for some securities being more sensitive than others to macroeconomic shocks. For example, auto firms might respond more dramatically to changes in general economic conditions than pharmaceutical firms. We can capture this refinement by assigning each firm a sensitivity coefficient "Beta" to account for macro conditions (Bodie et al., 2014).*

underperformance to the "shunned-stock hypothesis" sometimes associated with business'

offering products and services related to addiction and vice. The theory "allows other investors

who are willing to invest in sin stocks to earn a premium from the reputation risk. This means

that socially responsible investors pay a financial cost when avoiding these stocks because of

social and ethical criteria" (Kincaid, 2021).

Despite perceived societal expectations and varying ethical criteria across consumers,

companies offering products that can be addictive in nature are able to produce profits and

provide investors with returns that outperform the market. Notwithstanding seemingly endless

tax hikes, increasing rules, and tightening restrictions, people continue to provide tobacco

companies, for example, with adequate sales to produce a profit. A 2008 World Health

Organization (WHO) report cited tobacco as "the single most preventable cause of death in the

world today" (WHO, 2008). Billions of dollars in lawsuits against big tobacco citing their

products' addictive nature, and the various negative impacts to user's overall health and

reduction in lifespans have had minimal impact on changing the behavior of tobacco users.

Following a series of smaller, private lawsuits from the mid-1950s to the mid-1990s, the 4

largest U.S. tobacco companies – Phillip Morris Inc., R.J. Reynolds, Lorillard, and Brown &

Williamson – agreed to pay $206 billion dollars over the course of 25 years to reimburse 46

states for healthcare costs related to tobacco use as part of the 1998 Tobacco Master Settlement

Agreement (MSA) (National Association of Attorneys General, 1998). Despite the large dollar

value of healthcare costs now acknowledged by big tobacco, people continue to spend hundreds

of billions of dollars annually on tobacco products. "Total tobacco retail sales across the globe

in 2011 were estimated to be just under $500 billion, generating combined profits of $35.1

billion for the worlds six largest tobacco firms – a mere $1,100 of profit per second" (The

Guardian, 2012). Even with the MSA representing increased liabilities for big tobacco, these costs are partially passed on to the consumer depending on cost pass-through price elasticities, in part offsetting the impact of the MSA's cost to potential investment returns.

Inflation is another factor impacting consumers. Whether driven by rising energy prices, change in monetary policies, or regionalization of industrial production, inflation influences investment returns across asset classes. *Figure #4* presents returns for the addiction portfolio and S&P500 along with the annual inflation rate (% change) from 2001-2020. Following periods of
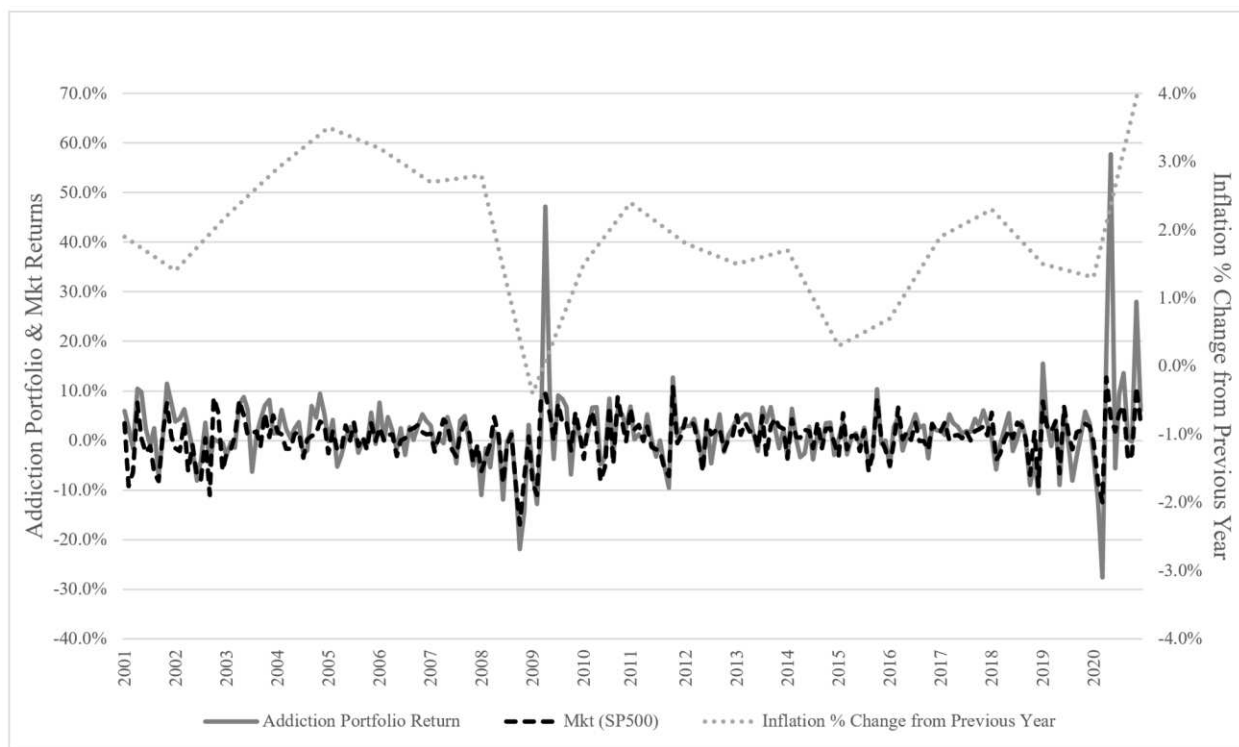
Figure #4: Annual Inflation (% change from previous year), Addiction Portfolio and S&P500 Market Returns (%) from 2001-2020. Notes: Inflation data per U.S. Bureau of Economic Analysis.

deflation from 2008-2009 and 2018-2020 when consumers experienced an increase in purchasing power, we see a spike in positive returns for the addiction portfolio. Inflation varies across all categories of goods and services – such as gasoline, automobiles, food, home ownership and internet access – and erodes consumer purchasing power. Certain investments perform better than others in inflationary environments and looking at *Figure #4* we get an idea

of the relationship between inflation, S&P500 (Mkt) performance, and addiction portfolio returns.

Statistics on addiction published by the American Addiction Centers (AAC) show addiction issues can develop at a young age. "Almost 74% of adults suffering from a substance abuse disorder in 2017 struggled with an alcohol use disorder" and "About 3.4 million young adults aged 18 to 25 had an alcohol use disorder in 2017, or a total of about 10% of young adults" (AAC, 2021). According to the National Center for Responsible Gaming (NCRG), "Approximately 1 percent of the adult population in the United States has a severe gambling problem (Alegría et al., 2009), and recent research estimates that 6 to 9 percent of young people and young adults experience problems related to gambling" (Barnes et al., 2010). Companies operating in business sectors characterized as producing products associated with addiction may be profiting from addictive behavior. The intentions of investors seeking potentially higher returns offered by investments in companies associated with addiction are in stark contrast to the adverse impacts to our communities resulting from addictions such as alcoholism and gambling. This highlights a paradox of the market – investing in companies not involved with addictive products (ex. socially beneficial investments) often involve higher costs which deteriorate returns, while investments in companies offering potentially addictive products present the conceivable opportunity to outperform the market while promoting addiction and negatively impacting society.

The aim of this research thesis is to investigate whether investors can expect higher returns when investing their monies in a portfolio of companies with products associated with addiction. By considering historical trends and analyzing a stock's projected future expected return on equity via the CAPM, Fama-French three-factor, and several control variable

augmented models, we analyze return performance of the addiction portfolio as compared to the

S&P500. We will look to estimate if an investment portfolio composed of addiction and vice

stocks has the potential to outperform the broader S&P500 market index.

CHAPTER 2 – LITERATURE REVIEW

There are a variety of published sources that make it possible to situate the work of this thesis in relation to the literature. Published research on investing opportunities in vice and sin stocks became both more in-depth and prevalent in the mid-2000s following the creation of the Vice Fund (Ticker: VICEX) in 2002. The Vice Fund was an open-end mutual fund (offered by advisor 'USA Mutuals') with an investment strategy stated in the prospectus as "Under normal market conditions, the Fund will invest at least 80% of its net assets (plus borrowings for investment purposes) in equity securities of companies that derive a significant portion of their revenues from a group of vice industries that includes the alcoholic beverages, defense/aerospace, gaming, and tobacco industries" (Vitium Global Fund prospectus, 2020[3]).

Most of the existing literature on sin stock investing can be tied back in some way to the following definition of a 'sin' or 'vice' investment: *"A publicly traded company involved in or associated with an activity that may be considered by some to be unethical or immoral."* An important aspect of this literature review is attempting to identify and understand the importance of any common themes from existing work, and properly take those ideas into consideration in our analysis. Previous research has ranged from attempting to measure (and subsequently predict future) returns of vice related equities over economic business cycles (Salaber, 2007), quantifying the cost of being good by investing in green, ethically responsible portfolios in terms of negative impacts on potential returns (Fabozzi et al., 2008), and comparing returns of sin related investments with those of socially responsible and green-based portfolios (Durand et al., 2013). For the purposes of this paper, we will take this definition a step further to focus on publicly traded companies offering specific products or services that have a historical association

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[3]*The fund has since been renamed twice; to the 'Barrier Fund' from 2014-2016, and the 'Vitium Global Fund' from 2016 – present.*

with addiction – brewers, distillers & vintners, tobacco, casinos & sports gambling, and cannabis (the latter two of which have recently been legalized in some U.S. states). This thesis will not consider any publicly traded companies involved in aerospace & defense, which are often considered to be a sin investment and have been classified as such in some previous research.

Author Julie Salaber (2007) modeled the expected returns of sin stocks over macroeconomic business cycles by focusing on the alpha (measure of an investments' return when compared to the market) and beta (measure of an investments volatility) correlations of individual equities with the overall market. The author assumes that the overall percentage of investors who avoid "vice-based" investments due to pressure from ethical and societal norms is increasing over time, and that many such investments may be overlooked by institutional investors aiming to appear socially responsible. Using a data set from the period 1926-2005, the article measures the difference in sensitivity of vice stocks versus the overall market based on the economic cycle being a recession or expansion. This analysis was also completed at the industry level – including gaming, tobacco, and alcohol – to determine performance sensitivity compared to the market across those three specific sectors. Salaber's 2007 study found that one plausible explanation for sin stocks outperforming the broader market in the long-run is time-varying expected returns, or correlation with the changing volatility in the market across different time periods. When expected returns of the sin stock portfolio were allowed to vary with pre-determined macro-economic factors, the increased return on the portfolio was reduced. Secondly, the paper also concluded that the sin stock sector is to be considered defensive[4], with a calculated beta of approximately 0.75 versus the market. Two specific sin industries – alcohol and tobacco – proved to be more defensive than others, such as gaming, to an extent the overall

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[4]*A defensive investment approach attempts to reduce the impact of falling markets on an investor. "Seeking shelter in volatile markets." Web. https://www.fidelity.com/viewpoints/investing-ideas/defensive-portfolio-investing. Accessed February 2021.*

portfolio beta was pulled below 1.0, implying reduced fluctuation and increased overall stability in terms of pricing.

The analysis also provided insight into the behavior of specific vice sectors based on economic cycles. The total return of tobacco and alcohol stocks in the sin portfolio was higher during periods of recession versus periods of expansion, whereas the performance of casino & gaming stocks was consistent with the market and did not vary abnormally with business cycles. Smoking and drinking are vices and addictive activities that are easily accessible for consumers, especially when compared to frequenting casinos and gaming institutions that may also require additional time commitment and travel related expenses. An explanation of the difference in performance between the two sectors is that consumers spend more time at home during a recession, where they can easily drink alcohol purchased at a local liquor store and smoke at their leisure.

Fabozzi, Ma, and Oliphant (2008) modeled the performance of a portfolio of 'sin' stocks by defining the idea of sin on the generally accepted moral standards of society. The authors analyzed the performance of equities that appeared to have a bad reputation based on the nature of the company's products or services when compared to societal views of what constitutes a sin. The authors also explored the impact of additional limitations faced by institutional investors such as endowments, pension funds, and other entities with fiduciary responsibilities tied to following specific investment criteria and guidelines. An important aspect of the author's conclusion is the demand for equity in sin stocks will be a collective reflection of those willing to bear the potential repercussions from their peers and society resulting from the optics of investing in sin. There will always be a certain segment of the investment community that is

willing to sacrifice higher portfolio returns either in the interest of adhering to their value system, or to avoid the appearance of endorsing controversy and impropriety.

In addition to the sin and addiction-related stocks that are available to individual or institutional investors, several Socially Responsible Investing (SRI) options are available for investors adhering to their morals and values when making investment decisions. In their 2008 study Fabozzi, Ma and Oliphant also note the potential impact to a firm's overall market value when the subset of SRI investors avoid a stock based on their societal views. This could be considered an example of behavioral factors affecting economic outputs and valuations. "Although not everyone agrees on what constitutes social responsibility, almost 10% of the U.S. stock market's value is currently classified as SRI" (Fabozzi et al., 2008). With such a large amount of overall market value categorized as SRI, the authors try to determine if commonly used pricing models (including CAPM, which is also used as part of our analysis) that do not account for behavioral factors have a significant impact on a firm's market value. The paper concludes this impact is material, with results showing SRI-only investors should expect to realize a lower overall return than those investors utilizing an unrestricted portfolio. This conclusion applies to the firm level as well. For example, a professionally managed mutual fund facing restrictions on investment options would expect to realize lower returns than a fund applying unconstrained selection criteria to their investment allocations.

The authors completed their study by creating a basket of sin investments composed of a variety of equity positions in companies operating in the biotech, gaming, tobacco, defense, alcohol, and adult services industries. Over a 37-year period from 1970 – 2007 the sin portfolio produced an average annual return of 19%, consistently outperforming market indices across a total of twenty-one countries included in the study over that period. The research concludes the

basket of sin stocks outperforming the broad market can be contributed to two factors. The first

being a reduction in overall costs from not having to conform to social standards. Firms

investing in addiction and vice are operating within the boundaries of law and regulation, but

without regard for subjective optics or social opinions. The second factor noted by the authors is

that sin stocks may be undervalued to begin with due to the adverse effect of the average investor

being driven by emotion – buying high, over-reacting, and panic selling in a down market. "The

average investor is best described as a person attempting to time the market intentionally or

unintentionally based on emotional influence" (Smith, 2016).

Another research article focusing on vice and addiction investments "Saints versus

Sinners. Does morality matter?", by Durand, Koh, and Limkriangkrai (2013), investigates the

impact of complying with social norms on consumer decision making, economic behavior, and

overall market outcomes. Investment portfolios are constructed by screening equities to meet

criteria outlined in two categories – saints and sinners. Equities are chosen for the sinner

category based either on being a part of Standard Industry Classification (SIC) code industry

categorization group 4 or 5 (for beer or alcohol and smoke or tobacco companies respectively),

and gambling stocks based on the applicable NAICS (North American Industry Classification

System) codes for the gaming industry. Stocks classified as saints were those included in the

MSCI KLD400 Social Index ('KLD400'). Companies involved in the tobacco, firearms,

gambling, alcohol, nuclear power and/or weapons industries are automatically deemed ineligible

for inclusion the KLD400.

Following this initial screening step, analysis is completed to determine an effective

management rating for each company's environmental, social, and governance practices, known

as an 'ESG' rating. The Morgan Stanley Capital International (MSCI) ESG Rating is designed

to measure a company's resilience to long-term, industry material environmental, social and governance (ESG) risks. Durand et al. (2013) uses a rules-based methodology to identify industry leaders and laggards according to their exposure to ESG risks and how well they manage those risks relative to peers. Based on the KLD400 being established in 1990, the authors decided to compare performance returns of the saints vs. sinners' portfolios from 1990 through 2008. Institutional ownership (one focus of the study) in the sinner's category is noted as less than that of the saint's category. The authors suggest that investment management teams holding more ESG friendly equities shows they are succumbing to the pressure of optics and societal norms. "Almost one out of ten dollars under professional management in the US is invested according to socially responsible principles. It is therefore to be expected that companies with high SRI ratings would be held in greater proportions by institutions as compared to those deemed to be undesirable" (Durand et al., 2013).

This theme seems consistent throughout the articles we have researched so far, as institutions are seemingly more impacted by failure to adhere to social norms in the public eye when compared with the individual investor. The authors findings confirm this, as ownership statistics across five categories of institutions (banks, insurance companies, mutual funds, independent investment advisors, and others such as universities & employee stock plans) show a tendency to own saints rather than sinners. In addition to more likely being owned by institutional investors, companies in the saint category also are found to have higher analyst coverage when compared to their sinner counterparts.

The combination of higher institutional ownership and increased media & analyst coverage on those equities in the saint category seems to indicate that societal norms are taken into consideration by institutional investors when constructing their portfolios. If the values of

the saint firms are impacted positively by these factors, investors can assume the sinner firms'

value would be adversely affected. This impact (although initially negative) may help to provide

increased returns in the long run based on the sinners being underpriced. Another factor

differentiating saints from sinners highlighted in the research is the latter's propensity to use debt

or enter leveraged positions when compared to their counterparts. The nature of this behavior by

companies categorized as sinners increases risk. Borrowed funds invested wisely often increase

the overall returns generated by a firm but will exacerbate losses during downturns when the

firm may be generating an operational loss and remaining liable for interest payments to

creditors. By comparing performance between companies categorized as either saints or sinners,

the paper concludes investors can expect higher positive risk-adjusted performance returns from

companies categorized as sinners. The authors also illustrate a lower overall institutional interest

in sinners when compared with companies categorized as saints. The paradox of ESG and SRI

investments offer potentially inferior investment returns due to higher screening & compliance

costs, while addiction investments offer possibly higher returns with the negative social

consequences of addiction.

When analyzing the performance of sin stocks versus other investment options, much of

the previous research has been completed at the individual equity level using a portfolio of

stocks that meet a specific set of criteria. In addition to studies focusing on specific sin stocks,

there is also research on the performance of mutual funds with investment objectives focused on

sin and vice. Jo, Saha, Sharma, and Wright (2010) compare the performance of two funds with

contrasting investment objectives – SRI and vice. By comparing the performance of the Vice

Fund (VICEX) and the Domini Social Equity Mutual Fund (DSEFX) over a 20-year period 1990

through 2009, the authors attempt to investigate expected returns of vice and socially responsible

industries by comparing return performance of professionally managed investment products like mutual funds.

In the study, sin funds are stated to be comprised of "stocks from companies that are associated with (or are directly involved in) activities that are widely considered to be unethical or immoral" (Jo et al., 2010). The timing of comparing returns of this "unethical" portfolio to that of SRI vehicles was of heightened interest due to a 2010 Social Investment Forum (SIF) conclusion that 65% of SRI funds outperformed their peer benchmarks during the 2009 calendar year, noting most benchmarks were outperformed by significant margins. The Jo et al. (2010) study suggests that returns generated by SRIs, vice investments and the S&P500 vary in terms of performance rank depending on the applied time horizon. For example, SRI portfolios produced higher annualized returns when compared to the S&P500, but the index outperformed SRIs when returns were calculated over 5 and 10-year time frames. When the Vice Fund is added to the mix, the report concludes (similarly to the SRI vs. index comparison) that SRI vehicles are shown to outperform their vice counterparts over shorter 1-year time periods, but lag in performance when compared to vice investments over longer time horizons.

At the time of the study, SRI investments accounted for a significant amount of the overall investment marketplace in the U.S., representing "an estimated $2.71 trillion out of $25.1 trillion (or 10.79%) in the U.S. investment marketplace in 2009" (Jo et al., 2010). As previously noted, SRI encourages companies to improve, enhance, and promote their practices regarding societal well-being and the environment. SRI investment advocates often assume a company's adoption and commitment to sound SRI practices will enhance the firm's bottom line in the long-run, and in turn produce more wealth for shareholders. A theme portrayed in previous studies is seen again here; increasing adoption of SRI investment frameworks by institutional investors

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helping to drive up security prices of related companies. In addition to this macro level pricing

impact, Gompers, Ishii, and Metrick (2003) show a positive correlation between responsible SRI

governance and total return on investment. When ranking firms based on a corporate

governance index focusing on shareholder protections, their findings conclude that firms with

stronger shareholder rights produce higher returns.

We have discussed how (from a historical perspective) institutions such as insurance

companies, banks, and pension funds often go out of their way to avoid the optics of investing in

vice industries which may be considered controversial. Institutions at times also cite risk of

litigation and settlement liability – such as that previously noted with publicly traded tobacco

companies – as reason enough to avoid taking equity stakes in certain vice companies. Do these

avoidance mechanisms drive down price and stunt performance returns in the short-term, but

allow long-term investors to realize higher overall returns? If an equity is undervalued or

deemed in a position to outperform the market, a mutual or hedge fund manager unconstrained

by SRI guidelines will target that security regardless of if the company does not meet SRI

investment criteria. However, securities that are deemed to carry a litigation risk, and are

therefore neglected by the broader market, experience depressed pricing and can lead to more

room for positive returns for investors indifferent to SRI guidelines. Jo et al. (2010) concludes a

"neglect" effect is seen in the overall basket of stocks defined as "immoral". The neglect effect

pushes a stocks valuation lower when risk is shared between the limited number of investors

taking equity stakes in sinful companies. "Unethical stocks seem to behave like value stocks as

they provide higher expected returns consisting of a neglect effect" (Jo et al., 2010). Companies

receiving less media coverage and reduced institutional ownership tend to outperform the overall

market.

Another factor proffered by Jo, et al. (2010) as driving levels of investment in companies associated with addictive products is the timing of changes in what is considered socially acceptable, such as smoking tobacco. Tobacco companies have evolved from being widely accepted in society to being considered a vice industry. The authors found a correlation between increased performance returns from tobacco stocks and a shift in societal acceptance of tobacco use. "The analysis reveals that this sector did not outperform the market until smoking became a human vice" (Jo et al., 2010). It seems that neglect as a factor driving excess returns is exacerbated even further when an activity is perceived as controversial in society. The study notes that companies showing adversity to meeting SRI and ESG guidelines share several common characteristics such as a tendency to be large-cap, produce higher than average annual earnings-per-share, and feature lower book-to-market ratios than the market average. Based on the study's conclusions, sin stocks seem to be more attractive investment opportunities for individual and institutional investors as they provide both increased stability and earnings and have historically outperformed SRI investments over the long-term. This conclusion also implies that those investors who consider themselves socially responsible sacrifice returns over the long-term in favor of limiting their investments to companies meeting SRI criteria.

Unlike the previous research summarized above, the aim of this thesis is to compare expected returns of stocks specifically associated with potentially addictive products versus expected returns of the broader market, in our case represented by the S&P500 index. The hypothesis being tested is whether higher investment returns are realized from stocks in sectors associated with addiction. Unique to this research project is the inclusion of cannabis companies, which were legalized in at the federal level in Canada and began trading publicly in the U.S. in 2018. As of this writing cannabis remains illegal at a federal level in the U.S. but has

been legalized in 14 of 50 states in the U.S. (DisaWorks online, Map of Marijuana Legality by State, 2021). In addition to alcohol, gaming, and tobacco, cannabis companies are included as a fourth sector in our study to complete our addiction portfolio.

CHAPTER 3 – DATA ANALYSIS AND METHODOLOGY

The objective of this research project is to investigate whether investors can realize higher returns from investments in companies associated with products or services considered addictive (our addiction portfolio) versus investing in the S&P500, in this case a representation of the broader U.S. equities market. The analysis draws on S&P500 index and addiction portfolio stock return data from the Center for Research in Securities Prices (CRSP) via Wharton Research Data Services (WRDS). I choose a total of forty publicly traded companies falling into the addiction sectors previously defined, and excluded any companies associated with weapons, aerospace, and defense. Any privately owned firms are excluded from the study, and several Canadian firms traded on both U.S. exchanges and the Toronto Stock Exchange (Ticker = TSX) from the alcohol and cannabis sectors are included. There are two firms traded only on the TSX – Andrew Peller Limited (ADW-B.TO), and Corby Spirit and Wine Limited (CSW-B.TO). The average market capitalizations of the two firms across the performance period were $401,850,234 (CAD) and $510,125,968 (CAD) respectively, representing a total of 0.004934% of the alcohol sector market cap. From 2003–2020 the USD/CAD exchange rate varied between 1.42 and 0.95, or a maximum possible impact to performance of 66.901%. Due to the small contribution of ADW and CSW to the overall market capitalization of the alcohol sector and total addiction portfolio, we consider the potential impacts of USD/CAD currency exchanges de minimis for our empirical analysis.

Similar to the approach found in previous literature related to vice investing, we use monthly data to estimate the regressions and empirical analysis. The following provides an overview of the variables used to support this study. Data was obtained from multiple sources; S&P500 index and addiction portfolio stock pricing and return data was obtained from the

Center for Research in Securities Prices (CRSP) via Wharton Research Data Services (WRDS) from the period January 2001 to December 2020 (240 total observations). Data for the one-month treasury bill risk-free rate (RF), and the control variables – return spread of small minus large stocks (SMB); the return spread of cheap minus expensive stocks (HML); the momentum indicator (MOM); and the return spread of the most profitable firms minus the least profitable firms (RMW) – are obtained from the Ken French website via The Center for Research in Security Prices (CRSP) and Compustat Data.

3.1 Construction of Addiction Portfolio

The individual stocks included in the addiction portfolio are identified by their industry. Only equities in the alcohol, tobacco, cannabis, and casino/gaming industries are included in the study. Whereas Liston (2016) and Fama & French (1997) used SIC codes to help identify sin stocks, we use Global Industry Classification Standard (GICS) industry codes to pinpoint stocks for our addiction portfolio. Building on the GICS definitions provided in *Table #1: Addiction Stock Portfolio Qualifying Criteria,* companies falling under GICS industry code 302030 belong to the Tobacco industry. Sub-industry codes 30201010 and 30201020 (parent industry code 302010 beverage) belong to brewers and distillers & vintners respectively, and casino & gaming companies belong to GICS sub-industry code 25301010 (parent industry code 253010 Hotels, Restaurants and Leisure). At the time of writing cannabis companies not operating in the pharmaceutical industry under the healthcare sector within the GICS code framework were not assigned a GICS code. "The definition of Pharmaceuticals is being updated to include companies primarily engaging in the research, development, and manufacturing of cannabis-based drugs used to treat diseases. The Pharmaceuticals sub-industry will exclude companies primarily

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manufacturing non-medicinal marijuana and other cannabis products used for non-medical purposes which are classified based on end-use" (Consultation on potential changes in GICS structure in 2022, published 2021). *Table #2* shows a breakout of the forty equities in the addiction portfolio by sector.

Table #2: Addiction Portfolio holdings by sector

Sector	Alcohol	Cannabis	Casinos & Gaming	Tobacco	Total
No. of firms	10	7	17	6	40

3.2 Descriptive statistics and support

Table #3 presents the descriptive statistics and support for the data variables used in our empirical analysis. As shown the average monthly return of the addiction portfolio is 1.538%. This return figure is generally consistent with the findings stated in both Liston (2016) and Hong and Kacperczyk (2009), neither of which include cannabis companies. We realize some initial value from the summary statistics, seeing at a glance based on anticipated variance in performance the addiction portfolio may expose the investor to a higher overall risk level when compared to investing in a broader market index.

Referencing the addiction portfolio returns from January 2001 – December 2020 presented in *Figures #1-4,* we notice two spikes in portfolio performance; in 2009 following the passage of The American Recovery and Reinvestment Act, and in 2020 as part of the broader market rebound following the broad, global market selloff driven by the COVID-19 pandemic.

Table #3: Descriptive Statistics and Support

Variables	Mean	Std. dev.	Minimum	Maximum	Kurtosis	Skewness
ADDPR	0.01538	0.07411	-0.27630	0.57770	0.00000	0.00000
MKTR	0.00532	0.04352	-0.16940	0.12680	0.00420	0.00040
RF	0.00113	0.00131	0.00000	0.00540	0.22620	0.00000
EXADDPR	0.01426	0.07422	-0.27750	0.57760	0.00000	0.00000
EXMKTR	0.00420	0.04367	-0.17020	0.12680	0.00450	0.00050
SMB	0.00281	0.02674	-0.08320	0.07060	0.70330	0.55240
HML	-0.00090	0.02886	-0.14020	0.12480	0.00000	0.21440
MOM	0.00104	0.05097	-0.34300	0.12750	0.00000	0.00000
RMW	0.00311	0.02214	-0.09190	0.09120	0.00000	0.30210

Notes: All variables presented are in a monthly frequency. Variables are the return of the addiction stock portfolio *(ADDPR)*; the return of the S&P500 market index *(MKTR)*; the risk-free rate *(RF)*; the Addiction Portfolio return minus risk-free rate *(EXADDPR)*; the S&P500 market return minus risk-free rate *(EXMKTR)*; the return spread of small minus large stocks *(SMB)*; the return spread of cheap minus expensive stocks *(HML)*; the momentum indicator *(MOM)*; the return spread of the most profitable firms minus the least profitable firms *(RMW)*. The sample data set encompasses January 2001 to December 2020, and was obtained from various sources including Wharton Research Data Services, and Ken French's academic research website (via The Center for Research in Security Prices (CRSP), and Compustat Data).

3.3 Historical performance snapshot

We compute monthly and annual historical performance returns for the forty securities in the Addiction portfolio as well as the four portfolio sectors. The S&P500 index performance is used to provide a comparison benchmark indicative of the performance of the broader market. Due to some of the companies in the addiction portfolio having limited pricing history (firms in the cannabis industry in particular), performance of the S&P500 was matched with the appropriate time periods based on the individual firm's price history. Performance returns are calculated based on both equal investments in all 40 securities in the addiction portfolio, as well as using a value-based approach. Including a value-based method in the empirical analysis provides an understanding of the portfolio's impact to the broader market and economy, as it accounts for differences between market capitalizations between companies in the portfolio.

As shown in *Table #4: Addiction Portfolio Returns 2001–2020 (equally weighted)*, the addiction portfolio produced a monthly return of 1.54%, and an annual return of 15.87%, where the S&P500 index provided a monthly return of 0.53%, and a total annual return of 6.92%. When analyzed individually, each of the four sectors in the addiction portfolio provided annual returns of more than 7%, with each sector beating the benchmark index on its own. Total returns

across sectors range from a low of 7.42% for tobacco to a high of 24.06% for casinos and gaming. We see even the worst performing addiction sector – tobacco – provides a higher annual return of 7.42% when compared to the broader market index. The top performing addiction sector in the equally weighted performance analysis – casinos and gaming – nearly quadrupled the performance of the broader market providing investors with annual returns of 24.06%.

Table #4: Addiction Portfolio Returns 2001–2020 (equally weighted)

Addiction Portfolio	Monthly Return	Std. Dev.	Annual Return	Std. Dev.
Total return (%)	0.01538	0.00478	0.15873	0.05478
Alcohol sector	0.01159	0.00287	0.14699	0.04377
Cannabis sector	0.12614	0.10361	0.14441	0.62861
Casinos and gaming sector	0.01829	0.00672	0.24055	0.09267
Tobacco sector	0.00668	0.00361	0.07422	0.04120
S&P500 index return	0.00532	0.00281	0.06919	0.03883
Excess return	0.01006	0.00479	0.08954	0.04033

Notes: Total return % are the monthly and annual total returns of the Addiction portfolio. Alcohol sector, Cannabis sector, Casinos and gaming sector, and Tobacco sector returns are the total returns of each respective sector over the stated time periods. S&P500 index return represents the return of the benchmark market index. Excess return is the difference between the Addiction portfolio return and the benchmark return.

When performance is evaluated with a market value weighted approach, we see slightly different results. As shown in *Table #5: Addiction Portfolio Returns 2001–2020 (market value weighted)*, the addiction portfolio produced a monthly return of 0.93%, and an annual return of 11.86%, where the S&P500 index provided a monthly return of 0.53%, and a total annual return of 6.92%. When considered individually, each of the four sectors in the addiction portfolio

provided annual returns of at least 6.99%, equaling the performance of the market index. Total

returns across sectors range from a low of 6.99% for Tobacco to a high of 29.36% for casinos

and gaming.

Table #5: Addiction Portfolio Returns 2001–2020 (market value weighted)

	Market Value Weighted Average Returns			
Addiction Portfolio	Monthly Return	Std. Dev.	Annual Return	Std. Dev.
Total return (%)	0.00930	0.00350	0.11867	0.04399
Alcohol sector	0.00720	0.00326	0.08674	0.03676
Cannabis sector	0.10396	0.09017	0.78051	0.77913
Casinos and gaming sector	0.02086	0.00827	0.29363	0.10981
Tobacco sector	0.00590	0.00403	0.06996	0.04486
S&P500 index return	0.00532	0.00281	0.06919	0.03883
Excess return	0.00398	0.00275	0.04948	0.02731

Notes: Total return % are the monthly and annual total returns of the Addiction portfolio.
Alcohol sector, Cannabis sector, Casinos and gaming sector, and Tobacco sector returns are
the total returns of each respective sector over the stated time periods. S&P500 index return
represents the return of the benchmark market index. Excess return is the difference between the
Addiction portfolio return and the benchmark return.

Due to our sample spanning a 20-year period over which pricing data was complete for

some firms and limited for others, we computed the excess portfolio return to provide an

additional control variable for more robust regressions. The excess portfolio return was

computed as the addiction portfolio return minus the S&P500 index return. The rate of excess

return is also presented in *Tables #4 and #5*. We can see the monthly and annual excess returns

of the equally weighted addiction portfolio when compared to the market index are 1.00% and

8.95% respectively, reinforcing the strong performance seen across the 4 addiction investment

sectors. Over the 20-year period covered in the study, the addiction portfolio only produced

negative returns in 3 years (2002, 2008, 2018) compared to 6 years (2001-02, 2008, 2011, 2015,

2018) for the broader market index. Based on a simple historical performance analysis

comparing the addiction portfolio against the S&P500, we see higher returns from the addiction

portfolio in both regularity and scale.

3.4 Methodology

The empirical analysis is completed using three sets of regressors – CAPM, the Fama-

French three-factor model, and augmented four and five-factor models. We analyze historical

performance of a basket of stocks associated with addiction vs. the S&P500 to see if there is

more potential profit to be made in investments associated with addiction versus taking stake in

the S&P500 market index.

The Capital Asset Pricing Model (CAPM) offers several advantages for the purposes of

our analysis. One benefit is the CAPM assumes that all investors are working with the same

time horizon, a built-in feature of the model that provides an important standardizing factor for

returns. The model is also widely used and accepted as a reliable macro-level predictor of

expected future returns. "CAPM describes the relationship between systematic risk and expected

return for assets, particularly stocks. CAPM is widely used throughout finance for pricing risky

securities and generating expected returns for assets given the risk of those assets and cost of

capital" (Wake Forest University School of Law, 2004). We run two subsequent regressions

against a three-factor control variable augmented Fama-French model (includes SMB and HML

variables), followed by a final set of regressions using expanded four and five-factor control

variable augmented models (includes SMB, HML, MOM, and RMW variables).

3.4.1 CAPM model

The first regression is completed using the CAPM model to determine Jensen's alpha – the intercept of our regression equation coefficient – indicating the expected risk-adjusted excess return of the addiction portfolio versus the market. The CAPM regression equation is as follows:

$$ADDPR_t - RF_t = \alpha_i + \beta_i EXMKTR_t + \varepsilon_t$$

where *ADDPR* is the return of the addiction stock portfolio, *RF* is the risk-free rate, *EXMKTR* is the S&P500 market return minus the risk-free rate, α_i *and* β_i are the factors to be estimated, and ε is the error term. The risk-free rate *(RF)* is included in the calculations as an increase in *RF* will pressure the market risk-premium to rise since riskier assets will need to perform better to meet investors' expectations for required returns. *Table #5* presents the estimated values of Jensen's alpha (α_i) and beta (β_i) for each individual security in the addiction portfolio. Jensen's alpha is the intercept of the regression equation in the CAPM model and is in effect the expected excess return adjusted for systematic risk. As additional factors are added to the model, the estimated alpha will be conditioned to reflect the resulting impact to the overall risk of the portfolio as compared to the market. Beta is a measure of how much risk a specific investment will add to an overall portfolio versus the market, measures a securities sensitivity to macro-economic conditions, and accounts for the securities expected movement in relation to the S&P500 market index. For our study we will consider the S&P500 to have a beta rating of 1.0 (neutral), against which each of the securities in our addiction portfolio will be measured *(Table #6)*. *Table #7* shows Jensen's alpha and beta estimations for the four sectors in the addiction portfolio. The estimations are presented resulting from both equally weighted investments across firms in the portfolio, and as market value-based figures to capture the impact of changes in individual security prices more accurately to the broader market.

Table #6: Jensen's Alpha and Beta results for securities in the addiction portfolio

Ticker Symbol	Security Name	Sector Name	Jensen's Alpha	Beta	Value Weighted Jensen's Alpha	Value Weighted Beta
ADW-B.TO	Andrew Peller	Alcohol	0.01005	0.54274	0.00001	0.00081
BUD	Anheuser-Busch InBev	Alcohol	0.00148	0.73680	0.00422	0.36285
SAM	Boston Beer	Alcohol	0.02141	0.69058	0.00052	0.04493
BF-B	Brown-Forman Corp.	Alcohol	0.00804	0.62843	0.00067	0.05776
STZ	Constellation Brands	Alcohol	0.01349	0.82454	0.00052	0.04493
CSW-B.TO	Corby Spirit and Wine	Alcohol	0.00117	0.20859	0.00004	0.00320
BREW	Craft Brew Alliance	Alcohol	0.01764	0.78291	0.00001	0.00052
DEO	Diageo	Alcohol	0.00354	0.55977	0.00365	0.31359
TAP	Molson Coors Bev. Co.	Alcohol	-0.00482	0.87821	-0.00047	0.04070
WVVI	Willamette Valley Vineyard	Alcohol	0.00559	0.81243	0.00000	0.00012
ACB	Aurora Cannabis Inc.	Cannabis	0.50929	9.64569	0.01245	0.62164
CGC	Canopy Growth Corporation	Cannabis	-0.00691	2.43425	-0.03689	1.84209
CRLBF	Cresco Labs Inc.	Cannabis	0.01020	2.91884	0.00525	0.26213
HRVSF	Harvest Health & Recreation Inc.	Cannabis	-0.03240	2.60803	-0.00894	0.44645
JUSHF	Jushi Holdings Inc.	Cannabis	0.05161	1.66503	0.00093	0.04651
OGI	OrganiGram Holdings Inc.	Cannabis	-0.08253	0.30320	-0.00174	0.08701
TLRY	Tilray, Inc	Cannabis	0.00501	3.10822	0.00569	0.28432
BYD	Boyd Gaming Corp	Casinos & Gaming	0.01244	1.93986	0.00053	0.07482
CZR	Caesars Entertainment Inc	Casinos & Gaming	0.01446	2.61725	0.00028	0.03940
CPHC	Canterbury Park Holding Corp	Casinos & Gaming	0.00101	0.43146	0.00001	0.00118
CNTY	Century Casinos Inc	Casinos & Gaming	0.00942	1.39449	0.00003	0.00415
CHDN	Churchill Downs Inc	Casinos & Gaming	0.00821	0.86421	0.00035	0.04927
DKNG	DraftKings	Casinos & Gaming	0.14012	1.70224	0.00160	0.22719
EVRI	Everi Holdings Inc	Casinos & Gaming	0.01027	2.82310	0.00006	0.00808
FLL	Full House Resorts Inc	Casinos & Gaming	-0.00090	1.51594	-0.00001	0.00133
GDEN	Golden Entertainment Inc	Casinos & Gaming	-0.00053	2.52960	-0.00005	0.00715
IGT	International Game Tech. PLC	Casinos & Gaming	-0.00272	1.50606	-0.00072	0.10231
LVS	Las Vegas Sands	Casinos & Gaming	-0.00152	2.65111	-0.00551	0.78053
MLCO	Melco Resorts & Ent. Ltd - ADR	Casinos & Gaming	-0.01796	1.85343	-0.00113	0.15952
MGM	MGM Resorts International	Casinos & Gaming	0.00406	2.39674	0.00293	0.41454
PENN	Penn National Gaming Inc	Casinos & Gaming	0.01382	1.65908	0.00061	0.08637
SGMS	Scientific Games Corp	Casinos & Gaming	0.01375	1.85380	0.00041	0.05864
MSC	Studio City Intl. Holdings Ltd - ADR	Casinos & Gaming	-0.00206	0.84081	-0.00013	0.01843
WYNN	Wynn Resorts Ltd	Casinos & Gaming	0.00397	2.24505	0.00201	0.28511
MO	Altria Group Inc	Tobacco	0.00138	0.50245	0.00253	0.29203
BTI	British American Tobacco	Tobacco	0.00340	0.54117	0.00161	0.18546
PM	Philip Morris International	Tobacco	-0.00135	0.84686	-0.00244	0.28137
TPB	Turning Points Brands	Tobacco	0.03150	0.57901	0.00001	0.00101
UVV	Universal Corp	Tobacco	0.00081	0.76352	0.00003	0.00352
VGR	Vector Group Ltd	Tobacco	-0.00115	0.75343	-0.00003	0.00379

Table #7: Jensen's Alpha and Beta results for addiction portfolio sectors (includes market value weighted figures)

Sector Name	Sector Jensen's Alpha	Sector Beta	Value Weighted Sector Jensen's Alpha	Value Weighted Sector Beta
Alcohol	0.00776	0.66650	0.00364	0.31232
Cannabis	0.06490	3.24046	0.02664	1.33034
Casinos & Gaming	0.01211	1.71427	0.00382	0.54078
Tobacco	0.00576	0.66441	0.00260	0.30006
	Port. Jensen's Alpha	**Port. Beta**	**Port. Jensen's Alpha**	**Port. Beta**
Addiction Portfolio	*0.02263*	*1.57141*	*0.00917*	*0.62088*

3.4.2 Fama-French three-factor model

For the second set of regressors in our analysis we use a Fama-French three-factor model to examine the impact of the size and value effects on the addiction portfolio returns. The three-factor model is represented as follows:

$$ADDPR_t - RF_t = \alpha_i + \beta_i EXMKTR_t + \Theta_i SMB_t + \Omega_i HML_t + \varepsilon_t$$

where the additional variables *SMB* the return spread of small minus large stocks (the size effect), and *HML* the return spread of cheap minus expensive stocks (the value effect) are incorporated into the regression equation. The added variables provide insight to whether stocks in the addiction portfolio perform like small, robust companies, as well as show a tendency to behave like either growth or value stocks. Theta (Θ_i) *and* Omega (Ω_i) are the additional parameters associated with the new variables to be estimated in the three-factor model.

3.4.3 Four-factor and Five-factor augmented models

This section describes the four and five-factor models used to complete our third set of regressions. The four and five-factor models are presented in the following form:

$$ADDPR_t - RF_t = \alpha_i + \beta_i EXMKTR_t + \Theta_i SMB_t + \Omega_i HML_t + \phi_i MOM_t + \mu_i RMW_t + \varepsilon_t$$

The four and five-factor models build on the three-factor model by introducing two new variables; *MOM* is defined as the momentum factor, and *RMW* which is the return spread of the most profitable firms minus the least profitable firms. Phi (ϕ_i) and Mu (μ_i) are the additional factors to be estimated in the four and five-factor equations.

3.5 Empirical results

3.5.1 CAPM and Fama-French three-factor model results

Results for estimating the CAPM and control-variable augmented three-factor models are reported on *Table #8*. We see Jensen's Alpha (our intercept or expected excess return versus the market) is positive and statistically significant for both models, showing an investor can expect an estimated 0.938% higher return when investing in the addiction portfolio versus the market. Furthermore, Beta is above one for both models showing an exaggerated return for the addiction portfolio when compared to broader market movements over the same time periods.

The coefficient estimate for *SMB* is 0.67394 (and significant at the 1% level), showing a greater portion of the expected variance in addiction portfolio returns can be explained by including *SMB* in the model. The positive and significant estimator on the *SMB* variable indicates that equities in the addiction portfolio perform more like small-cap stocks than large-cap, while the positive and significant estimator on the *HML* variable suggests that stocks in the addiction portfolio perform most like value stocks.

Table #8: CAPM and control-variable augmented Three-factor model estimations

Independent Variables	CAPM		Three-factor	
	Coefficient Estimates	Standard Errors	Coefficient Estimates	Standard Errors
Alpha	0.00938*	(0.00352)	0.00811**	(0.00334)
EXMKTR	1.16225*	(0.08039)	1.03845*	(0.07902)
SMB			0.67394*	(0.13384)
HML			0.12194***	(0.11977)
R-squared	0.46760		0.53000	
Adjusted R-squared	0.46530		0.52410	

$ADDPR_t - RF_t = \alpha + \beta EXMKTR_t + \varepsilon_t$

$ADDPRt - RFt = \alpha + \beta EXMKTRt + \Theta SMBt + \Omega HMLt + \varepsilon t$

where ADDPR$_t$ – RF$_t$ is the return of the addiction stock portfolio minus the risk-free rate. EXMKTR is the S&P500 market return minus the risk-free rate. SMB is the return spread of small minus large stocks from Fama & French. HML is the return spread of cheap minus expensive stocks. ε is the error term.

*, **, *** respresent significance at 1%, 5%, and 10% levels, respectively.

3.5.2 Four-factor and Five-factor augmented model results

Table #9 shows the results of our four-factor and five-factor model regressions. In the case of the four-factor model we incorporate two additional variables into the regression. The first variable is MOM, or the momentum premium. MOM is the measure of a security's tendency for its price to keep moving the direction it changed the previous period. The additional variable added to create the five-factor model is RMW, which is the return spread between the most profitable and least profitable firms (or the most robust versus weakest). As seen previously with the CAPM and Fama-French three-factor models, the resulting Jensen's Alpha is positive and statistically significant for both the four and five-factor models indicating a higher anticipated return (and level of risk) than the S&P500. Also like the previous results, the resulting beta values are less than or close to one for both models.

Table #9: Four and Five-factor control-variable augmented model estimations

Independent Variables	Four-factor		Five-factor	
	Coefficient Estimates	Standard Errors	Coefficient Estimates	Standard Errors
Alpha	0.00857**	(0.00334)	0.00453***	(0.00323)
EXMKTR	0.97420*	(0.08724)	1.09838*	(0.08526)
SMB	0.65172*	(0.13393)	0.82299*	(0.13001)
HML	0.10760***	(0.11959)	-0.09769***	(0.11871)
MOM	-0.12626***	(0.07397)	-0.25283*	(0.07340)
RMW			0.95701*	(0.17343)
R-squared	0.53580		0.58920	
Adjusted R-squared	0.52790		0.58050	

$$ADDPR_t - RF_t = \alpha + \beta EXMKTR_t + \varepsilon_t$$

$$ADDPRt - RFt = \alpha + \beta EXMKTRt + \Theta SMBt + \Omega HMLt + \varepsilon t$$

$$ADDPRt - RFt = \alpha + \beta EXMKTRt + \Theta SMBt + \Omega HMLt + \phi MOMt + \varepsilon t$$

$$ADDPRt - RFt = \alpha + \beta EXMKTRt + \Theta SMBt + \Omega HMLt + \phi MOMt + \mu RMWt + \varepsilon t$$

where $ADDPR_t - RF_t$ is the return of the addiction stock portfolio minus the risk-free rate. EXMKTR is the S&P500 market return minus the risk-free rate. SMB is the return spread of small minus large stocks from Fama & French. HML is the return spread of cheap minus expensive stocks. MOM is the momentum indicator. RMW is the return spread of the most profitable firms minus the least profitable. ε is the error term.

*, **, *** represent significance at 1%, 5%, and 10% levels, respectively.

Examining the results of the four-factor model regression we see positive values for two of the three control coefficients. *SMB* shows a positive value of 0.65172, indicating a significant impact of the return of small minus large stocks coefficient to our model. This value decreases when compared to the three-factor model, accounting for the slightly less explanatory power of *SMB* to the addiction portfolio performance in the four-factor model. We also see a small decrease in the loading on *HML* – the return spread between expensive and cheap securities – from 0.12194 to 0.10760 for the three-factor model and note the statistical significance at the 10% level in both. Thus, when compared to the three-factor model both *SMB* and *HML* have a smaller impact to returns of addiction portfolio stocks in the four-factor model. Lastly with the four-factor model, the value of the *MOM* coefficient is -0.12626. Since the momentum variable is defined as a stock's tendency to keep moving in the same direction it moved during the previous pricing period, we see an indication for securities in the addiction portfolio to experience price movements in the opposite direction of the previous period. This indicator further supports one of our initial observations that stocks in the addiction portfolio are more volatile and riskier than the broader market index (addiction portfolio beta is 1.57141 as shown in *Table #7*).

Also reported in columns #4 and #5 of *Table #8* are the five-factor augmented model regression results, where the coefficient values of all control variables – *SMB, HML, MOM, and RMW* – are estimated. As with the four-factor model, we see that all coefficient estimates are statistically significant, with three of the seven resulting in negative values across both models. *SMB* has the largest impact across the models on addiction portfolio returns, where *RMW* specifically has a large impact when introduced in the five-factor model. Aside from a slight increase from the three to four-factor model, we also observe the scale of Jensen's alpha being

gradually reduced as additional control variables are added to the models. Although it does indicate a small reduction in irregular performance as expected versus the market index, we still see a potential for higher returns with the addiction portfolio when compared to those provided by the S&P500 as all Jensen alphas are statistically significant.

The five-factor model also results in *SMB* increasing from 0.65172 to 0.82299, representing a higher impact of the small minus big portfolios return factor on the addiction portfolio returns. Like previous regressions, this suggests securities in the addiction portfolio perform more like small-cap stocks than large-cap stocks. Interestingly the value of *HML* flips from a positive to a negative value in the five-factor model and remains significant at the 10% level. This indicates a shift in return behavior of the addiction portfolio securities to more mirror growth stocks than value stocks, and accounts for a portion of differing return expectations for the addiction portfolio when set against the S&P500. The *MOM* coefficient estimated for the five-factor model is -0.25283, indicating stocks in the addiction portfolio tend to experience more variation in price movement and trends when compared to the S&P500. We see an increase in the coefficient weight of *MOM* in the five-factor model, providing evidence for the investor they can expect increased volatility in the addiction portfolio when *RMW* is included in the regression. The coefficient estimated for *RMW* in the five-factor model is 0.95701. It indicates a positive and significant increase in addiction portfolio returns being driven by the return spread of the most profitable minus the least profitable firms, showing companies in the addiction portfolio tend to perform more like robust, lucrative firms rather than those earning weaker profits. We also see a change in the overall composition of our coefficients with the introduction of *RMW*, as three of the five coefficient estimates experience a change of greater than eighty percent. The *RMW* coefficient has a heavy impact on the model, further supporting

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the idea firms in the addiction portfolio perform more robustly than the broader market, providing the potential of higher returns for investors.

In summary, changes in both *SMB* (small minus big) and *RMW* (robust minus weak) seem to have the greatest impact on excess returns provided by the addiction portfolio when compared to the S&P500. These factors help drive higher expected returns and correlate to investor expectations typically associated with innovative small-cap stocks. We also see a consistent increase in the value of *Adjusted R-squared* (0.46530, 0.52410, 0.52790, 0.58050) as we progress through the regression models, showing an increasing goodness of fit for our model estimations. The large impact of SMB and RMW supports our theory that investors can expect higher returns when investing in addiction securities versus the broader market, as the performance can be correlated to addiction portfolio holdings behaving more like small, robust companies driven by innovation and opportunity provided by evolving consumer markets. As a result, stocks in the addiction portfolio may be susceptible to increased volatility, while at the same time providing investors willing to shoulder the additional risk with higher opportunities for return on their investment.

CHAPTER 4 – CONCLUSION

This paper has sought to provide insight to the individual investor on whether they can expect the potential for higher total returns by investing in companies associated with addiction. There is an expanding body of literature centering around the potential above-average investment returns offered by publicly traded firms providing potentially addictive products and services. Much of the previous research referenced in the literature review for this project showed that investors can indeed expect higher returns from stocks associated with addiction which are controversial and often harmful to individuals and society (Hong and Kacperczyk, 2009, Liston 2016). This paper builds on previous literature by including publicly traded sports gambling and cannabis companies in a portfolio of firms offering products and services that are considered addictive in nature. Previous studies have not taken into consideration potential returns from firms in the sports gambling and cannabis industries, which are available across public stock exchanges following recent changes in legislation in many states across the U.S.

We applied a combination of analytical approaches to compare the returns of a portfolio of stocks from various industries associated with addiction to returns of the S&P500 index. Going forward, opportunities for investors to purchase equity in companies whose products have addictive attributes will continue to increase in North America as laws change at both national and state levels to introduce sports gaming and recreational cannabis to previously untapped consumer markets. As the legalization of previously illegal products and services continue in new markets, investors may be provided with opportunities for higher returns. For those opposed to the idea of looking to profit from investing in stocks associated with addiction and vice, it is important to note the existence of socially responsible investing (SRI). When compared to investing in equities tied to potentially addictive products and services, SRI and

ESG investments offer investors less controversial investment options while exposing a possible paradox of the market – socially beneficial investments often involve higher costs impacting potential returns while investments in vice may help promote addiction with consequently negative impacts on society.

By analyzing both historical returns and expected returns of such firms using CAPM, Fama-French three, four and five factor models, we conclude an investor framing their choices based on whether a company produces addictive products and services – such as alcohol, tobacco, gambling, and cannabis – can expect a potentially higher return from their addiction-based portfolio than they would from the S&P500. We completed performance return calculations and estimated Jensen's alpha and betas based on both equal investments in all 40 securities in the addiction portfolio, as well as using a market value-based weighted approach. Including a value-based method in the empirical analysis provides insight into the portfolio's impact on the broader market and economy, as it accounts for differences between market capitalizations between companies in the portfolio.

Our findings show that although the S&P500 has outperformed vice and addiction stocks in the recent short-term, addiction-based investments outperformed their benchmark counterpart based on both monthly and annual returns. An anomaly of the financial markets is that an addiction portfolio investor can expect higher overall returns (with the potential for negative social consequences) versus their counterparts investing traditionally in the S&P500 market index, and the results of the analysis from our models show the regression estimates supporting our findings as statistically significant. As to be expected, when pursuing higher returns, our research also shows investors will be exposed to greater risk when investing in a portfolio of addiction related firms versus a broad market index like the S&P500. Potential applications to

policy of the findings presented here could vary depending on preferences of regulators and voters. Investment gains from securities associated with addiction could be penalized or taxed at a higher rate to discourage the financial backing of products and services that may be harmful to society, while at the same time providing incentive to avoid the increased risk of investing in addiction related industries.

This study also provides opportunities for further research. First, the analysis could be revisited when additional pricing data is available for both cannabis companies and firms involved in sports gambling. As more states allow these activities to be made available to consumers, the additional data will support a more comprehensive analysis. Pricing data from companies operating in industries not covered in this study (such as vaping) could also be included in further research. In addition, further studies could focus on the performance of an addiction portfolio during different periods of political majority, when one political party controls Congress, the House of Representatives, and/or the Presidency. This research angle could prove especially interesting as controversial activities such as those covered in our study are often correlated closely with political views. Another opportunity to expand on this research is to revisit the performance of ESG and SRI based investments when additional pricing data becomes available. Over time the benefits of investing in environmentally and socially responsible companies has shown mixed results, with recent research such as the noted 2012 Deutsche Bank study showing ESG investing proving to be beneficial for firms and individual investors.

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