Sin Stock Returns on European Markets

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Abstract

   In this paper I study the returns of sin stocks on European markets. The sin stocks here include alcohol, tobacco, gambling and defence industries. Nowadays, the increasing awareness of health issues caused by sin products has influenced the investors' behaviour, which may have sizeable price effects of these stocks. I find evidence, that a portfolio long sin stock earns both financially and statistically significant abnormal returns over the market return. I also match the sin industries with their virtuous comparables. I run the most important time-series regression analyses with both sin and comparable industries to examine more accurately effects of societal norms on stock returns.

   I further hypothesize the sin stocks to be undervalued. I study that with two value factors; market-to-book and price-to-earnings ratios. I find some contradictory evidence about the undervaluation theory, but the recent trend supports the theory about deeper undervaluation. The undervaluation may be due to the lack of arbitrageurs, such as institutional investors, who have to rule out sin stocks because of societal norms. Thus, I study the effects between the amount of money invested in socially responsible investment funds and the returns of sin stocks.

   Additionally, I study some other sin stock characteristics. By examining the single-factor CAPM betas, I find that the sin stocks are relatively stable against the market fluctuations. Furthermore, I find that they are fairly resistant against recessions and recover quickly from sinking markets.

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1 Introduction

Throughout the centuries and cultures people have been craving for sin. And for just as long, some people have turned it into profitable business. Nowadays the core sin industries are alcohol, tobacco and gaming industries, additionally defence or gun industry adds to this triumvirate of sin.

In academic literature, these industries are widely characterized as stable, recession-resistant, profitable business fields. Hong and Kacperczyk (Hong & Kacperczyk, 2009) find typical characteristics of sin stocks; they are less held by norm-constrained institutions, receive less coverage from analysts, have higher expected returns than their comparables and face greater litigation risk.

In this paper I examine the performance of sin stocks in the European markets. I study the returns of a sin stock portfolio, reasons that might cause the abnormalities, and sin stock performance in different business cycles. I include 18 countries in my research and compare the returns to the stock index benchmarks in Europe. I assume the sin stocks to overperform the benchmarks. Further I compare the sin stock returns with their comparable industries and overall European market average, which I expect to show lower returns than sin stocks.

Is there a significant undervaluation and low demand on sin stocks then? In academic literature, these features have been explained by social norms driving investors' ability to make decisions (Hong & Kacperczyk, 2009). As the awareness about the health hazards caused by smoking has increased, it has become more criticized to support these industries by investing in them. Many investors and especially public institutions have to restrain from investing in sin businesses, because otherwise they might suffer from social reputation loss. Ethical norms play a massive role in controlling people's lives still in the 21st century, and the social responsibility movement is still increasing.

Investors' awareness about social responsibility issues has increased from the 1990's and early 2000's was booming time for social responsibility and corporate governance research. In 1979, Carroll (Carroll, 1979) identifies four types of responsibility, that would emerge to become the framework of corporate social responsibility (CSR)

concept. The four types were; (1) Economic responsibility, (2) Legal responsibility, (3) Ethical responsibility and (4) Discretionary responsibilities. Nowadays, many of the sin companies easily fulfil all the CSR criteria (2)-(4), but the principal questions is about economic responsibility. Because it refers to the fundamental responsibility of business to produce goods and services that the society wants and needs, sin companies are often considered unethical only due to their core products.

CSR concept also includes many ethical theories about business management. One of them is 'Consequentialism', which refers to theories of ethics that assess right and wrong in terms of consequences of actions. It includes the utilitarian theory, where the 'good' acts are those bringing the greatest happiness to the largest number of people (Blowfield & Murray, 2008). This is often questioned with sin companies: do they bring happiness to the customers or a smaller number of stock owners?

One can see the phenomenon in the rapid growth in the assets invested in socially responsible investment (SRI) funds in Europe as Figure 1 shows (Vigeo, 2011) (KPMG, 2016) (Eurosif, 2015).

Figure 1 Assets in the SRI funds industry
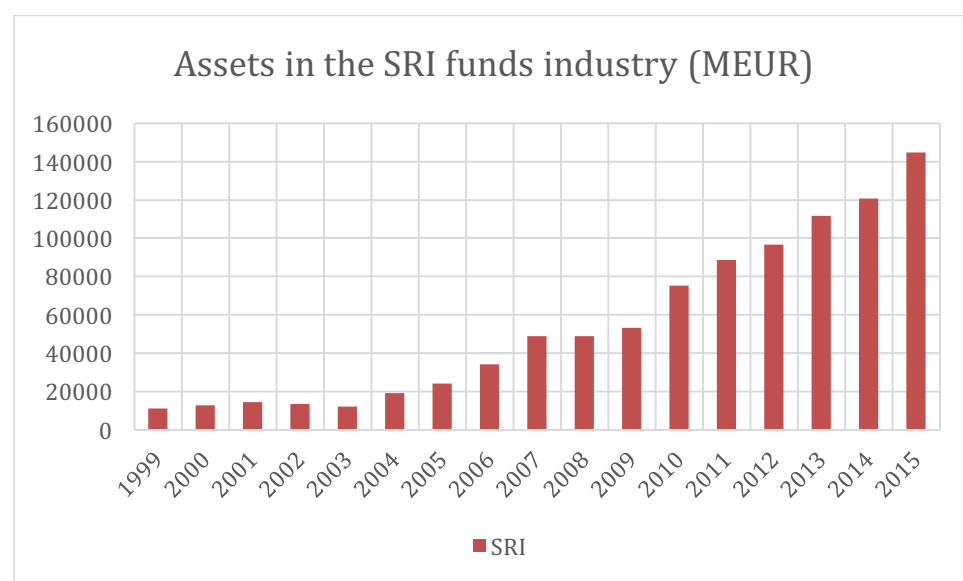
Source: Vigeo: Green, Social and Ethical Funds in Europe; Eurosif: European SRI Study 2014; KPMG European Resonsible Investing Fund Survey 2015

Firstly this paper adds to the existing literature, because so far most of the literature concerning sin stocks has studied the US markets, but this thesis focuses on European markets. However, as Julie Salaber (2007) noted, the differences between the ethical norms in US and Europe are significant, and the need of morality varies also inside Europe. On the other side, I predict the avoidance of sin stocks to be a more or less universal phenomenon, and I aimed to approve it through comparable and similar results between the US and European markets.

Besides the differences in ethical norms, there are also legislation differences both between US and Europe and inside of Europe. Legislation changes play a heightened role within sin industries, which are particularly vulnerable to unexpected legal amendments. Again, this paper adds to the existing literature, by focusing on European markets under more versatile legislation. One of the biggest legal differences is that the online gambling is not legal in the US, while in Europe many of the biggest companies in the gambling field are focused on online business. To my knowledge there is no academic study that would include online gaming companies of this scope in their research.

The paper is constructed as follows. In section 2 I am going to introduce you the essence of sin industries and discuss the characters that are common to them. Then follows the section 3 about the previous literature about sin stock return research, and then, in section 4, I present the hypotheses. In section 5 I tell about my data and methodologies in the following section. Finally, I present the results in section 7 and discuss them more thoroughly in section 8. Conclusion in section 9 completes the paper.

2 About the essence of sin industries

The Vice Fund, initiated in 2002, is the most notable mutual fund focusing solely on investing in sin stocks. Nowadays the fund is called the Barrier Fund, and it continues in the solid path of providing profitable fiscal years one after another. The fund lists five compelling investment characteristics in sin stocks:

- Natural barriers to new competition
- Steady demand regardless of economic condition
- Global marketplace – not limited to the US economy
- Potentially high profit margins
- Ability to generate excess cash flow and pay and increase dividends (USA Mutuals, 2016).

While there is little academic proof about for instance the recession-proof characteristic of sin stocks, according to Barrier Fund, it works at least in practice.

One of the common features of sin industries is the high threshold for new companies to enter the market. Legislation and other restrictions limit the willingness of new companies to enter the market. In some situations, this causes a relatively oligopolistic market concentration, but in general the sin markets are healthy and competitive. In some European countries, for example Sweden and Finland, there are no publicly listed alcohol companies, because in these countries it is considered to be nation's responsibility to run these businesses through state-owned monopolies. In Finland also live-gaming is run entirely by state-owned monopoly. While these monopolies are reasoned by nation's health and responsibility issues, many defence companies are state-owned due to security issues.

Nowadays, the most common litigation risk is the increase in excise tax rates. Tables 1 and 2 show the excise tax rates of alcohol and tobacco products in Europe in 2014. Tax regulations are a big burden the sin companies and the consumers must carry.
As we can see, there are significant differences between the different countries even within EU.

For instance, wine industry is a large industry and employer in Italy, and the zero-level excise tax reflects how Italy's government wants to support the vintners. In the middle

of 1990's many European Union countries lowered their excise tax rates on alcohol, but after 2000, the overall trend in Europe has been to raise the excise tax rates (Neslen, 2016) (WHO, 2008). It reflects the attitude, about how countries want to guide their citizens' habits into healthier ways.

Table 1 Excise tax rates on alcohol beverages in EU

Country	Excise tax% of retail price		
	Beer	Wine	Spirits
Austria	.	0.00	.
Belgium	.	11.34	.
Czech Republic		0.00	
Denmark	34.20	17.60	41.50
Finland	38.00	36.00	67.00
France	8.80	3.10	33.20
Germany	6.60	0.00	13.78
Greece		0.00	
Hungary	20.00	40.00	27.00
Ireland	20.40	22.50	41.30
Italy	11.00	0.00	20.00
Netherlands	20.00	9.40	45.80
Poland	22.00	14.00	57.00
Portugal	.	0.00	.
Slovenia	.	0.00	.
Spain	6.18	0.00	22.25
Sweden	25.90	33.80	67.10
UK	.	34.35	.

Source: EU Commission - Excise Duty Tables

Table 2 Excise tax rates on tobacco products in EU

Country	Excise tax% of retail price	
	Cigarettes	Cigars & Cigarillos
Austria	40.00	13.00
Belgium	45.84	10.00
Czech Republic	27.00	.
Denmark	21.69	10.00
Finland	52.00	31.00
France	49.70	23.00
Germany	21.69	1.47
Greece		35.00
Hungary	38.00	14.00
Ireland	9.20	.
Italy	51.03	23.00
Netherlands	1.09	5.00
Poland	31.41	.
Portugal	17.00	25.00
Slovenia	21.18	6.00
Spain	51.00	15.80
Sweden	1.00	.
UK	16.50	0

Source: EU Commission - Excise Duty Tables

However, the radical variations in tax rates around Europe and between different alcohol or cigarette categories cause frictions between the companies and countries. Consequently, Snowdon (2012) found a pattern, that higher tax rates correlate with higher amount of unrecorded alcohol consumption. Suddenly, the usually law-abiding Nordic countries are at the top of the list of unrecorded alcohol consumption. The unrecorded alcohol can be smuggled or bought for example from lower-tax Baltic countries.

Figure 2 Affordability of alcohol/unrecorded alcohol consumption
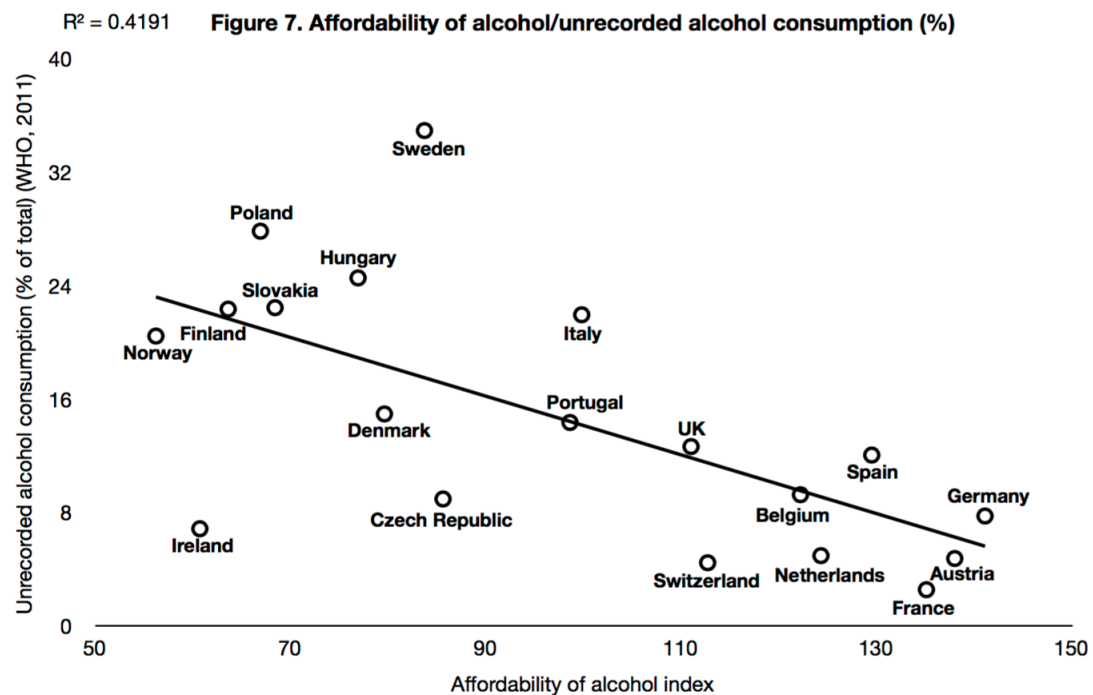
Source: Christopher Snowden – Drinking in the Shadow Economy

Sin companies are also considered to be financially sound and solvent. When looking for instance their quick ratios from 2000 to 2015, the figures support the assumption. The medians of the quick ratios of tobacco and gambling fields have been slightly above zero, and in alcohol and defence industries close to zero, which can be considered fairly good result. The average quick ratios constantly exceed one in all sin industries. The detailed table of quick ratios can be found in Appendix.

When it comes to the industries average net margins, tobacco is once again the positive exception. While the average and median net margins are close to moderate 5% within alcohol, gambling and defence industries, the margins in tobacco industry stay well over 10%. From time to time tobacco companies even reach almost 20% average net margin.

In this introduction of Section 2 I have focused on the common and global features of sin stocks. The rest of the section focuses on the individual industries and their exceptional characteristics in the European environment.

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2.1 Alcohol industry

EU is the largest exporter of spirit drinks in the world, and while its inside market is diminishing, it must find growth from outside of its continent (Spirits Europe, 2016). The exported spirits were worth €9.6billion in 2014 and they were transported to 150 markets. The largest single market was the US with exported spirits worth €3.3billion in 2014.

EU's Commission introduced an EU strategy in 2006 about how to support its member states in reducing alcohol related harms (European Commission, 2006). The strategy has led to reduced road deaths caused by alcohol and a larger part of Europe is now drinking responsibly. Also underage drinking is reduced, but it is still a living problem.

When it comes to the wine industry, EU is once again the market leader in the world is all categories: production, consumption, export and import. EU account fro 45% of the world's wine-growing areas, 65% of global wine production, 57% of consumption and 70% of export in global terms (Comité Européen des Entreprises Vins, 2016). Newer wine-producing countries, such as New Zealand, South Africa and Chile, have entered the markets and increased their exports during the past 20 years with 370%, but still 84 out of 100 most famous wine brands in the world come from France (BNP Paribas, 2015). The world wine consumption was 239 million hectolitres in 2013, and while the average world price for exported wines was 2.62 euros per litre, French wines average price amounted 7 euros per litre.

What France is to wine industry, Germany is to beer sector. Germany is clearly the largest producer and consumer of beer beverages in Europe (The Brewers of Europe, 2015). Figure 1 shows the production and consumption figures in the largest beer-producing countries in Europe.

Figure 3 Beer industry in Europe

Beer industry in Europe (in 1,000 hl)
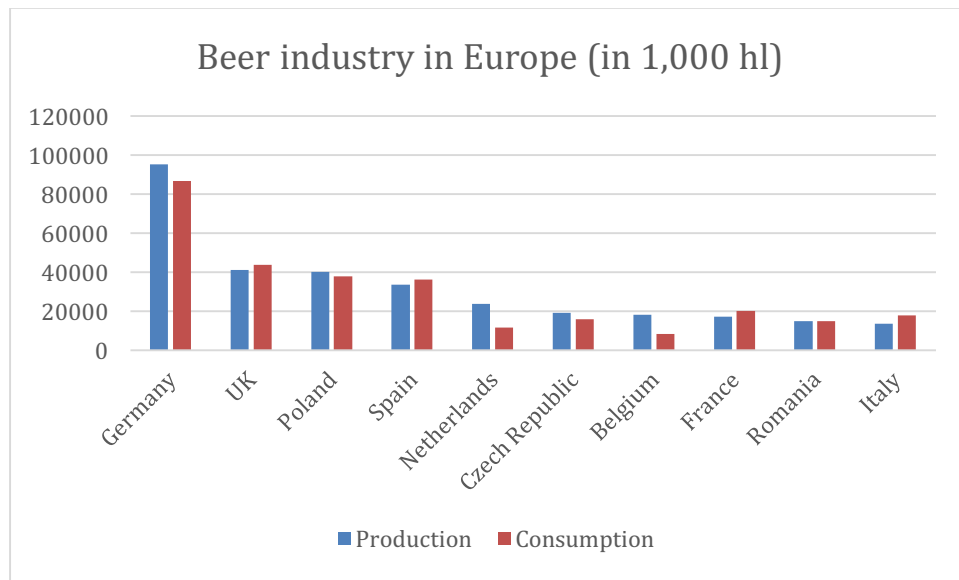
Source: National brewer's association

Beer consumption per capita is higher than Germany only in Czech Republic, and the Netherlands come close to Germany in the exporting figures: Germany exported 15,439,000 hectolitres in 2014, while the Netherlands exported 13,958 hl of beer. The United Kingdom was the largest beer importer in 2014 with 8,531 hectolitres and there is also the highest number of breweries in the UK, around 1,700 active breweries in 2014.

The beer market in Germany was worth USD36.2billion in 2014 and is expected to grow to USD40.6billion by 2021. Another significant growth is expected in France, where the beer market value could increase from USD11.7billion in 2014 to USD15.6billion by 2021 (Transparency market research, 2015).

The challenges in the European markets concern internal substitutes such as whiskey, rum and wine, which limit the growth in the beer market. Also some ready-to-drink non-alcohol beverages create a new competing environment for the beer industry.

The most radical change in the attitudes towards alcohol industry changed during the various prohibitions both in the US and in Europe during 1920's and 1930's. That era showed, that the alcohol consumption remains as part of the life style in western countries despite of the current legislation. However, one of the biggest insecurity

factors in this industry as well, are the changes in legislation, because they always have a straight impact on the companies' profitability.

The awareness of alcohol's health harms is increased during the passed decades like it has increased about tobacco products. Alcohol is definitely seen as a sinful industry in Europe, but it is an inseparable part of European culture and that is, why it still is a stable business.

2.2 Tobacco industry

In this section I must mention the problems of tobacco companies, when it was proven in the 60's that tobacco causes cancer.

Tobacco was initially a treat of American indigenous peoples, but only two centuries after Columbus had landed to America, tobacco was a global phenomenon. It is a piece of evidence that the plant *Nicotina tobacum* clearly causes serious addiction. In the 16th century, there were attempts to cultivate tobacco also in Europe, but they failed and the Europeans focused on importing it from America to both Europe and Africa (WHO, 2016).

The first notes about the health damages related to tobacco are found from the 17th century, when England's King James I wrote *A Counterblast to Tobacco* and in China philosopher Fang Yizhi pointed out that long years of smoking "scorches one's lungs". In Turkey even death penalties were used as punishments for smoking in 1633, but it took over 300 years more before the health issues related to tobacco causing lung cancer were truly acknowledged and smoking became – at least to some extent – publicly reprehensible.

In 1950's became the ongoing battle between the doctors and tobacco industry about the health hazards smoking causes. In 2011, lung cancer was the leading cancer site in males, comprising 17% of the total new cancer cases and 23% of the total cancer deaths. With females the figures are a little lower, but lung cancer is common with both sexes, and it is said that in 80% of the cases smoking has caused the cancer (Jemal, ym., 2011). Medical experts often talk about tobacco epidemic, referring to the popularity of

smoking in one country. In most of the Western countries the epidemic peaked by the middle of the 20th century, and now the peaks are seen in some Asian and African countries. Doctors together with WHO are still fighting to curb tobacco epidemic and try to convince the politician to raise the excess taxes and toughen the smoking bans.

Nowadays, the biggest consumers of tobacco products per person are Russia and China along with other far-east Asian countries and former Soviet Union countries, and there are altogether around one billion adult smoker around the globe (BAT, 2016). Nevertheless, Central European countries do not fall far behind with the consumption of tobacco products. In 2012 in all European countries the average number of cigarettes smoked per day by the smokers was over 10 pieces, and in 17 countries even over 20 cigarettes. An interesting development in Europe is also, that as the tobacco consumption in the western developed countries in general is decreasing, the situation is opposite among women in six European countries: Austria, Bulgaria, France, Greece, Lithuania and Portugal (Ng, ym., 2014).

2.3   Gambling business

"Gambling is a basic human instinct and it's going to happen whether we like it or not. The advantage of having a regulated industry is the transparency and control it gives to government and, through them, to society." – *James Henderson, CEO, William Hill Group*

The casino and gambling businesses status varies across Europe. In some countries, such as Finland and Sweden, the casinos are operated by state-owned monopolies and casinos are rare, whereas for example in Estonia even arcades have a status of a casino. Alone the European Casino Association covers 800 casinos in 23 European countries (Goudsmit, 2015). In Europe, first proper casinos were known to exist in France in the late 18th century. Nowadays there are 44 stock exchange listed gambling companies in Europe.

Even though the gambling business has suffered from a modest decline from 2013 onwards, the volume is still enormous. Las Vegas Strip's monthly revenue was in August 2015 almost $530million. According to Gaming Inspection and Coordination Bureau of Macau, the gaming revenues have declined from 2013, first only 3% from 2013 to 2014 but in 2015 gaming dived by 34% (Stutz, 2015) (News, 2016). One of the reasons for the plummeting figures was the new anti-corruption amendment China introduced in 2015 (An & Carlson, 2015). However, the revenue losses in China reflect the diminished gambling activities of the Chinese businessmen around the world. The Chinese are a massive client group for many European casinos as well.

Because the business is not as geographically concentrated in Europe, the corresponding figures are difficult to show, but the before mentioned revenue numbers give a scale of the business.

Gambling business is global but it takes different forms around the globe depending on the legislation. When it comes to the publicly listed companies in gambling business, the most significant difference between the US and other markets is, that in the US online casinos are still forbidden. Therefore it is no surprise that nine out of ten largest online gambling companies are listed in European stock exchanges, more specifically London and Stockholm (Potvin, 2015). Out of the largest online casino firms Amaya Inc. is the only one listed outside of Europe, and it is headquartered in Toronto, Canada.

The online gambling market is not small in any measures. The largest companies are multibillion dollar firms and they have registered players i.e. customers all around the world. However, the industry is young, since the first online gambling sites were published in 1994 in Antigua and Barbuda (OnlineGambling.com, 2016). In 1998 the first online poker room was opened and the game's popularity rocketed almost immediately. Many of the online poker companies were still registered in the Caribbean countries.

In 2006 the United Stated Congress passed the Unlawful Internet Gaming Enforcement Act (UIGEA), making it illegal to process payments for gambling activities to anyone residing in the US. This forced the majority of the websites to shut down their business, and even those few who still continued accepting players with US citizenship were

banned in 2011 by the US officials. In Europe, the business is healthy and does not suffer from such legislation that would place it in the grey zone.

2.4 Defence industry

Defence industry is a major employer in Europe. In 2014 it employed 500,000 people directly and created 1,200,000 more jobs indirectly (European Commission, 2016). The military industry is divided in four subcategories: Aeronautics, Land and Naval Defence and Space. Altogether their turnover concerning military activities in EU in 2014 was 97.3 billion euros (AeroSpace and Defence Industries Association of Europe, 2015). However, this figure includes all companies under defence industry in EU, not only the publicly traded ones.

While almost two thirds of aerospace industry's and over 90% of the space sector's annual sales come from civil activities (AeroSpace and Defence Industries Association of Europe, 2015), the defence industry's political importance is undeniable. Consequently, many of the industry's companies are at least partially owned by their domestic countries and not traded publicly.

Unlike basically all other sin industries, defence has high research and development costs. R&D expenditures of defence industry in EU were 20 billion euros in 2014 (AeroSpace and Defence Industries Association of Europe, 2015). Due to that reason, defence industry typically employs highly educated employees. In 2014 70% of the industry's employees had either technical education or university graduation.

In the beginning of 2015 European Commission saw the reducing defence budgets and increasing development costs as a challenge for individual European countries. It also found the shortage of skilled labour and the limited resources of the industry's SMEs to be challenges for competitiveness. On the other hand, in June 2015 executives and EU officials were unanimous about the overcapacity the European defence industry had reached (Reuters Markets, 2015). Many of the European defence companies export their products outside of the continent, but the inside market is more challenging due to national interests. European Commission stated that the industry must make a move

away from the existing focus on national markets, and that "Europe can no longer afford the inefficiencies of duplication and overcapacity that our existing fragmented market entails".

The legislation concerning gun ownership is very strict in many parts of Europe. Despite of that, many of the European countries are at the top of the list of gun ownership per capita. For example, all Nordic countries excluding Denmark are at the top of the list, but part of the amount of guns can be explained by popularity of hunting in these countries. In many of the countries, self-defence is not a valid reason for gun ownership, and in UK "military-style" firearms are banned, and handguns nearly impossible to legally possess. At the other end of the spectrum lies Austria, where self-defence is a valid reason for owning a gun, and semi-automatic rifles and shotguns can be freely bought for sports and hunting, but following the minimum standards of EU, the minimum age for gun ownership is 18 and automatic weapons are banned also in Austria (Boulden, 2015).

The geopolitical development especially in the South-Eastern part of Europe remains a question, and the situation can quickly turn into unstable crisis, which also causes some fluctuations to the defence industry stocks returns.

The attitudes towards guns are more tolerant in the United States, which is clearly seen in the legislation (Guttman, 2012). Especially civil gun ownership is seen more unethical in Europe, and defence industry is often called weapon industry, which also reflects attitudes towards guns. It is possible that this mind-set is also shown in the returns of the stocks.

2.5   Excluded industries

2.5.1   Adult entertainment

I was forced to exclude adult entertainment and drug industries from my sample of sin stocks. By their nature of being entertainment for adults and widely considered as sinful activity, pornography and brothels should be included in the sin stocks. It would have very interesting to study the European companies and their returns involved in these

businesses, especially because in Germany, Austria, Switzerland, the Netherlands and Greece the brothels are legal and taxable business. And nor is it small industry.

Germany legalized prostitution in 2002, and in 2013 the market only in Germany was estimated to be worth 15 billion euros annually (Gunter & Clissitt, 2013). Not even prostitution is a completely recession-proof industry, as the German brothels were reported to be forced to cut their prices during the financial crisis in 2009 (Kirschbaum, 2009). There are many mega-brothels in Germany as well as smaller cubicles, where women sell sex (Gunter & Clissitt, 2013). The country attracts sex tourists with inexpensive services and massive milieus (Local, 2013).

Unfortunately, a large part of the business is still underground even in the before-mentioned four countries, where prostitution is legal. On top of that, there are practically no publicly listed companies in adult entertainment industry in Europe. One of the best-known publicly listed companies globally in the field of pornography has been Playboy Group. In the beginning of 2016 it reported plummeting figures in its sales, and admitted the company is looking for an acquirer (Perlberg, 2016). Printed magazines are also in this field suffering because of the free digital substitutes.

2.5.2   Drug industry

I must also exclude drug industry i.e. pharmaceuticals, which has a controversial reputation. Some companies in the industry have been accused for unethical animal testing and some for overpricing their medicines to sinful levels. For example, one of these cases was GlaxoSmithKline's (GSK) anti-depressant in 1998 (Blowfield & Murray, 2008). By filing four patent infringement lawsuits, GSK effectively stopped other companies to enter their generic drugs to the markets. As the original patent owner, GSK was able to keep its expensive drug on markets, but suffered from negative publicity and reputation losses on top of legal expenses.

Despite of the before-mentioned ethical questions, during more than the past decade the liveliest debate in pharmaceuticals has been about legalizing cannabis. Three European countries have already done so: Czech Republic, France and the Netherlands. Others

still consider marijuana to belong to sinful narcotics that should not be a legally accessed public commodity.

Once again, no marijuana-expertized companies have become publicly listed yet. On the other hand, it is nearly impossible to scan all the medical companies and rank them by their ethics, because most of their sins have been discovered only through scandals.

The immorality of the drug industry is also debated, because many people think that the goal of making people healthier forgives all deeds. On the other hand, people's awareness of the harms of excessive use of drugs and medicine has increased and some people nowadays even refuse to take medical treatment.

Thus, because the sinfulness of drug industry is unclear, I must exclude it from this research, despite of its common characteristics to the included sin stocks, such as its sometimes addictive nature.

3 Literature Review

3.1 Sin industries tend to outperform market returns

So far, the most cited academic article about sin stocks and their returns has been the one by Hong and Kacperczyk (Hong & Kacperczyk, 2009). They hypothesize that there is a societal norm against funding operations that promote vice and that some investors, particularly institutions subject to norms, pay a financial cost in abstaining from these stocks.

Their paper provides new evidence on the market effects of social norms. Studying sin stocks is a suitable industry, because firstly, there is clearly a societal norm against funding operations that promote human vice. Secondly, the stock market provides them with a rich set of data on investor behaviour, stock pricing and firm behaviour, which allows them to discriminate more finely among alternative hypotheses and thirdly, there can be significant financial costs associated with norm-constrained investing i.e., investors pay for their discriminatory tastes.

Some investors may be concerned about getting a bad reputation for investing in vice. In contrast to institutional investors, individual investors can keep their stock positions out of the view of enforcers of societal norms, and therefore, individual investors are often more willing than institutional investors to hold sin stocks (Hong & Kacperczyk, 2009). The sin stock comparables have on average about 28% of their shares held by institutions, while in contrast, the comparable figure for sin stocks is 23%. Also the analyst coverage is weaker for sin stocks; only 1.3 analysts cover sin stocks on average, while 1.7 analysts cover their comparables.

Sin stock are known to be cheap compared to other stocks, i.e. they have low price-to-book or price-to-earnings ratios, and Merton provides at least two possible reasons for this in his paper (Merton, 1987). First, the neglect of sin stocks by an important set of investors, such as institutions, means that the prices of those stocks will be depressed relative to their fundamental values because of limited risk sharing and hence, sin stocks should have higher expected returns than comparables. Second, because of neglect or limited risk sharing, Merton shows that the CAPM no longer holds and idiosyncratic

risk and not just beta matter for pricing. Consequently, the increased litigation risk should further raise the expected returns of sin stocks. Hong and Kacperczyk find evidence that the sin stocks clearly outperform their comparables and have lower valuation ratios.

One of the rare papers about sin stocks in European markets is the one called The Determinants of Sin Stock Returns: Evidence on the European Markets by Julie Salaber (Salaber, The determinants of sin stock returns: evidence on the European market, 2007). She explores in her paper, whether sin stock returns depend on legal and cultural characteristics such as religious preferences, the level of excise taxation, and the degree of litigation risk. She finds evidence that protestants are more sin averse, sin stocks have higher risk-adjusted returns when they are located in a country with high excise taxation, and that sin stocks outperform other stocks when the litigation risk is higher.

On the other hand in a more recent paper of hers, she finds evidence that the sin stocks are only as recession-proof as some other industry-comparable stocks, but that they still outperform the overall market during bad times, suggesting that socially responsible investors pay a financial cost when avoiding sin stocks because of social and ethical criteria (Salaber, 2009).

3.2 Ethics in business

There exists some previous literature about how ethics affect investors' decisions. In this section we have a look at that aspect.

Ethics and different sense of morality guide people in their decision making, even the investor's decisions. Hong and Kostovetsky have studied the influence of political values to investing (Hong & Kostovetsky, Red and blue investing: Values and finance, 2012). They find that mutual fund managers who make campaign donations to Democrats hold less of their portfolios (relative to non-donors or Republican donors) in companies that are deemed socially irresponsible. They ration the behaviour of these investors so, that the investors might not want to see their savings invested in causes that they oppose, similar to a boycott of certain consumer products, or alternatively, the

pecuniary-based explanation would be, that the political values shape investor's risk-return model. On the non-pecuniary side, managers might be using their portfolio choices as a form of a perk, as in classic principal-agent models. They might tilt towards stocks that conform with their political views if the social responsibility of stockholdings enters their utility function.

They find strong evidence that political values influence the investment decisions of mutual fund managers. Democratic managers invest 2.82% of their assets in politically sensitive industries, while Republicans invest 3.75%. A typical SRI fund underweights such industries by 1.6%. In a larger perspective, the fact that such a large group of investors (Democrats) potentially care about corporate social responsibility and invest accordingly could affect the cost of capital of firms in all industries and motivate improvements in community programs, employee relations, environmental records, and other forms of corporate social responsibility.

Consequently, as mutual funds are important marginal price setters in markets, considering that many professional managers are already practicing "closet socially responsible investing", it is unlikely that they will provide the contrarian positions needed to stabilize prices in markets, which could lead to underpricing of sin stocks.

3.3 Addictions guide people's behaviour

To be able to understand the business behind sin stocks, we must first take a look into what drives a major part of the sin product consumption: the addiction.

All people have habits and some of them evolve into addictions. George Messinis has studied the habit formation hypothesis, and the two main objectives in his paper are to outline the habit persistence hypothesis and to review the theory of addiction with a focus on issues of relevance to the theory of consumption (Messinis, 1999). In the previous literature, the addiction is often divided into rational addiction and myopic addiction.

Messinis leans his study on the life cycle -permanent income model of consumption, which predicts that risk averse consumers smooth their consumption by saving in good times and by dissaving in recessions. When faced with a rising income profile, finite-lived consumers would also like to save when young and dissave when in retirement. A trivial statement would be that this pattern does not quite suit the consumption of sin products, which are highly consumed regardless of the consumer's underlying wealth. Empirical research, however, has identified that i) the consumption follows current income too closely, ii) income growth Granger-causes saving with a positive sign and iii) saving behaviour by the elderly is highly heterogeneous. Messinis defines addiction as a strong form of habit formation, which can be rational or myopic.

Rational habit formation involves time-dependent preferences where the marginal utility of consumption at time t depends on past levels of consumption. Additionally, past consumption raises the consumption standard and makes a unit of current consumption less enjoyable. Furthermore, consumption is a weighted average of permanent income and past consumption. Traditionally there is found to hold an inverse relationship between wealth and impatience, but habit persistence suggests a positive association between consumption and consumer impatience.

When it comes to rational addiction, the consumer tries to maximize the utility by taking into account the future consequences of past and current consumption of addictive substances. Potential addiction is associated with adjacent complementarity, which is present, when positive correlation exists between current and future consumption or when the marginal utility of consumption from a change rises above the so called shadow price. Furthermore, Messinis adds, that as regret if an essential part of addiction, addiction originates from mistaken beliefs regarding one's likelihood of becoming an addict. Because an addiction is the unintended outcome of uncertainty and erroneous underestimation of the harm caused by the consumption of addictive substances, the addicts often are surprised to find themselves drawn into an addiction and they regret having been overly optimistic in their assessment of the initial prior.

A person suffering with myopic addiction on the other hand is in inner-conflict. This is due to three different systems controlling brains. The *alpha* brain seeks to fulfil basic physiological needs, the *beta* brain forms tastes, habits, acts efficiently and learns only

from experience. The *gamma* brain is intelligent, monitors the activities of the other brains, forms expectations and can influence the other brains. Shefrin and Thaler (Shefrin & Thaler, 1988) discuss about two systems, the quick one called "doer" including *alpha* and *beta*, and a slow *gamma* brain, which they call "planner". While the doer is in many cases efficient helper in everyday life, it causes troubles, when trying to fulfil the needs arising from myopic addictions. Luckily, because of the planner, many consumers are able to control their desires.

Messinis concludes, that there are two schools of thought. The first perceives the consumer as a single unit who is fully aware of the effects of addiction on future utility. Addiction is the outcome of consumer choice and involves a substantial increase in consumption over time. Based on the second school of thought, the consumer deals simultaneously with several objectives, and in contrast to the first school, research here has highlighted external stimuli as a means to managing addiction.

Addiction, and especially the usual denial of it, is probably the biggest issue, why alcohol, tobacco and gambling are considered to be so sinful. Not only does the excessive use of these substances or forms of entertainment cause financial and health problems to the addicted person himself or herself, but also to the people close to the addicted one.

4 Hypotheses

Following previous literature and especially the paper by Hong and Kacperzcyk (2009), my first hypothesis is:

H1. Sin stocks earn abnormal returns over market portfolio.

This hypothesis I study by running time-series regression analyses based on capital-asset pricing model and Fama-French three-factor model. I use the returns of a sin portfolio over the risk-free rate and the returns of a portfolio comparable industry portfolio. I also create a portfolio long sin stocks and short their comparables to study its abnormal returns.

As for the causes of the abnormal returns, I have two other hypotheses:

H2. Sin stocks are undervalued measured by valuation ratios.
H3. Sin stocks stay underpriced due to their low demand caused by investors' ethical choices.

Hong and Kacperzcyk found clear undervaluation of sin stocks by running cross-section regressions about the stocks' market-to-book ratios and price-to-earnings ratios. I follow their method and run cross-section regressions as well to study my Hypothesis 2.

Societal norms force certain investors to avoid sin stocks and are against promoting vice operations. Especially institutional investors such as mutual funds and hedge funds are under constant surveillance from their owners, and the managers are often forced to screen sin stocks out of their portfolios. If these major arbitrageurs avoid sin stocks, consequently the sin stocks may stay undervalued, and that would cause their expected returns to rise. I study Hypothesis 3 by running time-series regressions, where the return of sin stock portfolio is the dependent variable, and the growth of money invested in socially responsible investment funds is the independent variable.

5 Data

5.1 Sin stocks

I started the data retrieval in ThomsonOne database. I included 18 EU countries (Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece Hungary, Ireland, Italy, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden and United Kingdom) in the set. I wanted to include only EU countries, because within the union the broad guidelines of legal issues are harmonized. However, there are still big interesting differences between the countries' legislation; for example in Austria, Germany, Greece and Netherlands the brothels are legal, which might reflect their more tolerant view to sin industries.

From the 18 countries I picked all tobacco industry companies, all alcohol beverage companies and all companies, whose industry was defined as defence. Out of aerospace industry I picked the companies, who either had 30% or more of their production in defence products or mentioned in their description, that they serve the defence industry with their products. In ThomsonOne the gambling businesses are classified under the category Travel & Leisure, from where I handpicked all companies whose at least subcategory was gambling. There is also no SIC code for gaming industry, but they are usually categorized to 7999 'Miscellaneous entertainment'.

I included both active and dead companies in the material, so the results should be free of survivorship bias. All in all, there were 72 alcohol companies, 27 defence, 6 tobacco and 44 gaming companies. Largest number of sin companies were in United Kingdom and France.

In Figure 4 we can see, that the number of sin stocks has increased steadily except of two leaps; first was the increase in the amount of alcohol companies in the late 1980's and the second was the increase of publicly listed gambling stocks around 2005, when the online gambling had its major boom.

Table 3 Number of sin companies in the data sample

Number of companies					
Year	Alcohol	Defence	Gambling	Tobacco	Total
1985	10	10	2	1	23
1986	10	10	2	1	23
1987	12	10	2	1	25
1988	13	10	2	2	27
1989	29	11	3	2	45
1990	31	11	4	2	48
1991	31	11	5	2	49
1992	33	11	5	2	51
1993	33	11	5	2	51
1994	34	11	5	3	53
1995	37	11	5	3	56
1996	39	11	6	3	59
1997	41	12	7	5	65
1998	46	13	9	5	73
1999	48	14	10	5	77
2000	51	14	12	5	82
2001	54	15	15	5	89
2002	56	15	17	5	93
2003	57	15	19	5	96
2004	59	15	19	5	98
2005	60	16	23	5	104
2006	62	17	27	5	111
2007	64	20	35	5	124
2008	64	20	36	5	125
2009	65	20	36	5	126
2010	66	20	37	5	128
2011	67	21	39	5	132
2012	68	22	39	5	134
2013	68	23	40	5	136
2014	70	23	42	5	140
2015	71	23	43	5	142

There are many well-known companies in the sin stock categories. The most notable alcohol companies are the world's largest beer company Anheuser-Busch, which owns Budweiser brand, and Diageo, which owns many of the world's most famous distilled drink brands, such as Smirnoff vodka and Captain Morgan rum, but also Guinness beer. European alcohol companies also cover companies with strong brand names themselves, like Remy Cointreau or Heineken.

Figure 4
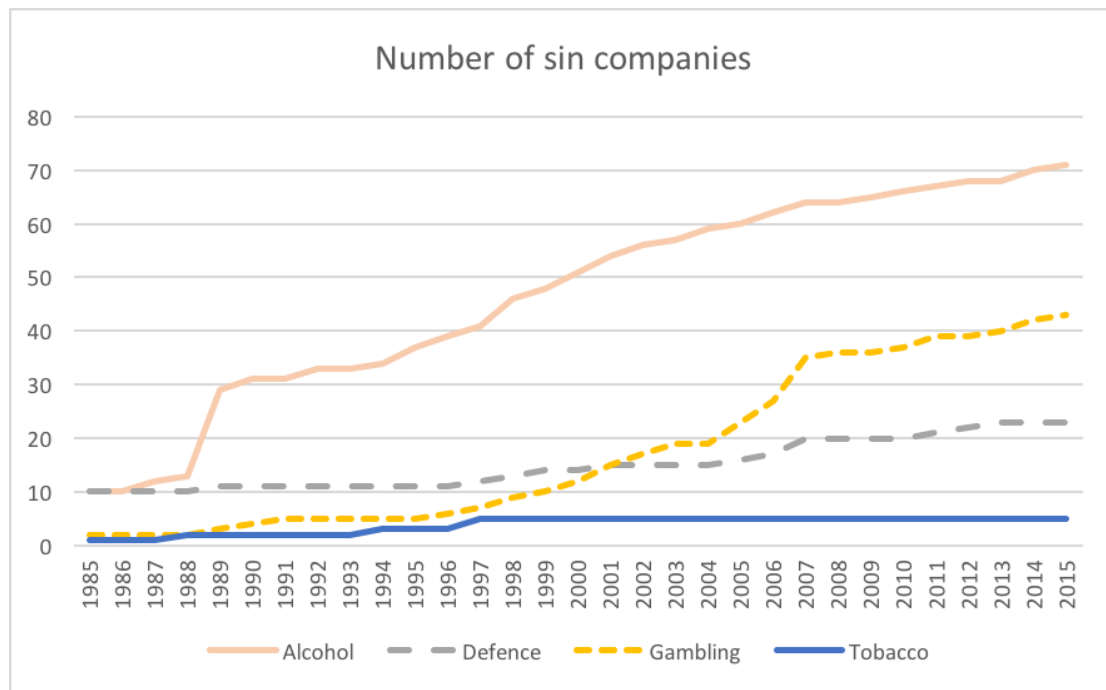
Tobacco industry includes companies, such as Philipp Morris and British American Tobacco Company, the latter founded in1902 and still leading 55 markets around the world out of the 200 markets, where it is present (BAT, 2016). The gambling industry involves companies like The Société des Bains de Mer, a traditional French company owning several casinos and hotels including Casino de Monte Carlo, but also the new-comer companies like Unibet and Betsson, the online-gambling companies. By entering the business, they have changed it into more technical direction, but the industry has also become able to approach the customers more easily.

The defence industry covers both large defence companies like Verney Carron and Dassault Aviation and also the ones that are better-known from their civil activities, such as Airbus Group.

The data range starts 1.1.1985 and ends 31.12.2015, and mostly the data frequency is monthly. The only exceptions to the frequency come from certain financial statement data, which update annually, and the gross domestic products figures, which are presented quarterly. All the details of the companies' financials are collected from Datastream. I excluded financial companies under SIC code 6, because typically their financial structures can be very different from other industries.

5.2 Comparable stocks

I also collected data about the so called comparable industries. The concept behind the comparable industries is to find industries with characteristics as close as possible to sin stocks while still being virtuous. As the comparable for alcohol beverages I chose the categories that fall under the SIC codes 2080 'Beverages' and 2086 'Bottled and Canned Soft Drinks'. The other industries are not as easily paired with the virtuous ones as the alcohol business, but with tobacco I followed Hong and Kacperzcyk's example and chose food as its comparable. Thus I chose to use the companies under SIC code 20 but excluding the miscellaneous 208 category.

As the comparable for the defence industry I chose the industries under the SIC code 36 'Electronic and Other Electric Equipment', and there the subcategories of 363 'Household Appliances' and 365 'Household Audio and Video Equipment'. Even though some transportation products could be closer to large scale army arsenal, civil hand weapons are closer to these smaller devices, and the household equipment represent consumer goods, a characteristic, which is very typical to all other sin industries except for defence.

The comparables for gambling industry are found under two head categories of SIC codes: 70 'Hotels and Other Lodging Places' and 79 'Amusement and Recreation Services'. From the SIC code group 70 I only included the companies from group 701 'Hotels and Motels', but from the other main group I chose 792 'Producers, orchestras and entertainers', 793 'Bowling centres' and 794 'Commercial sports'. Hotels are comparable to many casino complexes, and the others represent many other types of entertainment and excitement, which is what customers usually are looking in gambling.

From each of these company lists I manually excluded the overlapping companies i.e. companies, that also occurred in the sin stock lists. In all of the lists, except for tobacco, there were several overlapping firms, which also proves that the matched pairs are rational.

5.3 Risk-free rate

As risk-free rate I use 10-year government bond of Germany. During the past decades, Germany has been considered economically one of the most reliable countries in Europe. In studies made with US data, many researchers (Bernanke & Kuttner, 2005) (Baker & Wurgler, 2006) have used the risk-free rate found in Kenneth French's website's database. A comparison between this database and the 10-year government bond of Germany show significant similarities. Considering Germany's financial stability and the similar return level compared to the US risk-free rate, I consider this bond's monthly yield-to-maturity to be a good proxy for a general European risk-free rate.

5.4 Market return

In market return proxy I use all stocks from the 18 sample countries and create a weighted-average monthly return portfolio of them. In the following regression equations, I have subtracted the risk-free rate out of the monthly market returns.

6 Methodology

6.1 Capital Asset Pricing Model

I start with the capital asset pricing model using the following regression equation:

$$SINrf = \alpha + \beta MRKRET + \varepsilon \qquad (1)$$

where *SINrf* is the excess return of a portfolio long sin stocks over the risk-free rate, *MRKRET* is the return of a value-weighted market portfolio over the risk-free rate, α is the intercept and ε is the error term. The main interest is on the value of alpha, because it shows, how much higher returns the sin portfolio earns compared to the market portfolio. The null hypothesis is, that the intercept is zero, but according to my Hypothesis 1, I expect it to be above zero.

6.2 Fama-French three-factor model

I also use the Fama-French three-factor model

$$SINrf = \alpha + \beta_1 MRKRET + \beta_2 SMB + \beta_3 HML + \varepsilon \qquad (2)$$

where *SMB* means small-minus-big capitalization portfolio, and *HML* is high-minus-low book-to-market portfolio. To construct these portfolios, I calculate book-to-market values and market capitalizations of all the stocks from my sample's 18 European countries, and then divide them in two size categories – small (S) and big (B) stocks – based on their market capitalizations (50-50), and then into three valuation groups – low (L), medium (M) and high (H) – based on their book-to-market ratios. In the latter categorization, L represents the lowest 30% and H the highest 30% part of the stocks. High book-to-market ratio implies to value stocks, and low to growth stocks.

Thus creating six portfolios, SL, SM, SH, BL, BM, BH, I was able to construct two value-weighted return portfolios SMB and HML. SMB is the difference between the small portfolios' (SL, SM, SH) average return and the large portfolios' (BL, BM, BH) average return. HML is the difference between the value portfolios' (SH, BH) average

return and the growth portfolio (SL, BL) average return, leaving the medium stocks out of this factor.

First I use all data from the beginning of 1985 in the regressions, but I also split the time span in half, because of two reasons. Firstly, the number of sin stocks was pretty low still in 1985, whereas in July 2000 it had already grown to 53 alcohol companies, 14 defence companies, 13 represented gambling and 5 tobacco firms. At the end of 2015 there were 45 gambling, 24 defence and 77 alcohol companies, while all the tobacco companies had survived till 2015. Secondly, I am interested in the trend of development of the sin portfolio returns, as an addition to the existing literature, and thus it serves my study to split the time-range and examine the return in shorter periods.

6.3   Cross-section regressions

I use cross-section regressions to examine, whether there are abnormal valuations on sin stocks. As the dependent variable I use the logarithm of market-to-book and price-to-earnings ratios of all European stocks, and as the dependent variable I use a dummy variable, which has the value of one if the stock is a sin stock, and zero otherwise. Other dependent variables are return on equity and logarithm on the size of the company.

Demirakos et al. (2004) show in their research, that analysts covering industries of fairly uniform and stable growth tend to prefer single-period comparatives valuation. They use beverage industry as an example of this fairly stable industry. Single-period comparatives are valuation ratios such as price-to-earnings, price-to-book value and different sales multiples.

Because sin stocks can be considered fairly uniform industries with stable growth rates, I also use price-to-earnings ratios and market-to-book values in stock valuations. More precisely I use logarithms of these two ratios as dependent variables, and three other variables as independent variables in cross-section valuation regressions.

The independent variables are *SINDUM, ROE* and *LOGSIZE. SINDUM* is a dummy variable, which gets the value of one if the stock is a sin stock and zero otherwise. *ROE*

is the return on equity and *LOGSIZE* is the logarithm of the company's market capital. The equation for the cross-section analysis is:

$$VR = \alpha + \beta_1 SINDUM_{j,t} + \beta_2 ROE_{j,t} + \beta_3 LOGSIZE_{j,t} + \epsilon \qquad (3),$$

where *VR* is the valuation ratio.

7 Results

The results from the first estimations based on capital asset pricing model – Equation 1 – are presented in Table 4. The first estimation *SINrf* shows the excess return of the sin stock portfolio net of risk-free rate over the excess market return. The return is 0.39 percentage points monthly, meaning 4.7 percentage points annually. The result is statistically significant at 5% confidence level. The market beta of the equation shows the result of 0.62, which indicates that the sin portfolio is less sensitive to the changes is market return. This result is significant at 1% level.

The second regression *SINCOMP* shows the excess return of the portfolio long sin stocks and short their comparables. The result shows 0.25 percentage points monthly excess return over market return, but the figure is not statistically significant. The annual return is 3.0 percentage points. However, interestingly this portfolio shows beta of -0.14 meaning, that the portfolio is very insensitive and slightly reverse to the market return. The result concerning beta is statistically significant at the 1% confidence level.

The third estimation *COMPrf* is about the excess return of the portfolio of comparable stocks net of risk-free rate. The monthly abnormal return is only 0.14 percentage points, and the result is not statistically significant. On the other hand, the portfolio beta is less than one but higher that the sin portfolio beta, meaning that the returns of the portfolio of the comparable stocks are slightly more sensitive to the changes in market return.

Panel B shows the results from Fama-French three-factor model analysis. The coefficients of intercepts are not statistically significant in this sample, but all of the market betas are less than a unity. Furthermore, the loading of *SMB* factor on sin portfolio is negative, which implies that the larger sin stocks would outperform the smaller ones, and the positive loading on *HML* factor implies that the sin stocks are typically value stocks rather than growth stocks. Adjusted R-squared value is at a decent level of 50%.

Table 4 Return performance of sin stocks 1985-2015

Panels A and B report the average coefficients obtained from time-series regressions of a *SINrf* portfolio that represents the monthly return for a value-weighted portfolio of sin stocks – alcohol, tobacco, gambling and defence – over the risk-free rate. *SINCOMP* is a portfolio long sin stocks and short their comparables, and *COMPrf* is the portfolio of comparable stocks minus the risk-free rate. Intercept represents the abnormal return of the portfolios over the market return. R-squared is the adjusted R-squares measure for the fit of the model. * means that the result is significant at 10% confidence level, ** means 5% level and *** 1% level. Thus *** shows the t-value of less than 0.001 and * t-value of less than 0.010. The figures in parentheses are standard deviations.

Panel A	1985-2015				
	Intercept	MRKRET	SMB	HML	R^2
SINrf	0.0039**	0.6186***			0.5032
	(0.0016)	(0.0320)			
SINCOMP	0.0025	-0.1400***			0.0442
	(0.0017)	(0.0339)			
COMPrf	0.0014	0.7586***			0.6465
	(0.0015)	(0.0292)			
Panel B					
SINrf	0.0027	0.6011***	-0.1712*	0.1259**	0.5150
	(0.0019)	(0.0356)	(0.0903)	(0.0565)	
SINCOMP	0.0012	-0.1296***	0.0123	0.0870*	0.0447
	(0.0019)	(0.0362)	(0.0700)	(0.0521)	
COMPrf	0.0017	0.7554***	-0.0095	-0.0192	0.6438
	(0.0017)	(0.0313)	(0.0604)	(0.0450)	

The amount of publicly listed sin stocks was rather modest in 1985. By the year 2000, the number of publicly traded sin companies – especially tobacco and gambling stocks – had increased significantly and the portfolio where an investor could have invested was much broader. That is one of the reason, why I also wanted to split the sample to start from 2000 and ending in 2015. A broader portfolio of sin stocks intuitively serves us with more reliable results. Another reason for the split is, that the most financially turbulent times began in 2000, and it is interesting to examine, whether the sin stocks earned higher returns during those times.

As table 5 shows, this certainly is what happened. The intercept in the first sin portfolio return regression from 2000 to 2015 grows significantly from its respective coefficient from a longer period. From the millennium the average coefficient of abnormal returns has been 0.84 percentage points monthly, meaning a remarkable return of 10.06

percentage points per annum over the market portfolio return. When we further split the time period to start from 2008, the latest financial crisis, the intercept rockets into 1.36 percentage points monthly, meaning an excess return of 16.33 percentage points annually. Both of these results are statistically significant at 1% confidence level.

From 2000 to 2015, also the comparable stocks have earned positive returns over the market returns, but the excess return of comparable stock portfolio is 43% less than the sin portfolio excess return. During the last time period from 2008 to 2015, also the portfolio long sin stocks and short their comparables earns positive abnormal excess returns over the market portfolio, and the result is statistically significant at 5% level.

Interestingly the coefficient of *HML* factor in this time period is negative. The result is somewhat counterintuitive, because it implies that the returns would rise from the low-valuation stocks such as growth stocks. This is contrarian to the typical characteristics of sin stocks.

The results are to large extent in line with the existing literature. Hong and Kacperzcyk studied the portfolios long sin stocks and short their comparables in 1965-2006, and in their regressions based on capital assets pricing model, the abnormal returns are 0.25 percentage points monthly, which is exactly what my result in Panel A is. Also the coefficient of the market premium was negative by 0.6% in Hong and Kacperzcyk's paper.

With the Fama-French three-factor model, the abnormal returns stayed at the same level, and the loading of HML was 0.0832, which again is very close to my results. The difference is in the loading of SMB, which was negative in their paper, but my result is not statistically significant.

I also reached similar results with Julie Salaber. He found that the level of abnormal returns of sin stocks over the risk-free rate was 0.33 percentage points monthly, which is relatively close to my results in Panel A. He also divided the data into two sets of countries based on their religion. In catholic countries the abnormal returns were lower and statistically not significant, but in protestant countries they reached the level of 0.39 percentage points monthly.

Table 5 Return performance of sin stocks 2000-2015

Panels C and D report the average coefficients obtained from time-series regressions of a *SINrf* portfolio that represents the monthly return for a value-weighted portfolio of sin stocks – alcohol, tobacco, gambling and defence – over the risk-free rate from the year 2000 to 2015 and from 2008 and 2015 respectively. * means that the result is significant at 10% confidence level, ** means 5% level and *** 1% level. Thus *** shows the t-value of less than 0.001 and * t-value of less than 0.010. The figures in parentheses are standard deviations.

Panel C	2000-2015				
	Intercept	*MRKRET*	*SMB*	*HML*	R^2
SINrf	0.0084***	0.5133***	-0.1653	-0.0121	0.4718
	(0.0028)	(0.0458)	(0.1128)	(0.0744)	
COMPrf	0.0048*	0.7315***	-0.1322	-0.0938	0.6687
	(0.0026)	(0.0425)	(0.1047)	(0.0691)	
Panel D	2008-2015				
SINrf	0.0136***	0.7450***	-0.0927	-0.2736**	0.6048
	(0.0037)	(0.0700)	(0.1500)	(0.1200)	
SINCOMP	0.0074**	0.0622	-0.0016	-0.2774**	0.0456
	(0.0034)	(0.0651)	(0.1395)	(0.1116)	

7.1 Results from the valuation analysis

Following Table 6 presents the results of the cross-section analyses. The time frame of the data is from 2000 to 2015, and it is also split so, that I examine the last eight years separately to show the change in valuation.

Table 6 Valuation regressions

SINDUM is a dummy variable, which gets the value of 1, if the stock is a sin stock and 0 otherwise. *LOGMB* and *LOGPE* are the logarithms of market-to-book and price-to-earnings ratios respectively. * means that the result is significant at 10% confidence level, ** means 5% level and *** 1% level. Thus *** shows the t-value of less than 0.001 and * t-value of less than 0.010. The figures in parentheses are standard deviations.

Cross-section regressions	2000-2015		2008-2015	
Variable	LOGMB	LOGPE	LOGMB	LOGPE
SINDUM	-0.0577***	0.0857***	-0.1324***	0.0098***
	(0.0215)	(0.0143)	(0.0341)	(0.0194)
LOGSIZE	0.0457***	0.0141***	0.0865***	0.0492***
	(0.0086)	(0.0052)	(0.0128)	(0.0064)
ROE	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Interestingly the results are contradictory. The negative coefficient in front of *SINDUM* with *LOGMB* regression implies that sin stocks had been 5.8 per cent lower valued than the other stocks. On the other hand, when it comes to the price-to-earnings ratio, the coefficient is positive, which would indicate higher valuation than stocks in general.

The coefficients of sin stock dummy variables dropped in the second half of the time frame. The overvaluation based on price-to-earnings ratio sank from 8.6 per cent to 1.0%, and during the past eight years, sin stocks have had 13.2 per cent lower market-to-book ratios than rest of the markets.

The results are significant at 1% confidence level. With *LOGMB* results, they are also in line with the paper of Hong and Kacperczyk (2009), who found undervaluation of 15.4%, when measured by logarithm of book-to-market ratio. However, according to their studies, the undervaluation of sin stocks measured by *LOGPE* was 15.1%, which highly differs from my results.

Given the 13 per cent undervaluation in *LOGMB* in 2008-2015 and a small overvaluation in *LOGPE*, one could say, that the sin stocks seem to be moderately undervalued. Because the phenomenon strengthened during the past eight years – the same time the abnormal returns increased – some of the recent abnormal returns could be explained through undervalued stocks, which supports my Hypothesis 2. However,

because the time frame is relatively short and the results contradictory, I am not able to draw very strong conclusions.

7.1.1 Additional valuation factors

In addition, I also calculate the Sharpe ratios for individual sin industries, and for sin, comparable stock and market portfolios. The Sharpe ratios are detailed in the appendix. The ratios are calculated by dividing excess mean portfolio return with the standard deviation of portfolio return.

All Sharpe ratios are between 0.098 and 0.185, so the differences are not very big. However, while the ratio for market portfolio is 0.117, the ratio of the sin portfolio was 0.172. The Sharpe ratio of the portfolio of comparable stocks is 0.123. The defence industry has the lowest Sharpe ratio and the most attractive risk-adjusted returns are in alcohol and tobacco industries.

Also the single-factor capital asset pricing model betas are reported in the appendix. As expected, the betas are reverse to the Sharpe ratios. The defence industry has the highest beta and alcohol and tobacco have the lowest betas. Respective figures with the comparable industries show similar patterns; food and soda industries have lowest betas, household electronics the highest.

In sum, sin stocks seem to be stable and profitable investments with attractive risk-return ratios.

8 Channels

8.1 Online-gaming does not cause the abnormal returns

The question, that arises from the results is, what actually drives the excess returns of the sin portfolio. It is rather clear, that the returns have grown recently. One of the possible explanations is the development in the gaming and especially online gambling field. It is not often that sin industries face as significant development as the rise of the online gambling. The research and development of sin industries has traditionally been at a relatively low level compared to many other more technology-oriented industries.

To find out the effect of the gambling stocks on the abnormal returns, I compute a robustness check, where I run a time-series regression analysis of sin stock returns but excluding the gambling industry. Table 7 reports the results.

Interestingly the abnormal return stays at approximately same level even when excluding the gambling stocks. From 2000 to 2015 the abnormal monthly excess return in FF-three-factor model stays at 0.81 percentage points. It is 9,77 percentage points per annum, which is only 3.1% less than the corresponding abnormal return of the sin portfolio including gambling industry. However, the results from the entire period 1985-2015 confirm the loadings on other factors; sin stocks do correlate inflexibly with the market movements, larger sin stocks outperform the smaller ones and sin stocks are typically value stocks.

Table 7 Return performance of sin stocks excluding gambling

Panels E reports the average coefficients obtained from time-series regressions of a *SINrf* portfolio that represents the monthly return for a value-weighted portfolio of sin stocks – alcohol, tobacco and defence – over the risk-free rate from the year 1985 to 2015. Panel F reports the results of regressions of sin stock portfolio returns from 2000 to 2015. *ExcGam* represents the returns of the sin stock portfolio over the risk-free rate. * means that the result is significant at 10% confidence level, ** means 5% level and *** 1% level. Thus *** shows the t-value of less than 0.001 and * t-value of less than 0.010. The figures in parentheses are standard deviations.

Panel E	1985-2015				
	Intercept	*MRKRET*	*SMB*	*HML*	R^2
ExcGam	0.0041**	0.6095***			0.4775
	(0.0017)	(0.0330)			
ExcGam	0.0030	0.5891***	-0.1849**	0.1195**	0.4905
	(0.0020)	(0.0369)	(0.0935)	(0.0585)	
Panel F	2000-2015				
ExcGam	0.0081***	0.5230***			0.4329
	(0.0021)	(0.0438)			
ExcGam	0.0081***	0.4965***	-0.1662	0.0248	0.4317
	(0.0028)	(0.0476)	(0.1159)	(0.0740)	

Consequently, we can conclude, that the high abnormal returns from 2000 to 2015 are not entirely caused by the booming gambling industry.

The recent financial crises may have some influence on the abnormally high returns of sin stocks. As the investors' belief in financial institutions has been afflicted in the 2000's, the sin stocks may have seen to be even better safe havens than in the past. Whether the sin stocks are more resistant against the regressions compared to the stocks in general, I answer in the section 8.4.

8.2 Excluding industries one by one to find out, which causes the high returns

Because gambling business is not the sole driver of the abnormal returns, I choose to exclude all the industries one by one from the regression to find out, which one of them is driving the abnormal returns most. Thus I use the same equations ((1) and (2)) as in

previous regressions. This time I am looking for the lowest intercept, which would indicate, that excluding that industry lowers the portfolio returns most, i.e. that excluded industry has the highest returns of its own. Table 8 presents the results.

Table 8 Time-series regressions of sin stocks returns by excluding industries one by one

ExcAlc means the returns of a sin portfolio, where alcohol industry is excluded, *ExcTob, ExcDef* and *ExcGam* mean portfolios where the excluded industries are tobacco, defence and gambling respectively.

Panel G	2000-2015				
	Intercept	*MRKRET*	*SMB*	*HML*	*R^2*
ExcAlc	0.0080***	0.5195***			0.4303
	(0.0022)	(0.0442)			
ExcTob	0.0062***	0.6454***			0.5318
	(0.0022)	(0.0448)			
ExcDef	0.0089***	0.4504***			0.3466
	(0.0022)	(0.0457)			
ExcGam	0.0076***	0.5308***			0.4432
	(0.0022)	(0.0440)			
Panel H	2000-2015				
	Intercept	*MRKRET*	*SMB*	*HML*	*R^2*
ExcAlc	0.0086***	0.5116***	-0.0493	-0.0200	0.4309
	(0.0029)	(0.0483)	(0.1188)	(0.0784)	
ExcTob	0.0070**	0.6121***	-0.2062*	-0.0031	0.5399
	(0.0029)	(0.0486)	(0.1194)	(0.0788)	
ExcDef	0.0098***	0.4200***	-0.1893	-0.0122	0.3554
	(0.0030)	(0.0497)	(0.1222)	(0.0807)	
ExcGam	0.0089***	0.4987***	-0.1994*	-0.0223	0.4520
	(0.0029)	(0.0478)	(0.1174)	(0.0775)	

I narrowed the time frame to cover only the years from 2000 to 2015 for two reasons. Firstly, the data is more reliable due to the higher number of companies in every industry. Secondly the initial regression about the returns showed especially high returns during this timeframe, so I focus on finding the reasons for these latest abnormal returns.

Panel G of Table 8 shows the results of regressions on market return (Equation 1) and Panel H presents the results from the Fama-French-regressions (Equation 2). In both of these tables lowest intercepts are achieved in regressions where tobacco is excluded from the portfolio leaving there alcohol, gambling and defence. This indicates, that the abnormal portfolio returns are driven by the returns of the tobacco industry. On the

other hand, the highest intercept is in the portfolio, where defence is excluded. The result means, that the defence industry has suffered from the lowest returns among the sin industries.

8.3   Ethical choices can explain the abnormal returns

From another point of view, coming back to the principle idea of ethics guiding investors' decisions, I estimate the impact of such investor behaviour on sin stock returns by running a simple time-series regression analysis using the growth in assets invested in SRI funds as the independent variable. Once again, I study the years 2000-2015. The equation I use, is:

$$GSIN_t = \alpha + \beta_1 logGSRI_t + \varepsilon \qquad (4),$$

where *GSIN* is the growth of a sin portfolio at the end of year *t*, *logGSRI* is the natural logarithm of the growth of assets invested in European SRI funds at the end of year *t* and *GMRK* is the growth of the market portfolio. The following Table 9 reports the results.

Table 9 Time series regression of sin stock returns and money invested in socially responsible investment funds

Panel I	2000-2015		
	Intercept	logSRI	R^2
GSIN	-0.1048	0.7990***	0.8055
	(0.0911)	(0.0974)	
GMRK	0.3349	0.4974***	0.6212
	(0.0891)	(0.0953)	

We are interested in the coefficient of *logSRI,* and it implies, that when assets invested in SRI funds increase by one percent, the value of the sin portfolio grows by 0.80%.

As we can see from Table 9 and from the following Figure 4, there has been a positive correlation between the growing assets in SRI funds and the compounded returns of the

sin portfolio. Also the market portfolio return follows the pattern but much more modestly.

Figure 5 Increase in SRI assets
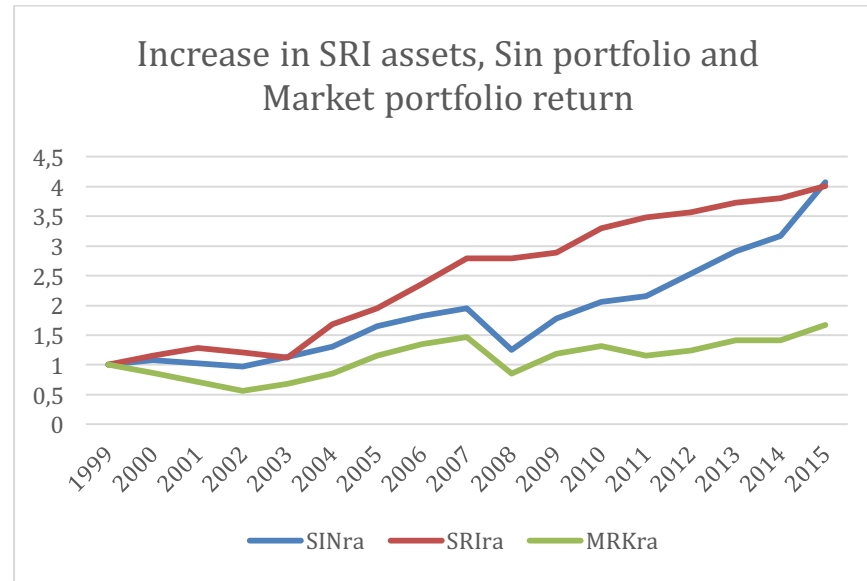
It is hard to say based on this relatively short time period, whether the growth in SRI assets actually causes the increasing returns of the sin portfolio. However, we can conclude that the awareness of the SRI investing has risen, and it may have caused institutional investors to avoid sin stocks. Consequently, lacking major arbitrageurs like hedge funds may have caused the increased undervaluation as found in Table 6. The more money is spend in SRI funds, the deeper the undervaluation on sin stocks, and the higher the expected returns. The results support my Hypothesis 3 about the underpricing caused by low demand on sin stocks.

8.4   Sin stock portfolio performance in different business cycles

Because of their stability characteristic and low betas on market return in previous regression analyses, I ran a test about the relation between the sin stock returns and the growth rates in gross domestic product in Europe.

I use the GDP growth rate as the variable to measure the business cycles. GDP is currently an accepted benchmark for economic activity, and it is widely used to identify the business cycles; rising GDP indicating economic expansion, falling GDP marking

a contraction (Yamarone, 2012). GDP is considered a broad and comprehensive barometer available to describe a country's overall economic conditions.

The data about GDP rates of individual countries in Europe is found from the website of Organisation for Economic Co-operation and Development (OECD). Because there is not a perfect figure for GDP growth covering all Europe, I created a suitable index. First I searched the quarterly growth rates of real GDP, changing over previous quarter, individually from each of the 18 countries that I have been using previously in this paper. I then searched the historical quarterly GDPs calculated by expenditure approach for each of the countries. Time frame for both of these data sets is from the third quarter of 2000 to the last quarter of 2015.

From the historical GDP figures I calculated the weight of each of these countries, and used that share in calculating the weighted averages of the growth rates in Europe. Germany has the most weight in the European economy, so I could have used only the GDP growth rate of Germany, but as it compounds only a fifth of the total GDP of these 18 countries, the weighted average approach will give a more accurate estimate of the real economic growth.

I ran a regression analysis based on following equation:

$$SIN = \alpha + \beta GDP + \varepsilon, \qquad\qquad (5)$$

where *SIN* is the quarterly return of a sin portfolio and *GDP* is the quarterly growth rate of the European gross domestic product. I then compare the results with a similar regression, where I have replaced the returns of the sin portfolio with the returns of their comparable industry portfolio.

The hypothesis was to get a negative coefficient for the GDP growth rate, because that would indicate that the sin stocks perform especially well during the recessions and less impressively during the economic peaks. In other words, they would be resistant against the regressions. Furthermore, I expect the coefficient with the sin portfolio to be lower than with the comparable industries.

The results are presented in the following Table 10. The coefficients are statistically significant at the 10% confidence level. Even though they are not negative, the GDP coefficient with the sin portfolio is lower than the coefficient of the comparable portfolio. Thus it would seem, that the sin stocks may be more resistant against recessions than their comparables.

Table 10 Sin stock portfolio returns and GDP growth rates

Panel J	2000-2015		
	Intercept	GDP	R^2
SIN	0.0244**	0.0295*	0.0550
	(0.0104)	(0.0158)	
COMP	0.0062	0.0348*	0.0519
	(0.0126)	(0.0192)	

With a closer look at the past one and a half decade, the sin stocks seem to recover quicker from the recessions. Table 11 shows the returns of sin and comparable portfolios during one business cycle. The cycle started from its peak in the end of 2006, and ended in the next peak in 2010.

Table 11 Sin and comparable portfolio returns during one economic cycle from GDP growth rate peak to peak

Time	SIN06-10	GDP06-10	COMP06-10
Q4-2006	0,090	0,096	0,076
Q1-2007	0,041	0,081	0,059
Q2-2007	0,077	0,065	0,073
Q3-2007	0,010	0,057	-0,066
Q4-2007	-0,012	0,067	-0,057
Q1-2008	-0,073	0,044	-0,107
Q2-2008	-0,108	-0,030	-0,057
Q3-2008	-0,025	-0,065	-0,081
Q4-2008	-0,167	-0,183	-0,217
Q1-2009	0,006	-0,250	-0,029
Q2-2009	0,173	-0,022	0,246
Q3-2009	0,129	0,027	0,135
Q4-2009	0,097	0,052	0,006
Q1-2010	0,089	0,046	0,072
Q2-2010	-0,038	0,100	-0,058

The same phenomenon can be seen in the following graph in Figure 5. The graph presents the portfolio performances of sin stocks and their comparable stocks during the most recent economic cycle. The cycle started in the last quarter of 2006, when the

economy in Europe reached its peak and the GDP growth was the most intense. After that the economy slowed down to its lowest point in the second quarter of 2009. Finally it recovered back to its new peak in the second quarter of 2010.

Figure 6 Portfolio performances from peak to peak
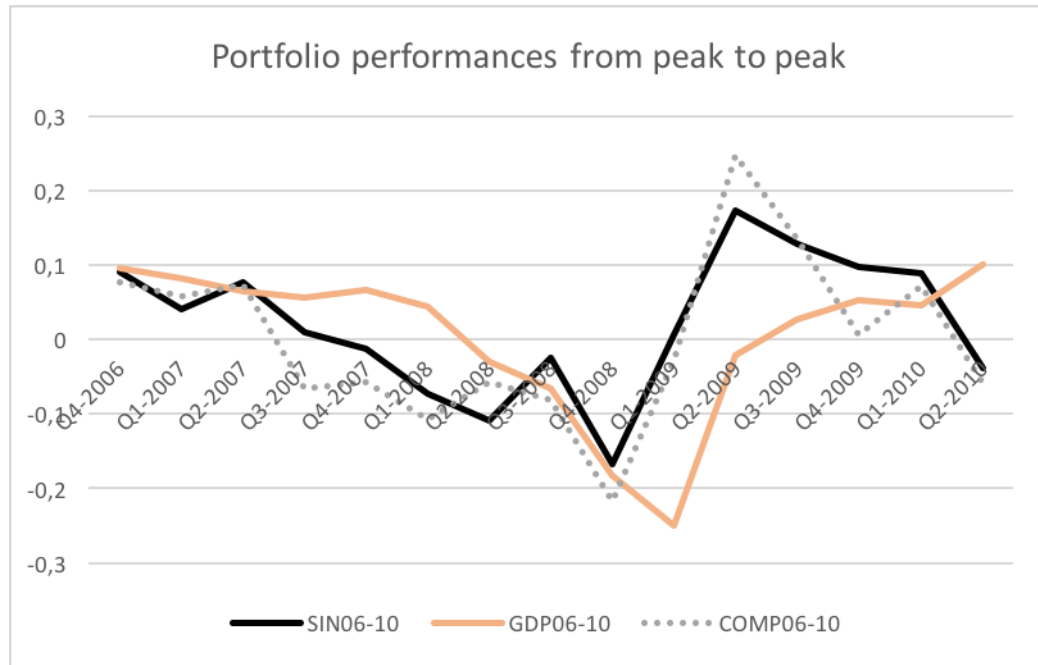
The graph shows, that even though the sin stocks sink along with the markets, they recover more quickly than their comparables and are steadier during turbulent times. In order to fully confirm this characteristic of sin stocks, more data from a longer time period should be collected, but as mentioned before, unfortunately the amount of publicly listed sin stocks is rather limited before the year 2000.

9 Conclusion

Ethical norms guide the investors' decisions and especially public investors, such as pension funds, universities and mutual funds, must reason their investments from a sustainable point of view. Consequently, they become reluctant to invest in stocks that are considered to be sinful. Though it may be ethical, it does not seem to be financially wise.

In this paper I show, that sin stocks earn abnormal returns. Even though this phenomenon has been known in previous literature for over a decade, the markets have not corrected it. On the contrary, I show in this paper, that the phenomenon is strengthening. During 1985-2015 sin stocks earned an abnormal returns of 4.7 percentage points over the market returns, but in 2008-2015 the abnormal return was already 16.3 percentage points.

The more the investors' awareness of ethics increases, the more the sin companies earn. It can be stated that the demand on sin stocks is too low, and due to that, the stocks would be underpriced causing the higher returns. There seems to be a positive correlation between the money invested in socially responsible investment funds and the sin stock returns. It supports the theory of the abnormal returns caused by the lack of demand on sin stocks.

The lack of demand could be seen as lower valuation ratios. I study the market-to-book and price-to-earnings ratios, and find evidence of market-to-book ratios. The price-to-earnings ratios give a more modest but contradictory result, which decreases the credibility of undervaluation theory. However, the data is relatively limited covering only 16 years. For further research, when more data is available, this could be an interesting point of view to focus, and a good research to update.

I also studied, whether the sin stocks are recession-proof. I found evidence that they are stable, their market betas are lower than unity, and they seem to recover faster from the recession than their comparables.

The abnormal returns are slightly drawn by the high returns of tobacco industry. The same phenomenon has been found in the previous literature as well (Hong & Kacperczyk, 2009). The defence industry shows the lowest returns in the sin portfolio. However, the differences in the abnormal returns are not wide, when excluding industries one by one from the portfolio. Sin is profitable.

Appendix

Sharpe Ratios

Sin portfolio	**0.172**
Alcohol stocks	0.172
Defence stocks	0.098
Gambling	0.106
Tobacco	0.185
Market portfolio	**0.117**
Comparable stocks	**0.123**

Single-Factor CAPM Betas

Sin industries

Alcohol	0.57
Defence	0.84
Gambling	0.75
Tobacco	0.46

Comparable industries

Soda	0.45
Household electronics	0.85
Hotels	0.63
Food	0.51

Quick Ratios and Net Margins by Quarters – Years 1985-1999

Table 12

Month	Tobacco				Alcohol				Gaming				Defence			
	Quick Ratio		Net Margin		Quick Ratio		Net Margin		Quick Ratio		Net Margin		Quick Ratio		Net Margin	
	Average	Median	Average	Median	Average	Median	Average	Median	Average	Median	Average	Median	Average	Median	Average	Median
01/03/85	0,5	0,5	7,3	7,3	0,8	0,6	4,1	4,3	0,8	0,5	6,2	4,3	0,8	0,8	4,0	3,2
01/06/85	0,5	0,5	7,3	7,3	0,8	0,6	4,1	4,3	0,8	0,5	6,2	4,3	0,8	0,8	4,0	3,2
01/09/85	0,5	0,5	7,3	7,3	0,8	0,6	4,1	4,3	0,8	0,5	6,2	4,3	0,8	0,8	4,0	3,2
01/12/85	0,5	0,5	7,3	7,3	0,8	0,7	3,4	4,1	0,6	0,5	6,0	4,3	0,8	0,8	3,8	3,2
01/03/86	0,5	0,5	9,6	9,6	0,8	0,8	4,8	4,6	0,5	0,4	7,5	7,2	1,0	0,9	4,2	3,2
01/06/86	0,5	0,5	9,6	9,6	0,8	0,8	4,8	4,6	0,5	0,4	7,5	7,2	1,0	0,9	4,2	3,2
01/09/86	0,5	0,5	9,6	9,6	0,8	0,8	4,8	4,6	0,5	0,4	7,5	7,2	1,0	0,9	4,2	3,2
01/12/86	0,5	0,5	9,6	9,6	1,0	0,8	4,7	4,3	0,5	0,4	11,1	7,2	1,1	0,9	5,0	3,7
01/03/87	0,8	0,8	13,6	13,6	0,9	0,8	5,8	4,2	0,7	0,8	11,6	6,8	1,1	1,2	5,8	6,4
01/06/87	0,8	0,8	13,6	13,6	1,0	0,8	5,3	3,3	0,8	0,8	9,2	6,7	1,1	1,2	5,8	6,4
01/09/87	0,8	0,8	13,6	13,6	1,0	0,8	5,3	3,3	0,8	0,8	9,2	6,7	1,1	1,2	5,8	6,4
01/12/87	0,8	0,8	13,6	13,6	1,0	0,9	4,7	3,3	0,8	0,8	9,3	6,7	1,1	1,1	6,1	6,4
01/03/88	0,5	0,5	15,2	15,2	0,9	0,8	4,9	4,0	0,7	0,6	8,6	5,4	1,0	0,9	8,7	6,7
01/06/88	0,5	0,5	15,2	15,2	0,8	0,8	4,8	4,2	0,7	0,6	8,8	5,4	1,0	0,9	8,7	6,7
01/09/88	0,5	0,5	15,2	15,2	0,8	0,8	4,8	4,2	0,7	0,6	8,8	5,4	1,0	0,9	8,7	6,7
01/12/88	0,5	0,5	15,2	15,2	0,8	0,7	18,8	4,7	0,8	0,7	8,0	6,9	1,0	0,9	9,0	8,9
01/03/89	0,7	0,7	18,6	18,6	0,8	0,6	18,6	4,2	0,8	0,7	7,7	5,8	1,0	0,9	9,4	7,8
01/06/89	0,7	0,7	18,6	18,6	0,8	0,6	17,6	4,2	0,9	0,7	8,3	5,8	1,0	0,9	9,4	7,8
01/09/89	0,7	0,7	18,6	18,6	0,8	0,6	17,6	4,2	0,9	0,7	8,3	5,8	1,0	0,9	9,4	7,8
01/12/89	0,7	0,7	18,6	18,6	0,7	0,6	13,4	4,2	0,9	0,8	8,1	5,8	1,0	0,8	8,7	6,8
01/03/90	0,6	0,6	13,2	13,2	0,8	0,6	13,0	3,9	0,9	0,8	11,3	9,1	0,9	0,9	5,2	4,6
01/06/90	0,6	0,6	13,2	13,2	0,8	0,7	12,8	4,4	1,0	0,8	12,2	10,3	0,9	0,9	5,2	4,6
01/09/90	0,6	0,6	13,2	13,2	0,8	0,7	12,8	4,4	1,0	0,8	12,2	10,3	0,9	0,9	5,2	4,6
01/12/90	0,6	0,6	13,2	13,2	0,8	0,7	7,0	4,4	1,1	0,6	8,0	6,7	0,9	0,9	5,0	4,6
01/03/91	0,6	0,6	11,3	11,3	0,8	0,7	7,5	4,4	1,1	0,8	3,7	4,1	1,0	1,0	4,4	3,9
01/06/91	0,6	0,6	11,3	11,3	0,8	0,7	7,1	4,0	1,2	0,8	3,6	4,1	1,0	1,0	4,4	3,9
01/09/91	0,6	0,6	11,3	11,3	0,8	0,7	7,1	4,0	1,2	0,8	3,6	4,1	1,0	1,0	4,4	3,9
01/12/91	0,6	0,6	11,3	11,3	0,8	0,7	5,5	3,7	1,1	0,8	3,7	4,1	1,0	1,0	4,6	3,9
01/03/92	0,6	0,6	10,6	10,6	0,8	0,7	5,4	2,7	1,0	0,6	3,2	1,4	1,0	1,1	1,4	2,7
01/06/92	0,6	0,6	10,6	10,6	0,8	0,7	5,1	2,1	1,1	0,6	2,8	1,4	1,0	1,1	1,4	2,7
01/09/92	0,6	0,6	10,6	10,6	0,8	0,7	5,1	2,1	1,1	0,6	2,8	1,4	1,0	1,1	1,4	2,7
01/12/92	0,6	0,6	10,6	10,6	0,8	0,7	4,8	2,4	1,0	0,6	3,0	1,4	1,0	1,1	1,4	2,6
01/03/93	0,6	0,6	11,6	11,4	0,8	0,7	3,2	2,9	1,0	0,6	2,0	0,6	0,9	0,9	0,8	2,6
01/06/93	0,6	0,6	11,6	11,4	0,8	0,7	3,0	2,3	1,0	0,6	1,5	0,6	0,9	0,9	0,8	2,6
01/09/93	0,6	0,6	11,6	11,4	0,8	0,7	-0,7	2,3	1,0	0,6	1,5	0,6	0,9	0,9	0,8	2,6
01/12/93	0,6	0,6	11,6	11,4	0,9	0,7	-0,5	2,5	1,0	0,6	2,1	1,1	0,9	0,9	0,5	1,8
01/03/94	0,5	0,5	13,1	14,4	1,0	0,8	-0,3	3,0	1,0	0,6	0,9	1,1	0,9	1,0	2,6	2,6
01/06/94	0,5	0,5	13,1	14,4	1,0	0,8	-0,2	3,0	1,0	0,6	-0,4	-1,0	0,9	1,0	2,6	2,6
01/09/94	0,5	0,5	13,1	14,4	1,0	0,8	6,8	3,4	1,0	0,6	-0,4	-1,0	0,9	1,0	2,6	2,6
01/12/94	0,5	0,5	13,1	14,4	1,0	0,9	7,0	3,8	1,0	0,8	3,4	-0,6	0,9	1,0	2,8	2,7
01/03/95	0,7	0,7	10,8	12,0	0,9	0,7	6,2	4,0	0,9	0,8	3,0	0,7	0,9	0,9	1,8	3,1
01/06/95	0,7	0,7	10,8	12,0	0,9	0,8	6,1	3,9	0,9	0,8	1,3	0,7	0,9	0,9	1,8	3,1
01/09/95	0,7	0,7	10,8	12,0	0,9	0,8	5,1	4,2	0,9	0,8	1,3	0,7	0,9	0,9	1,8	3,1
01/12/95	0,7	0,7	19,2	13,4	0,9	0,8	4,9	3,9	0,9	0,8	1,2	0,2	1,0	0,9	1,8	3,1
01/03/96	0,8	0,7	20,3	13,3	0,9	0,8	5,0	3,5	0,8	0,5	0,8	0,6	1,0	1,0	3,3	4,1
01/06/96	0,8	0,7	20,3	13,3	0,9	0,8	5,0	4,5	0,8	0,5	1,6	0,6	1,0	1,0	3,3	4,1
01/09/96	0,8	0,7	20,3	13,3	0,9	0,8	3,6	4,4	0,8	0,5	1,6	0,6	1,0	1,0	3,3	4,1
01/12/96	0,6	0,7	15,5	13,3	0,9	0,8	3,8	4,5	0,8	0,5	1,9	0,6	1,0	1,0	-1,2	4,1
01/03/97	0,6	0,7	14,3	14,0	0,9	0,8	5,1	4,3	0,9	0,7	-0,2	1,6	1,1	1,0	-3,2	5,5
01/06/97	0,6	0,7	14,3	14,0	0,9	0,8	4,8	4,2	0,9	0,7	0,8	3,0	1,1	1,0	-3,2	5,5
01/09/97	0,6	0,7	14,3	14,0	0,9	0,8	4,8	3,8	0,9	0,7	0,8	3,0	1,1	1,0	-3,2	5,5
01/12/97	0,6	0,7	14,1	14,0	0,9	0,7	4,8	3,8	1,0	0,9	0,8	3,0	1,1	1,0	0,5	5,5
01/03/98	0,6	0,5	12,7	8,9	1,0	0,8	2,0	4,1	0,9	0,6	-12,0	1,0	1,0	1,0	5,6	6,7
01/06/98	0,6	0,5	12,7	8,9	1,0	0,8	2,6	4,2	0,8	0,6	-12,4	0,9	1,0	1,0	5,6	6,7
01/09/98	0,6	0,5	12,7	8,9	0,9	0,8	3,0	4,2	0,8	0,6	-12,4	0,9	1,0	1,0	5,6	6,7
01/12/98	0,6	0,5	12,6	8,9	1,0	0,8	2,5	4,1	0,8	0,7	-12,6	0,0	1,0	1,0	5,8	6,7
01/03/99	1,1	0,9	21,8	20,1	1,0	0,8	6,1	4,2	1,4	0,8	-10,7	2,2	0,9	0,9	5,1	5,7
01/06/99	1,1	0,9	21,8	20,1	0,9	0,8	3,4	3,8	1,8	1,4	-10,4	2,1	0,9	0,9	5,1	5,7
01/09/99	1,1	0,9	21,8	20,1	1,0	0,8	3,4	3,8	1,8	1,4	-10,4	2,1	0,9	0,9	5,1	5,7
01/12/99	1,1	0,9	22,0	20,1	1,0	0,8	5,7	4,1	1,7	1,4	-10,3	2,1	0,9	0,9	4,9	5,3

Quick Ratios and Net Margins by Quarters – Years 2000-2015

Table 13

Month	Tobacco				Alcohol				Gaming				Defence			
	Quick Ratio		Net Margin		Quick Ratio		Net Margin		Quick Ratio		Net Margin		Quick Ratio		Net Margin	
	Average	Median	Average	Median	Average	Median	Average	Median	Average	Median	Average	Median	Average	Median	Average	Median
01/03/00	0,8	0,9	15,2	10,0	0,9	0,7	1,9	4,1	1,4	1,1	-7,0	0,3	1,0	0,8	4,9	5,8
01/06/00	0,8	0,9	15,2	10,0	1,1	0,7	1,6	4,3	1,2	1,0	-5,6	0,3	1,0	0,8	4,9	5,8
01/09/00	0,8	0,9	15,2	10,0	1,0	0,8	1,7	4,1	1,2	1,0	-5,6	0,3	1,0	0,8	4,9	5,8
01/12/00	0,8	0,9	14,9	10,0	1,0	0,8	1,5	3,7	1,1	1,0	-6,4	-0,7	1,0	0,8	4,6	5,8
01/03/01	1,2	1,0	14,8	9,0	1,1	0,8	2,7	4,0	1,1	1,0	-3,8	-0,3	1,1	0,8	4,4	4,5
01/06/01	1,2	1,0	14,8	9,0	1,0	0,8	3,4	4,6	1,0	1,0	-3,7	0,6	1,1	0,8	4,4	4,5
01/09/01	1,2	1,0	14,8	9,0	1,0	0,8	3,4	4,4	1,0	1,0	-3,7	0,6	1,1	0,8	4,4	4,5
01/12/01	1,2	1,0	12,5	9,0	1,0	0,8	3,2	4,4	1,0	1,0	-3,3	1,2	1,0	0,8	4,4	4,0
01/03/02	1,4	1,1	14,8	12,3	0,9	0,7	2,5	3,7	1,2	1,3	-9,4	1,9	1,0	0,8	4,2	4,4
01/06/02	1,4	1,1	14,8	12,3	0,9	0,7	3,7	3,3	1,2	1,3	-9,3	1,9	1,1	0,8	4,1	4,0
01/09/02	1,4	1,1	14,8	12,3	0,9	0,7	3,3	3,3	1,2	1,3	-9,3	1,9	1,1	0,8	4,1	4,0
01/12/02	1,4	1,1	15,0	13,2	1,0	0,7	3,3	3,3	1,2	1,3	-9,5	1,8	1,1	0,8	4,4	4,4
01/03/03	1,1	1,3	15,0	13,2	1,0	0,7	5,3	4,7	1,2	1,3	6,6	3,1	1,0	0,8	4,0	3,2
01/06/03	1,1	1,3	15,0	13,2	1,1	0,7	3,4	5,0	1,1	1,2	6,0	2,2	1,1	0,9	4,3	3,6
01/09/03	1,1	1,3	15,0	13,2	1,1	0,7	3,7	5,2	1,1	1,2	6,0	2,2	1,1	0,9	4,3	3,6
01/12/03	1,1	1,3	15,3	14,5	2,7	0,8	9,9	5,2	1,1	1,2	5,8	2,2	1,1	0,9	4,4	3,6
01/03/04	1,1	0,9	16,4	14,7	2,7	0,8	8,6	4,0	3,5	1,1	6,5	2,9	1,1	0,8	4,5	5,6
01/06/04	1,1	0,9	16,4	14,7	2,7	0,8	8,6	3,5	3,4	1,1	7,0	3,6	1,1	0,8	4,7	6,0
01/09/04	1,1	0,9	16,4	14,7	2,7	0,8	8,7	4,0	3,3	1,1	7,9	4,0	1,1	0,8	4,7	6,0
01/12/04	1,1	0,9	17,1	14,8	1,7	0,8	2,5	4,0	3,3	1,1	7,9	3,2	1,1	0,9	4,4	6,0
01/03/05	0,9	1,0	16,2	18,1	1,7	0,8	5,2	6,1	1,3	1,1	8,0	5,2	1,0	0,9	5,5	6,4
01/06/05	0,9	1,0	16,2	18,1	1,6	0,7	7,0	6,6	1,3	1,1	8,2	8,2	1,2	0,9	5,3	5,5
01/09/05	0,9	1,0	16,2	18,1	1,6	0,7	7,3	6,7	1,4	1,2	7,1	5,6	1,2	0,9	5,3	5,5
01/12/05	0,9	1,0	17,9	19,0	1,1	0,7	7,7	6,7	1,4	1,2	7,2	6,8	1,2	0,9	2,5	5,5
01/03/06	1,1	1,0	17,9	19,0	1,1	0,7	7,0	6,2	1,4	1,2	10,0	8,8	1,2	0,8	3,8	6,8
01/06/06	1,1	1,0	17,9	19,0	1,1	0,7	6,0	5,9	1,6	1,4	10,2	9,6	1,1	0,8	3,9	6,8
01/09/06	1,1	1,0	17,9	19,0	1,1	0,7	5,9	5,9	1,6	1,4	9,1	9,6	1,1	0,8	3,9	6,8
01/12/06	1,1	1,0	18,0	19,0	1,1	0,7	7,3	5,9	1,6	1,4	8,8	9,6	1,0	0,8	7,1	7,0
01/03/07	0,9	0,7	17,8	19,0	1,0	0,7	7,9	6,2	1,5	1,2	3,8	7,8	1,1	0,7	6,7	6,2
01/06/07	0,9	0,7	17,8	19,0	1,0	0,6	10,9	8,0	1,4	1,2	4,3	8,2	1,0	0,7	6,6	6,8
01/09/07	0,9	0,7	17,8	19,0	1,0	0,6	11,0	8,0	1,4	1,2	5,2	8,2	1,0	0,7	6,6	6,8
01/12/07	0,9	0,7	13,2	16,4	1,0	0,6	9,1	8,0	1,3	1,2	4,1	8,2	1,0	0,7	4,7	6,8
01/03/08	0,9	0,6	13,0	17,1	0,9	0,6	5,4	5,3	1,3	1,0	5,3	7,2	0,8	0,6	3,1	5,2
01/06/08	0,9	0,6	13,0	17,1	0,9	0,6	4,8	4,5	1,3	1,0	5,0	6,1	0,8	0,6	3,2	5,9
01/09/08	0,9	0,6	13,0	17,1	1,0	0,6	4,6	4,5	1,3	1,2	5,2	7,2	0,8	0,6	3,2	5,9
01/12/08	0,9	0,6	13,0	17,1	0,9	0,6	4,7	4,5	1,3	1,2	6,9	7,4	0,8	0,6	5,1	5,9
01/03/09	1,1	1,0	14,1	19,1	0,9	0,6	5,6	5,8	1,1	1,2	5,4	6,2	0,9	0,7	5,2	5,9
01/06/09	1,1	1,0	14,1	19,1	0,9	0,6	5,4	5,8	1,1	1,1	4,8	5,1	0,9	0,7	4,5	4,5
01/09/09	1,1	1,0	14,1	19,1	0,9	0,6	5,7	5,8	1,1	1,1	4,6	4,6	0,9	0,7	4,5	4,5
01/12/09	1,1	1,0	15,2	19,1	1,0	0,6	5,5	5,8	1,1	1,1	1,1	4,5	0,9	0,7	4,6	4,5
01/03/10	1,4	1,4	15,2	19,3	0,9	0,7	-13,5	5,0	1,1	1,0	0,6	4,7	1,0	0,8	3,9	4,3
01/06/10	1,4	1,4	15,2	19,3	0,9	0,7	-13,4	5,0	1,2	1,0	0,4	5,1	0,9	0,8	4,2	4,6
01/09/10	1,4	1,4	15,2	19,3	0,9	0,7	-13,4	4,7	1,2	1,0	-0,9	5,8	0,9	0,8	4,2	4,6
01/12/10	1,4	1,4	15,6	19,3	0,9	0,7	-13,4	4,7	1,3	1,0	2,1	6,1	1,0	0,8	4,3	5,1
01/03/11	1,1	1,2	15,2	16,0	1,0	0,7	5,1	4,7	1,9	1,0	1,3	3,8	0,9	0,8	-0,7	5,4
01/06/11	1,1	1,2	15,2	16,0	0,9	0,7	4,7	4,7	1,9	1,0	1,1	3,8	0,9	0,9	0,2	6,6
01/09/11	1,1	1,2	15,2	16,0	0,9	0,7	4,6	4,7	1,8	1,0	1,1	3,7	0,9	0,9	0,2	6,6
01/12/11	1,1	1,2	14,0	15,3	1,3	0,7	4,7	4,8	1,8	0,9	1,1	3,8	0,9	0,8	-0,1	6,1
01/03/12	1,3	1,2	15,0	14,6	1,3	0,7	5,2	4,8	2,0	1,1	5,5	6,6	0,8	0,7	5,0	6,2
01/06/12	1,3	1,2	15,0	14,6	1,3	0,7	4,9	4,8	2,1	1,1	4,7	6,2	0,8	0,7	3,9	5,8
01/09/12	1,3	1,2	15,0	14,6	1,3	0,8	5,1	4,5	2,2	1,1	4,5	5,3	0,8	0,7	3,9	5,8
01/12/12	1,3	1,2	15,3	14,6	1,0	0,8	5,1	4,5	2,2	1,1	4,5	5,3	0,9	0,7	3,5	5,8
01/03/13	1,2	1,2	14,4	13,6	6,3	0,8	5,1	4,5	1,8	1,0	2,4	4,5	0,9	0,8	4,8	5,3
01/06/13	1,2	1,2	14,4	13,6	6,2	0,8	5,4	4,5	1,6	1,0	4,0	5,7	0,9	0,8	5,1	5,3
01/09/13	1,2	1,2	14,4	13,6	6,3	0,7	5,4	4,9	1,6	1,0	3,3	5,4	0,9	0,8	5,1	5,3
01/12/13	1,2	1,2	15,0	13,9	6,4	0,7	5,4	4,9	1,6	1,1	3,6	5,8	0,9	0,8	4,8	5,3
01/03/14	1,4	0,8	14,6	13,2	1,2	0,7	4,3	5,2	1,4	1,1	3,5	3,2	0,9	0,8	4,2	4,9
01/06/14	1,4	0,8	14,6	13,2	1,2	0,6	3,8	5,2	1,3	1,1	3,6	2,6	0,8	0,8	4,8	5,0
01/09/14	1,4	0,8	14,6	13,2	1,2	0,6	3,6	5,2	1,4	1,1	6,2	3,6	0,8	0,8	4,8	5,0
01/12/14	1,4	0,8	15,1	14,7	1,2	0,6	2,9	4,9	1,4	1,1	6,2	3,3	0,8	0,8	5,5	5,0
01/03/15	1,3	1,2	17,6	16,3	1,5	0,6	4,3	5,4	1,1	1,0	6,3	2,7	0,8	0,8	5,1	5,2
01/06/15	1,3	1,2	17,6	16,3	1,7	0,6	4,6	5,4	1,1	1,0	6,2	2,7	0,8	0,8	4,6	5,0
01/09/15	1,3	1,2	17,6	16,3	1,8	0,6	2,7	4,9	1,1	0,9	5,3	2,5	0,8	0,8	4,6	5,0
01/12/15	1,5	1,5	18,4	19,4	1,0	0,5	2,7	4,9	1,2	1,0	5,2	2,2	0,8	0,8	4,5	5,0

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