Everything Sinful Is Glamourous
These Days, Isn't It?

An investigation into the effects of social norms upon stock markets and the impact of the financial crisis

1019572

Abstract

This paper considers the role of social influences, alongside financial incentives, in motivating stock market participants' behaviour through investigating sin stocks: the equity of firms whose retail or production activities are involved in promoting what is typically viewed as sin-seeking behaviour. Social attitudes regarding sin may cause these firms to be treated differently to their more socially responsible counterparts. Using data collated from Thomson Reuters' DataStream and Thomson One Banker, for over 4,700 US companies spanning from 2000 to 2012, the extent of disparities in institutional ownership and analyst coverage of sin and non-sin stocks is analysed. A fresh perspective is taken in contemplating the impact of the recent recession and financial crisis upon social norm effects within stock markets. Evidence is found in support of the norm-constraint hypothesis in the form of lower institutional ownership and analyst coverage of sin stocks relative to the wider stock universe, controlling for financial variables. The breach between investment in the two classes of equity appears to have narrowed since the crisis, implying increased importance of financial incentives to investors in the deteriorated economic climate, while that separating analyst coverage of sin and non-sin stocks has broadened, arguably attributable to individuals being more susceptible to social norm constraints than institutions in economic downturns.

Table of contents

Section I. Introduction

"Everything sinful is glamourous these days, isn't it?"

- Aimee Agresti (2012), *Illuminate*

Perhaps not, but let's not get ahead of ourselves. First, let us discuss the ideals of society. Societal norms can often have a considerable impact upon human behaviour, to the point where social values affect economic values. One manifestation of this concept is the existence of discrimination, whereby certain groups are favoured or shunned due to characteristics classical economic theory would deem unrelated to the decision of whether or nor to interact with them, such as race or gender.

It is typical for economists to consider the role of discrimination in an employment context, yet the economics of discrimination may not only be at work in the labour market, but also in the stock market. An intriguing facet of investor behaviour is the apparent neglect of sin stocks, the equity of firms whose operations are commonly seen as encouraging human vice, such as companies involved in the tobacco, alcohol, adult entertainment, weapons and gambling industries. Potentially as a result of the negative connotations associated with such firms, investors may ignore their shares, despite evidence of high returns (Fabozzi, Ma and Oliphant, 2008; Kacperczyk and Hong, 2009): behaviour that is inconsistent with portfolio theory[1]. If such discrimination exists in the stock market, it would seem that sin stocks are in fact not glamourous[2], but largely sidelined.

Capital markets play an unwaveringly significant role in the economy, with the size of the global stock market estimated to be $57 trillion (McKinsey & Company, 2011), of which US stocks, where this study will focus, account for $21.4 trillion (Bloomberg, 2012). If social customs resulting in sin firm aversion are indeed affecting the stock market, the impacts are very likely to be non-trivial. Investors may incur losses if they choose to shun revenue-generating sin stocks in favour of upholding social customs and there could exist the potential to capitalise upon that revenue if less notice is taken of such norms – it may be considered whether

---

[1] A theory of finance based upon building an investment portfolio that aims to maximise expected return for a given level of risk.
[2] 'Glamour stocks' are well endorsed and widely held by investors, tending to sell at higher prices than other shares due to greater demand.
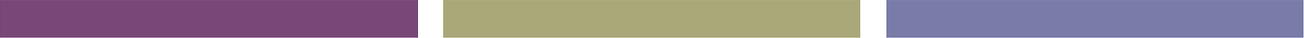
adhering to customs is worth the pecuniary loss. Moreover, traditional finance theories hold that stocks' values should only be determined by their unique properties of risk and return; if personal values placed upon stocks by individuals also have an impact, it may be argued that agents within the market are not maximising as pertains to standard economic motives, which could have significant implications for such theories and further afield. The implementation of social policies, such as the official clinical association between cancer and smoking, causing shifts in attitudes, may impact upon the workings of financial markets. If financial and non-financial incentives are not aligned, it is important to consider which side of the trade-off overrides and the repercussions this may have for market participants.

Such behaviour certainly merits further investigation into its cause and effect, but to date there has been a dearth of research conducted into the impact of discrimination upon stock markets, hence it remains important to add further analysis to existing findings. Much literature within this area is finance-based, yet economics has abundant insights to offer on the subject; this paper will take careful and explicit consideration of the economic forces at the root of social norm effects upon stock markets, presenting a theoretical explanation for this phenomenon before considering the extent to which theory can be supported econometrically. The most significant contribution will be to consider how stock market participants have reacted to the global financial crisis in their consideration of social norms regarding investment decisions. The crisis may be viewed as an external shock changing the extent to which financial decisions are scrutinised, with an explosion of media coverage of financial institutions' behaviour, while simultaneously heightening the need to maximise pecuniary gain in the challenging economic climate.

The remainder of the paper is laid out as follows: Section II reviews previous literature relating to this field; Section III discusses the theoretical framework; Section IV introduces testable data, the empirical methodology employed and results obtained; Section V comprises concluding remarks and possible extensions.
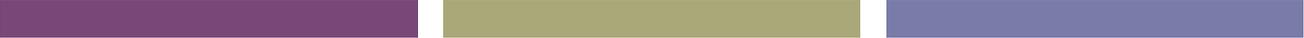
Section II. Literature review

Becker (1957) was among the first to rigorously model discrimination, presenting a theory where economic agents can have tastes over employees due to non-pecuniary characteristics. No explanation is provided for such tastes; rather it is assumed there is a preference against certain groups that can be treated in the same way as classical preferences over goods and services. In a labour market context, if the shunned group can be hired for a lower wage due to insufficient demand and all workers exhibit equal productivity, avoiding interaction serves to impose a cost upon the firm. This neoclassical analysis has since been extended by Arrow (1972), Akerlof (1980) and Romer (1984), who argue that although conforming to social norms may often be costly, creating financial gain for those who disobey, such norms continue to persist.

Kacperczyk and Hong (2009) hypothesise that there is a societal norm against holding sin stocks and investors may incur financial costs in conforming to such customs. In other words, upholding the social standards of the day may override profit motives. Including dummy variables for whether or not firms are classed as 'sin' in cross-sectional, time-series and panel data regressions on US stock market data, they find evidence in support of this view in three forms: higher expected returns of sin stocks; fewer holdings by "norm-constrained" institutional investors[3] relative to mutual or hedge funds, seen as "natural arbitrageurs" (Kacperczyk and Hong, 2009, p.15); and less coverage from analysts. Demand for sin stocks is low relative to comparable stocks, despite their economic merits, suggesting that discrimination may be a factor in demand determination. The worldwide persistence of high returns to sin stocks is confirmed by Fabozzi, Ma and Oliphant (2008), while Salaber (2009) aims to offer an explanation for this phenomenon beyond the broad title of social norms, considering the determinants of sin stock returns in the European market. Contributing factors include legal and cultural determinants such as religious preferences, excise taxation and litigation risk[4], suggesting that both conventional economic considerations and social norms are at play.

Extending the analysis, Liu, Lu and Veenstra (2011) allow for dynamic social customs, using consumption of sin goods as a proxy for social norm acceptance levels. The reliability of this is debatable; in response, the

---

[3] Such investors include pension funds, universities, religious organisations, banks and insurance companies.
[4] Litigation risk and excise taxation tend to be higher for sin companies, presenting a logical reason to shun sin stocks.

authors show sin good consumption to be correlated with survey responses regarding attitudes towards sin-seeking behaviour. They find that investment in vice firms is lower when their particular sin is seen as less acceptable, although the effect is dampened if the companies have higher expected future performance, presenting empirical evidence of a trade-off between financial and social incentives.

A further attempt at identifying the economic rationale behind this behaviour is made by Kim and Venkatachalam (2011), who consider whether substandard financial reporting quality on the part of sin firms, leading to greater informational risk associated with investing in such firms, can explain the higher expected returns of sin stocks. However, they find evidence to the contrary, both in terms of timely recognition of losses and the degree to which earnings for future cash flows are correctly predicted. This lends further credibility to the existence of social norm effects within stock markets, as sin stocks remain a neglected subset despite higher expected returns and superior financial reporting quality.

The prominence of social norm effects within the stock universe has grown in line with the booming industry of Socially Responsible Investment (SRI), which considers social good alongside financial gain by favouring[5] or shunning certain firms accordingly. At the beginning of 2010, the value of assets in socially screened portfolios equaled $3.07 trillion, showcasing a 34% increase from 5 years previously (Forum for Sustainable and Responsible Investment, 2010), indicating that social values can have a large role to play in investor decisions. Works such as Renneborg, Horst and Zhang (2007) and Adler and Kritzman (2008) suggest that the cost of SRI is substantial; a portfolio of stocks subjected to screening constraints will underperform relative to one without, on a risk-adjusted basis. Similarly, Statman and Glushkov (2008) find that although SRI yields a return advantage relative to conventional investment, this is largely offset by the return disadvantage brought about by shunning sin stocks. They conclude that SRI is optimally implemented when investment is tilted towards socially responsible companies, but refrains from neglecting any category of equity, even that of sin firms. More recent evaluation of these phenomena by Capelle-Blancard and Monjon (2012) determines that sectorial screens such as sin stock avoidance decrease funds' financial performance more so than any other screening process.

---

[5] Favoured firms are those that promote socially responsible practices, such as environmental concerns or civil rights.

Recognising the importance of these effects, Statman, Fisher and Anginer (2008) have developed a behavioural asset-pricing model that goes beyond standard financial theory to allow both objective and subjective risk to influence equity demand and thereby returns. The model is underpinned by the idea that shares, like consumer tangibles such as housing, "are considered good or bad, beautiful or ugly; they are admired or disliked" (Statman, Fisher and Anginer, 2008, p.1). In other words, they exude 'affect', cited by Zajonc (1980) and Kahneman (2002) as incredibly significant in the process of individual decision-making. When stocks are despised rather than admired, this manifests itself as lower prices, precipitating higher returns. Within this framework, stock market participants' aversion to sin stocks is entirely complicit with theory; the occurrence of such antipathy could then lend credence to the reliability of this model.

While strides have certainly been made in this field, it remains a relatively fresh area of research. This study will follow the methodology of Kacperczyk and Hong (2009) in considering differentials in institutional ownership and analyst coverage between sin and non-sin firms in the US, home to the world's largest stock market. Not yet discussed in the literature, to the best of this author's knowledge, and where this research will aim to contribute, is the impact of the financial crisis and consequent recession, specifically whether the increased scrutiny that the financial sector is now under has augmented the norm-constraint effect or whether the tough economic climate has given rise to a situation where profit motive is now overriding.

Section III. Theoretical framework

Christened by Elster (1989, p.99) as "one of the most persistent cleavages in the social sciences", the contradiction between the teachings of instrumental economic rationality and sociological norm adherence has long been scrutinised. The dispute essentially considers whether individuals are 'pulled' from ahead by the prospect of future rewards or 'pushed' from behind by external dynamisms (Gambetta, 1987). Experimental evidence has often found individual action to be influenced by an amalgam of outcome-orientated self-interest and social norm prescriptions partially maintained by the approval or otherwise of others (Kahneman, Knetsch and Thaler, 1986; Micro and Michael, 2012). This research will consider how far decision-making within stock markets is persuaded by both social and economic considerations, where agents' decisions are modelled in the following manner, a simple illustration of the behavioural asset-pricing model (Statman, Fisher and Anginer, 2008):

$$\textbf{Stock market participants' behaviour =} \qquad\qquad (1)$$

$$\boldsymbol{\alpha} \textbf{ (Objective financial incentives) + } \boldsymbol{\lambda} \textbf{ (Subjective social norms)}$$

These two distinct clusters of incentives mirror the division draw by Derwall, Koedijk and Ter Horst (2011, p.2137) between "profit-seeking" and "values-driven" social investors. In reality, most agents are likely to be hybrids of the two; the consideration will be the manner in which α and λ are combined and how the crisis has altered this, if at all.

Elster (1989) further entertains the possibility that, while rationality may act as a constraint on norms, and vice versa, the situation can arise where social customs are in fact followed out of a penchant for self-interest. Agents may have specific aims in exhibiting conformity, such as the desire to evade disapproval. Thus if social norms do have a role to play within stock markets, the power of this influence may lie in rational aspirations, such as avoiding investment practices that garner public disapproval in order to augment corporate social responsibility ratings, allowing for cheaper equity financing (El Ghoul *et al.*, 2011; Allen and Gordon, 2011). Akerlof (1980) maintains that even when social norm avoidance will result in financial gain

for the disobedient individuals, such as the high returns offered by sin stocks, established customs persist if their avoidance leads to sufficient reputational loss. Norms are then adhered to with the rational aim of building and preserving reputation, a goal that is likely to be of salience to institutional investors and individual agents alike. As such, sin stocks with bad reputations may be neglected, suffering discrimination as described by Becker (1957), due to social customs. Aversion to sin firms essentially enters as a preference into the decision-making processes of agents operating within financial markets.

Not since the 1930s has the global population been spectator to such an astonishing economic meltdown as the crisis that commenced in 2007. The effects of its incidence have been massive, extending into all corners of life; it is little surprise that one of those most shaken has been the worldwide capital market. Hours could be spent, and many have been, discussing the whys and wherefores of the occurrence of the downturn; for our current purposes, it suffices to say that the financial crisis sparked by the bursting of the US housing and credit bubble, precipitating a shutdown of credit markets, created substantial damages to equity and real estate wealth. This crippling blow to investor confidence triggered vast sell-offs in stock markets worldwide. In short, financial crises are endemic to the effective functioning of stock markets (Senbet and Gande, 2009), depressing returns, inducing major volatility and heightening risk (Chaudhury, 2011). Stock market trading has still not yet recovered since the crisis, even continuing to decline, with investors preferring to move away from company equity investment in favour of less risky financial instruments such as bonds (Popper, 2012).

Both the economic theories regarding social norm constraints and the observation of post-crisis global capital market contraction contribute to the formation of the hypotheses that this research seeks to address.

Section IV. Empirical strategy

IV.i. Methodology

No shortage of press reports (Borzykowki, 2012; Brown, 2012; Harris, 2012; Steen, 2012) suggest that sin stocks create an economic curiosity in their tendency to outperform more socially responsible alternatives, yet research finds they remain neglected by investors. In order to consider how far Becker's (1957) theories of discrimination are applicable in this context, two dimensions are examined: institutional ownership, the proportion of a company's total shares in issue held by institutional investors; and analyst coverage, the number of investment analysts who produce estimates on a firm's future expected equity performance, both measured at the conclusion of each year. The former is indicative of level of buyer demand for a company's shares, while the latter provides a complementary measure considering the extent to which stocks are paid attention to rather than ignored.

Together, both variables present a broader picture of the extent to which sin stocks, identified by a non-zero value of the dummy variable *sin*, are shunned in favour of more reputable alternatives, controlling for a set of financial characteristics such as company size, share price and returns. The impact of the financial crisis is considered through the inclusion of a dummy variable separating the pre- and post-crisis periods, in addition to a multiplicative term describing the interaction of the sin and post-crisis variables, in order to infer the extent to which the crisis has affected social norm effects within stock markets.

$$Institutional\ ownership\ =\ \alpha + \beta_1 sin_{it} + \beta_2 post_{it} + \beta_3 sin_{it} * post_{it} + X' + \varepsilon_{it} \qquad (2)$$

$$Analyst\ coverage\ =\ \alpha + \beta_1 sin_{it} + \beta_2 post_{it} + \beta_3 sin_{it} * post_{it} + X' + \varepsilon_{it} \qquad (3)$$

X' comprises the aforementioned set of financial variables; there is largely a consensus within the literature that the variables chosen to enter this set would typically affect the behaviour of agents within stock markets[6], through their effects on the expected risk and return associated with investing in a given stock. All variables

---

[6] Full descriptions of all variables included in the model are provided in Appendix III.

are measured for firm i at the end of year t. Institutional ownership is measured in percentage terms and the logarithm of analyst coverage is modelled, in order to consider changes. Initially, pooled OLS regressions are estimated, before considering further panel data methods: fixed effects, controlling for omitted variables that differ between cases but are constant over time, and random effects, allowing some omitted variables to be constant over time but vary between cases, and others to be fixed between cases but vary across time. These empirical methods are deployed with the aim of analysing the validity of the following hypotheses:

Hypothesis I: Institutional ownership and analyst coverage will be lower for sin compared to non-sin firms (negative β_1), controlling for financial variables typically expected to exert an effect upon stock market participants' behaviour.

Hypothesis II: Institutional ownership and analyst coverage for both categories of company will be lower following the crisis and consequent recession (negative β_2), similarly controlling for financial variables.

Hypothesis III: Since the financial crisis, one of the following two scenarios will have occurred:

  i.   Financial agents are now under increased external scrutiny, augmenting the norm-constraint effect (negative β_3).
  ii.   The tough economic climate has given rise to a situation where it is more important to perform as strongly as possible in pecuniary terms, thus profit motive has grown in influence relative to norm constraints (positive β_3).

In contemplating these hypotheses, it is necessary to note the bounds of the research. Immediately, the challenge of measuring social norms is presented. Following previous works (Kacperczyk and Hong, 2009; Salaber, 2009; Liu, Lu and Veenstra, 2011), this study will focus on the tobacco, alcohol and gambling industries[7]. There is a wealth of evidence to demonstrate the addictive properties of these vices and negative implications, both personal and external, of excessive consumption. This presents a solid foundation to define these sins as socially unacceptable practices, while the same is less certain for other arguably sinful industries, such as adult entertainment and nuclear power.

---

[7] For an explanation of the sin stock identification process and the list of sin stocks included in the sample, see Appendix I.

Social norms are additionally very likely to change over time and across countries, depending on cultural values, traditions and preferences. The drug trade is not studied here, as the majority of narcotics are illegal in the US and many other nations, immensely complicating any empirical analysis, yet the fact that marijuana is a part of Rastafarian culture in Jamaica may be used to illustrate the often juxtaposed nature of different cultures' societal norms.

Danger also abounds in grouping 'sin stocks' into one category rather than disaggregating by industry, as there may be variations in social acceptance levels of different vices. Similarly, industry-specific factors might influence stock market participants' attitudes and behaviour towards sin companies. Although sin stocks may share the common feature of being collectively shunned by socially responsible investors, Sizemore (2012) points to the difference in tobacco and alcohol being defensive consumer staples, while the performance of and demand for gambling stocks is dependent to a greater extent upon the condition of the travel and tourism industries, thus far more cyclical in nature. Controlling for unobserved heterogeneity across firms mitigates any limitation this may pose in empirical analysis.

IV.ii.   Data presentation

Company data was extracted from Thomson Reuters' DataStream and Thomson One Banker, while US GDP data was collected from The World Bank database. The complied dataset comprises all non-financial US stocks available in DataStream, including dead stocks to mitigate any survivorship bias, resulting in a sample size of 4,788 stocks, of which 80 are sin stocks, over a 13-year period, giving 62,244 individual observations, forming a panel.

Using panel data provides the advantageous ability to identify individual-specific and time effects through controlling for unobserved heterogeneity, a key concern in creating bias if not addressed. Within this dataset, an immediate issue regarding potential sources of bias is the small number of sin stocks relative to the wider stock universe. However, the underlying reason for this may in fact be in agreement with the spirit of Hypothesis I, in that publically traded sin stocks may not be in abundance as many vice firms are privately held in order to

Figure I. Proportions of sin and non-sin shares traded on the US stock market.

avoid the discrimination their equity faces on the stock market. Further statistical considerations are: problems of attrition, as not all firms have inputs for every variable in every time period[8]; the relatively short time-series dimension; measurement errors; and selectivity precipitating possible omission of relevant variables and sample selection bias. A rebuttal to the latter point is that the variables selected follow the methodologies of previous works (Kacperczyk and Hong, 2009; Liu, Lu and Veenstra, 2011) with the aim of achieving the best model specification including all variables deemed to be pertinent.

Preliminary analysis reveals that institutional ownership tends to be consistently higher among non-sin compared to sin firms, exhibiting a clear drop for both as the early stages of the crisis took hold, while analyst coverage appears considerably more constant across both firm types and time. The significant drop in institutional ownership occurs at the end of 2006, rather than 2007 as we might expect; the reason for this is

---

[8] Of the 62,244 observations, 20,887 have inputted data for ownership (available from 2003) and 17,956 for coverage.

likely to be that "2006 was the year of the incredible shrinking stock market" (Barr, 2006), when a record number of shares withdrew from public markets. However, ownership did not bounce back in line with positive predictions that the decline would bode well for 2007, indicating a role for the financial crisis in maintaining this contraction.


Figure II. Summary statistics: mean values of the key dependent variables over time, for sin compared to non-sin firms[9].

---

[9] Further summary statistics are outlined in Appendix II.

IV.iii. Results

Explanatory variables	Institutional ownership	Analyst coverage
sin	-8.105***	-0.0661
	(1.312)	(0.0521)
post	-13.84***	0.0312***
	(0.216)	(0.00567)
sinpost	3.248***	-0.122***
	(1.040)	(0.0265)
lsize	2.119***	0.302***
	(0.0766)	(0.00328)
iprice	0.00196***	0.0283***
	(0.000695)	(0.00526)
beta	-0.603***	0.0163***
	(0.122)	(0.00274)
returns	-3.11e-08	0.000112
	(2.24e-07)	(8.34e-05)
nasdaq	4.063***	0.157 ***
	(0.416)	(0.0178)
sp500	-0.336	0.239***
	(0.698)	(0.0258)
usgdp	-0.106**	-0.00833***
	(-0.0496)	(0.00136)
constant	11.71***	-0.243***
	(0.443)	(0.0235)
R^2	0.289	0.639
Observations	20,887	17,956

Figure III. Headline results. Standard errors in parentheses.

***Significant to the 1% level, **significant to the 5% level, *significant to the 10% level.

✦ denotes key variables of interest

The results of the institutional ownership model exhibit behaviour consistent with theoretical predictions of subjective social values colouring stock market participants' attitudes towards certain shares. Sin firms see less investment in their stocks than non-sin firms, by a margin of over 8%, controlling for financial factors,

while the occurrence of the crisis exerted a detrimental impact on both categories of equity, lessening institutional investment dramatically by 13.8%, supporting Hypotheses I and II. This decisive split between investment in sin and non-sin equity implies that discrimination does feature in stock markets, with sin shares being shunned due to industry orientation rather than measured on fiscal performance.

The occurrence of the financial crisis appears to have lessened the gap between ownership of sin and non-sin stocks, vindicating case *ii* of Hypothesis III, showcased by the positive coefficient on the difference-in-difference estimator *sinpost*. The additional increase in institutional ownership of sin relative to non-sin stocks for post- compared to pre-crisis is 3.2%. This finding implies that the desire to adhere to social norms has been dampened by the crisis and generating economic profit has become a relatively more important factor, although sin stock ownership remains below that of non-sin shares, indicating that on average social considerations remain dominant.

With regards to analyst coverage, sin firms receive less attention than their peers by a margin of 6.6%, in accordance with Hypothesis I, although the result is not statistically significant, while coverage since the crisis appears 3% higher than that during the pre-crisis period[10], at odds with Hypothesis II. Here, the impact of the downturn upon the norm-constraint effect has been to widen the divergence between sin and non-sin stock coverage by 12%, illustrated by the negative coefficient on the difference-in-difference estimator *sinpost*, implying case *i* of Hypothesis III, a surprising result given the opposite effect is exerted upon institutional investment.

There are two possible explanations for this. The first is simple: it may be a data failure, with the relevant data not available for enough firms to produce a reliable result. However, a more considerate elucidation could be that individual analysts pay greater attention to social customs than institutions do in difficult economic times. For instance, diminished job security in the downturn may lead analysts to stick to more conservative spheres, explaining why social norms only exhibit significance in coverage decisions since the crisis. Following this argument, the fact that coverage of all stocks has risen post-crisis is not a surprising result; with certain firms performing poorly or even going out of business, it would be logical for analysts to cover a larger portfolio of

---

[10] Further details of coefficient interpretations are provided in Appendix III.
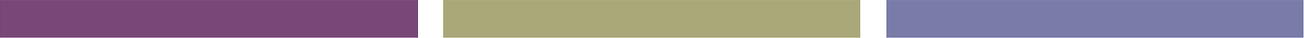
stocks, essentially diversifying risk and amplifying the chance of identifying well-performing shares.

Despite the negative coefficient on the difference-in-difference estimator indicating increased constraint by social norms post-crisis, the largest coefficients in the analyst coverage model are those on the logarithm of a firm's size and the dummy variables for whether or not a stock is included in the NASDAQ and S&P500 stock indices. This implies that financial considerations continue to bear weight in motivating individuals' behaviour, which may further explain why the coefficient on the dummy variable *sin* lacks statistical significance in this model.

These results are generated through estimation of random effects models. The Hausman test on each regression initially suggested a fixed effects model was the best fit; however, random effects tend to be the most appropriate form of panel estimation when the data comprises many observations at the individual level and fewer across time, as is the case here, while with fixed effects the time-invariant regressors, such as the key explanatory variable *sin*, cannot be investigated. As these variables cannot be estimated under fixed effects, computational problems with the Hausman test, which compares variable coefficients across fixed and random estimations, arise. Therefore, the Mundlak version of the Hausman test was performed (Perales, 2013), leading to estimation of the Hausman-Taylor model[11]. Through this method, the assumptions underlying random effects are found to be satisfied, confirming that it is the most efficient form of panel data estimation for both models.

Subsequently, the Chow test for structural change is applied to the models. This is simply a test of whether the coefficients estimated over one group of the data are equal to those over another. In other words, we are testing whether behaviour is the same, as measured by whether coefficients are the same. The two groups comprise sin and non-sin firms. Running this test on both models confirms the dual presence of a structural break. This further advocates a role for social values in stock market decisions, as market participants make investment and coverage choices in different manners dependent on whether they are considering sin or non-sin stocks.

---

[11] Full regression analysis, including details of checks to the robustness of using random effects models, is provided in Appendix III.
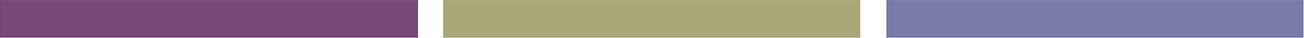
Section V. Conclusion & extensions

All things considered, we may have to break it to Miss Agresti that, these days, everything sinful may not be quite as glamourous as she has been led to believe. Sin stock investment falls short of that within the wider stock universe, while investment in all shares has further declined since the crisis. Furthermore, the difficult economic climate has given rise to a situation where profit motive has become more important in relation to social norm incentives for institutional investors. Discrimination against sin stocks has been dampened, although not extinguished, by the crisis, implying the amplified importance of outcome-oriented rationality relative to social norm constraints in trialling economic times. In terms of analyst coverage, sin stocks again trail behind more socially acceptable alternatives, while the crisis has heightened the magnitude of this effect, with sin shares being covered even less post-crisis, arguably attributable to individuals being more susceptible to social norm constraints in unfavourable economic conditions.

Due to the infancy of this specific field of research, potential extensions abound. While this research has focused upon the behaviour of stock market participants, further study may explore that of stocks themselves, considering the pattern of sin stock returns over the crisis period and if these shares are indeed "recession-proof" (Brown, 2012). International cultural divergences could also be considered, where different societies may exhibit variant levels of acceptance of sin-seeking behaviours due to diverse tastes regarding what is considered a sinful sector. As Salaber (2009) notes, little research has been devoted to the effects of social norms upon stock markets and even less to markets outside the US. Emerging markets and developing countries would make very interesting case studies, although data difficulties may be more pronounced here. Possible extensions also include the expansion of the list of companies defined as sin firms, from weapons and biotechnology to nuclear power and adult entertainment; Fabozzi, Ma and Oliphant (2008) find that returns for all these sin sectors outperform the norm. Another interesting avenue to explore would be further consideration of different social values that may affect investment decisions and stock market behaviour over and above classical financial variables, such as the work by Hong and Kostovetsky (2012) on the impact of political orientation on mutual funds' stock holdings. Indubitably, further investigation stemming from existing findings has much potential to provide captivating insights into the both the expected and unexpected role of economics in the nuances of the stock market world.

Appendix I: Classification of sin stocks

Identification of sin stocks began with the starting point of Kacperczyk and Hong's (2009) list of sin stocks, based upon industry codes. This was then expanded using the classifications set out by Salaber (2009), defining sin stocks as those in the 'brewers', 'distillers and vintners', 'tobacco' and 'gambling' industry groupings within Thomson Reuters' DataStream.

| List of sin stocks	
ALTRIA GROUP	ISLE OF CAPRI CASINOS
AMERICAS CAR MART	J BOUTARIS & SON HLDG. ORDINARY
AMERISTAR CASINOS	KIRIN HOLDINGS
AMERITYRE	LAKES ENTM.
ANHEUSER-BUSCH INBEV	LEUCADIA NATIONAL
ARCHON	LITTLEFIELD
BALLY TECHNOLOGIES	LOEWS
BINGO COM	LOTTERY &WAGERING SLTN.
BOSTON BEER 'A'	MENDOCINO BRW.CO.
BOYD GAMING	MGM RESORTS INTL.
BROWN-FORMAN 'B'	MONARCH CASINO & RESORT
CALL NOW	MTR GAMING GP.
CAP.BEV.	MULTIMEDIA GAMES HLDCO.
CBR BREWING 'A'	NATIONAL BEVERAGE
CENTRAL EUR.DISTRIBUTION	NEVADA GOLD & CASINOS
CENTURY CASINOS	NEW WORLD BRANDS
CHINA ORGANIC FTLZ.	PENFORD
CHURCHILL DOWNS	PENN NAT.GAMING
AMBEV PN	PERNOD-RICARD
CCU	PINNACLE ENTM.
CONSTELLATION BRANDS 'A'	PLYMOUTH RUB. 'A'
CONTINENTAL	PML 'A'
COOPER TIRE & RUB.	PROGRESSIVE GAMING INTL.
CRAFT BREW ALLIANCE	SCHWEITZER-MAUDUIT INT.
DIAMONDHEAD CASINO	SCIEN.GAMES 'A'
DOUBLE COIN HOLDINGS 'A'	SEABOARD
DOVER DOWNS GMG. & ENTM.	SPECTRE GAMING
DOVER MOTORSPORTS	STAR SCIENTIFIC
ELECTRONIC GAME CARD	TABCORP HOLDINGS
ELSINORE	GOODYEAR TIRE & RUB.
FLORIDA GAMING	TITAN INTL.ILLINOIS
FEMSA 'UBD'	TSINGTAO BREWERY 'A'
FULL HOUSE RESORTS	UNIVERSAL
GAMETECH INTL.	VECTOR GP.
GAMING PTNS.INTL.	CONCHATORO
GLOBAL CASINOS	W TECHNOLOGIES
GMODELO 'C'	WILLAMETTE VLY.VINEYARDS
INTERACTIVE SYSTEMS WWD.	WMS INDUSTRIES
INTERAMERICAN GAMING	WORLD RACING GROUP
INTL.GAME TECH.	WYNN RESORTS

Appendix II: Further summary data
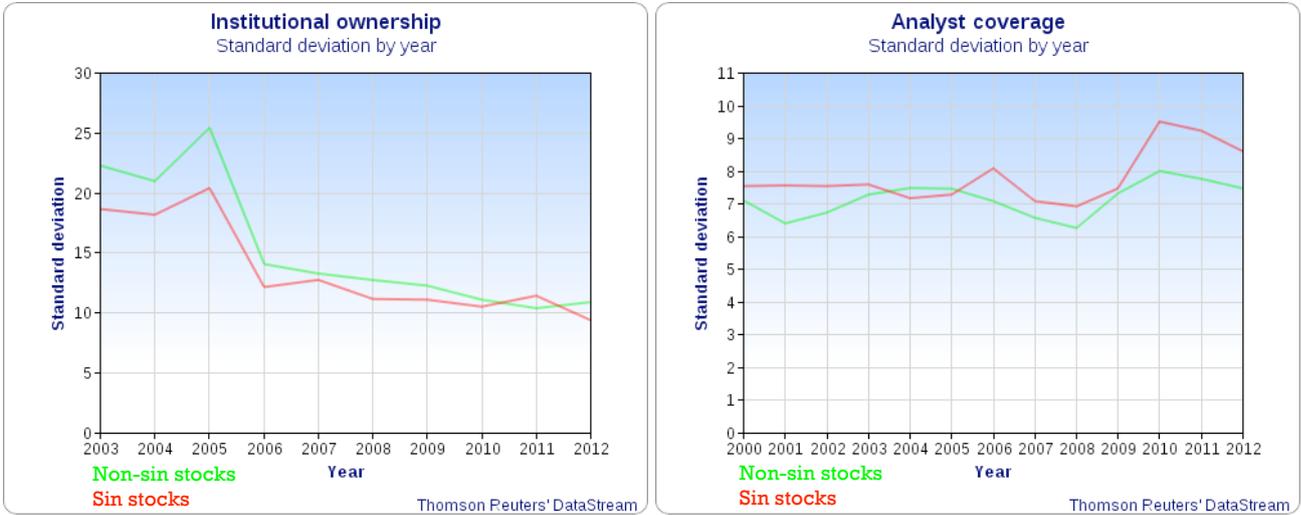
Figure IV. Summary statistics: standard deviations of the key dependent variables over time, for sin compared to non-sin firms.

Variable	Observations		Mean		Standard deviation		Maximum		Minimum	
	Non-sin	*Sin*	*Non-sin*	*Sin*	*Non-sin*	*Sin*	*Non-sin*	*Sin*	*Non-sin*	*Sin*
lsize	36385	1087	4.641	5.263	3.127	3.869	13.269	14.68	-4.605	-4.605
iprice	36536	1102	96.3	121.08	810.09	978.27	10000	10000	1.12e-10	3.4e-08
beta	36639	1101	1.135	0.989	2.011	0.968	138.31	6.529	-150.13	-4.356
returns	29502	885	-4329	-41.39	392266	761.262	109544	233.74	-5.3e+07	-21264
nasdaq	65912	1120	0.200	0.250	0.401	0.433	1	1	0	0
sp500	65912	1120	0.0664	0.100	0.249	0.300	1	1	0	0

Figure V. Summary statistics of variables included in the model for sin and non-sin firms separately[12].

---

[12] Of the summary statistics, those for share returns are surprisingly large and volatile in both positive and negative dimensions. First, it must be remembered that returns are reported in percentage terms, thus these represent changes rather than absolute values. Second, some firms may suffer issues of incorrect reporting or errors in inputting data, but this cannot be properly confirmed, thus all firms remain in the sample to avoid selection bias in omitting observations arbitrarily.

Appendix III: Full regression analysis

A note on coefficient interpretation

Institutional ownership is measured in percentage terms, as the proportion of firm *i*'s shares out of the total number in issue that are held by institutional investors. Therefore, we interpret the coefficients on the variables in this model as the unit effects of changes in the dependent variables upon institutional ownership, where the units are measured in percentage terms. For instance, the coefficient of -8.105 on the *sin* dummy tells us that sin firms (where *sin* takes the value 1) are invested in 8.105% less than non-sin firms. Analyst coverage takes the natural logarithmic form, measured as the natural logarithm of one plus the number of analysts covering firm *i* at the end of year *t*, thus the coefficient of 0.239 on the *s&p500* dummy, for instance, tells us analysts cover firms included in the S&P500 stock index 23.9% more than those that are not.

A note on forms of panel data estimation

Panel data provides information on multiple individuals at multiple points in time. Pooled OLS estimation of panel data enables exploitation of all the information in the data, but is often biased as it ignores the influence of unobserved heterogeneity, fundamental differences between individuals (here, firms) within the data, simply including it within the composite error term. Of paramount concern when dealing with panel data is the possibility of unobserved heterogeneity bias. In order to correct for this, alternate forms of panel data estimation may be employed, most typically fixed and random effects. Fixed effects estimations control for time invariant heterogeneity across individuals, while random effects assume that any time-invariant unobserved heterogeneity is uncorrelated with the explanatory variables. If this is the case, then a random effects model is the preferred form of estimation. The Hausman test can determine which form of estimation is most efficient; however, there can be computational issues with this test, such as the omission of time invariant variables from the comparison and the underlying assumption that variance is greater in fixed than random effects, which may not be the case. Further, random effects tend to be the most efficient estimation when the data in question covers many observations at the individual level and fewer across time. The Mundlak version of the Hausman test and Hausman-Taylor model can be used to determine the efficiency of random effects through testing if regressors are exogenous thus uncorrelated with unobserved heterogeneity.

Variable descriptions

Descriptions of all variables included in the regression analysis, each measured as specified by Kacperczyk and Hong (2009) and Liu, Lu and Veenstra (2011).

Variables	Description
Dependent	
Institutional ownership (insto)	The percentage of shares of company i held by institutions at the end of year t: number of shares held by institutions divided by total shares outstanding
Analyst coverage (lanalysts1)	The natural logarithm of one plus the number of analysts covering firm i at the end of year t
Explanatory	
sin	1 if firm i is classified as a sin firm, 0 otherwise
post	1 if the observation occurred from 2007 onwards, 0 otherwise
sinpost	The interaction term of the dummy variables *sin* and *post*, measuring the additional effect of being a sin compared non-sin firm for post- compared to pre-crisis
lsize	The natural logarithm of the firm's market capitalisation: price times shares outstanding
iprice	The inverse of firm i's share price at the end of year t
beta	The beta of firm's i's industry in year t, measuring the volatility of the asset
returns	The average monthly returns on firm i's stock during year t
nasdaq	1 if firm i is included on the NASDAQ stock index, 0 otherwise
sp500	1 if firm i is included on the S&P500 stock index, 0 otherwise
usgdp	US GDP growth during year t, measured in percentage terms

Pooled OLS regression results

Explanatory variables	Institutional ownership	Analyst coverage
sin	-9.757***	-0.0673**
	(0.969)	(0.0270)
post	-14.14***	0.00556
	(0.266)	(0.00861)
sinpost	3.103**	-0.135***
	(1.291)	(0.0410)
lsize	3.169***	0.328***
	(0.0514)	(0.00264)
iprice	0.00211***	0.0266***
	(0.000708)	(0.00527)
beta	0.180	0.0616***
	(0.113)	(0.00345)
returns	-2.18e-08	0.000132
	(2.49e-07)	(0.000103)
nasdaq	2.197***	0.161***
	(0.227)	(0.00745)
sp500	-5.736***	0.125***
	(0.394)	(0.0116)
usgdp	-0.220***	-0.0122***
	(0.0615)	(0.00213)
constant	7.441***	-0.392***
	(0.356)	(0.0186)
R^2	0.304	0.645
Observations	20,887	17,956

Figure VI. Pooled OLS regression results. Standard errors in parentheses.

***Significant to the 1% level, **significant to the 5% level, *significant to the 10% level.

Fixed effects regression results

Explanatory variables	Institutional ownership	Analyst coverage
sin	(omitted)	(omitted)
post	-13.01***	0.0385***
	(0.215)	(0.00576)
sinpost	3.682***	-0.122***
	(1.025)	(0.0265)
lsize	-0.640***	0.295***
	(0.128)	(0.00402)
iprice	0.00139*	0.0590***
	(0.000746)	(0.0104)
beta	-1.344***	0.0111***
	(0.139)	(0.00283)
returns	6.59e-08	6.64e-05
	(2.28e-07)	(9.12e-05)
nasdaq	(omitted)	(omitted)
sp500	(omitted)	(omitted)
usgdp	0.169***	-0.00674***
	(0.0497)	(0.00137)
constant	28.32***	-0.0350***
	(0.698)	(0.0272)
R^2	0.252	0.311
Observations	20,887	17,956

Figure VII. Fixed effects regression results. Standard errors in parentheses.

***Significant to the 1% level, **significant to the 5% level, *significant to the 10% level.

Pooled OLS specification tests

Ramsey RESET test for omitted relevant variables

	F-statistic	Probability > F	Conclusion
Institutional ownership	404.48	0.0000	Omitted variables
Analyst coverage	500.76	0.0000	Omitted variables

Strong evidence exists to suggest there are variables relevant to both models that have been omitted from the regressions. This is not a surprising result, firstly due to the selective nature of the variables within the dataset, and secondly because there are likely to be any number of unobservable factors relevant to the determination of the dependent variables that available data sources do not capture. The model specifications are derived from theory rather than trial-and-error empirical testing, aiming to select the variables deemed logically pertinent to market participants' decision-making,

Breusch-Pagen/Cook-Weinberg test for heteroscedasticity

	Chi^2-statistic	Probability > Chi^2	Conclusion
Institutional ownership	3428.56	0.0000	Heteroscedasticity
Analyst coverage	19.31	0.0000	Heteroscedasticity

The above test considers whether variance within the data is constant across all observations; the results of the test imply that it is not. We would expect variance to change markedly across firms due to natural differences.

Random effects specification tests

Breusch-Pagan Lagrangian Multiplier test

	Chi^2-statistic	Probability > Chi^2	Conclusion
Institutional ownership	10768.18	0.0000	RE appropriate
Analyst coverage	30316.63	0.0000	RE appropriate

This test determines whether random effects (RE) or pooled OLS is more appropriate to estimate the models. The results strongly indicate that random effects are most efficient, as subsequently vindicated by the Hausman-Taylor model.

Hausman test

	Chi^2-statistic	Probability > Chi^2	Conclusion
Institutional ownership	761.98	0.0000	FE appropriate
Analyst coverage	116.36	0.0000	FE appropriate

The Hausman test is used to determine whether correlation exists between firm-specific unobservable effects and the regressors. The results suggests that the use of a fixed effects (FE) model in both estimations would be consistent with the data than RE; however, as the dummy variables *sin*, *nasdaq* and *sp500* are time invariant, they cannot be estimated using fixed effects, therefore are omitted from the Hausman test comparison, creating problems with computing the test. As such, further consideration must be made as to which form of panel data estimation is most efficient for this data.

Mundlak version of the Hausman test

The Mundlak version of the Hausman test is used to determine the adequacy of the random effects model. To run this test, we generate means of each of the variables in the model and include them in the regression. The joint significance of these generated mean regressors indicates the exogeneity of the unobserved individual effects from the model regressors.

	F-statistic	Probability > F	Conclusion
Institutional ownership	220.14	0.0000	Mean regressors exogenous
Analyst coverage	111.47	0.0000	Mean regressors exogenous

The mean regressors are strongly significant, thus the Mundlak version of the Hausman test is consistent with the use of random effects. The Hausman-Taylor model further verifies this choice.

Hausman-Taylor model

In order to be able to employ a random effects model that is efficient and consistent, it is further necessary to confirm that the time invariant variables are exogenous, thus uncorrelated with unobserved effects, in order to ensure than the assumptions underlying random effects are satisfied and the model does not suffer endogeneity bias. The Hausman-Taylor model is used to determine which of the variables included in the

model are exogenous. In estimating this model, it is confirmed that the key time invariant variable, *sin*, is exogenous in both the institutional ownership and analyst coverage models, illustrated by P>|z| values of 0.319 and 0.266 respectively, thus unobserved heterogeneity is uncorrelated with the explanatory variables here and the assumptions underlying random effects are sound. Therefore, the Hausman-Taylor model is consistent with the use of random effects to estimate this data.

Chow test

Variable	Institutional ownership		Analyst coverage	
	Sin	Non-sin	Sin	Non-sin
post	-14.17	-10.38	-.00124	-0.0988
lsize	3.375	-0.0726	0.347	0.124
iprice	0.00236	-0.965	0.0323	-0.545
beta	0.0990	2.010	0.0599	0.189
returns	-4.009e-08	-0.00473	0.0000102	0.00379
nasdaq	1.943	1.579	0.167	-0.131
sp500	-6.895	10.211	0.0769	0.112
usgdp	-0.242	0.103	-0.0131	-0.0130
Constant	6.754	14.31	-0.505	1.044

Figure VIII. Coefficients for each of the models with the sample divided into sin and non-sin firms.

The Chow test examines structural change between sin and non-sin firms through testing whether the coefficients estimated over the sin group are equal to those over the non-sin group.

	F-statistic	Probability > F	Conclusion
Institutional ownership	54.33	0.0000	Structural break present
Analyst coverage	31.40	0.0000	Structural break present

For both models, ample evidence exists to reject the null hypothesis of no structural break between sin and non-sin firms. This implies that there exist fundamental differences in the manner that institutional ownership and analyst coverage of sin and non-sin firms are determined.
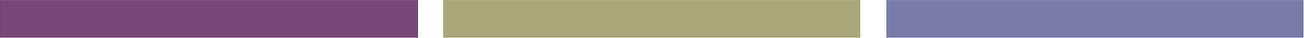
Bibliography

Adler, T., and M. Kritzman (2008), 'The Cost of Socially Responsible Investing', *Journal of Portfolio Management*, 35(1), pp.52-56.

Agresti, A. (2012), *Illuminate*, New York: Houghton Mifflin Harcourt.

Akerlof, G. (1980), 'A theory of social custom, of which unemployment may be one consequence', *Quarterly Journal of Economics*, 94(4), pp.749-775.

Allen, G. and Gordon, R. (2011), 'The impact of corporate social responsibility on the cost of bank loans', *Journal of Banking and Finance*, 35(7), pp.1794-1810.

Arrow, K. (1972), 'Models of job discrimination', in: Pascal, A. (Ed.), *Racial Discrimination in Economic Life,* Lexington, Massachusetts, pp.83-102.

Becker, G. (1957), *The Economics of Discrimination,* University of Chicago Press, Chicago.

Bloomberg (2012), *World Stock Indexes* [online], available at: *http://www.bloomberg.com/markets/stocks/world-indexes* (accessed December 2012).

Borzykowski, B. (2012), 'Investing in Sin Stocks', *Canada Business* [online], available at: *http://www.canadabusiness.com* (accessed December 2012).

Brown, A, (2012), 'Guns, Booze and Gambling: Sin Stocks for a Recession-Proof Portfolio', *Forbes* [online], available at: *http://www.forbes.com* (accessed December 2012).

Burke, M. and Young, P. (2011), in: Benhabib, J., Bisin, A. & Jackson, M. (eds.), *Handbook of Social Economics*, North-Holland, Amsterdam.

Capelle-Blancard, G. and Monjon, S. (2012), 'The Performance of Social Responsible Funds: Does the Screening Matter?', *Working Papers 2011-12*, CEPII research centre.

Chaudhury, M. (2011) 'The Financial Crisis and the Behaviour of Stock Prices', *Open Access Publications from Desautels Faculty of Management*, McGill University.

Derwall, J., Koedijk, K. and Ter Horst, J. (2011), 'A tale of values-driven and profit-seeking investors',

Journal of Banking and Finance, 35(8), pp.2137-2147.

El Ghoul, S., Guedhami, O., Kwok, C. and Mishra, D. (2011), 'Does Corporate Social Responsibility Affect the Cost of Capital?', *Journal of Banking and Finance*, 35(9), pp.2388-2406.

Elster, J. (1989), 'Social Norms and Economic Theory', *Journal of Economic Perspectives*, 3(4), pp.99-117.

Fabozzi, F., Ma, K. and Oliphant, B. (2008), 'Sin Stock Returns', *Journal of Portfolio Management*, 35(1), pp.82-94.

Gambetta, D. (1987), *Were They Pushed or Did They Jump? Individual Decision Making*, Cambridge University Press, Cambridge.

Harris, D. (2012), 'Vice Fund Backer Says So-Called Sin Stocks Beat Market', *ABC News* [online], available at: *http://www.abcnews.go.com* (accessed March 2013).

Kacperczyk, M. & Hong, H. (2009), 'The Price of Sin: The Effects of Social Norms on Markets', *Journal of Financial Economics*, 93(1), pp.15-36.

Kahneman, Daniel (2002). 'Maps of bounded rationality: A perspective on intuitive judgment and choice', Nobel Prize lecture, 8th December 2002.

Kahneman, D., Knetsch, J. & Thaler, R. (1986), 'Fairness as a Constant on Profit Seeking Entitlements in the Market', *American Economic Association*, 76(4), pp.728-741.

Kim, I. & Venkatachalam, M. (2011), 'Are Sin Stocks Paying the Price for Accounting Sins?', *Journal of Accounting, Auditing & Finance,* 26(2), pp.415-442.

Liu, Y., Lu, H. & Veenstra, K. (2011), 'Is Sin Always a Sin? The Interaction Effect of Social Norms and Financial Incentives on Market Participants' Behavior', *Research Collection School of Accountancy (Open Access),* paper 883.

McKinsey & Company (2011), *Mapping Global Capital Markets 2011*, Chicago: McKinsey Global Institute.

Micro, T. & Michael, V. (2012), 'Social Incentives Matter: Evidence from an Online Real Efforts Experiment', *IZA Discussion Papers 6716*, Institute for the Study of Labor (IZA).

Perales, F. (2013), 'MUNDLAK: Stata module to estimate random-effects regressions adding group-means of

independent variables to the model', *www.ideas.repec.org* (accessed March 2013).

Popper, N. (2012), 'Stock Trade is Still Falling After '08 Crisis', *The New York Times* [online], available at: *http://www.nytimes.com* (accessed January 2013).

Renneborg, L., Horst, J. and Zhang, C. (2007), 'The Price of Ethics: Evidence from Socially Responsible Mutual Funds', *Discussion Paper 2007-29*, Tilburg University, Center for Economic Research.

Romer, D. (1984), 'The Theory of Social Custom: A Modification and Some Extensions', *The Quarterly Journal of Economics*, 99(4), 717-727.

Salaber, J. (2007), 'The Determinants of Sin Stock Returns: Evidence on the European Market', *Open Access Publications from Université Paris-Dauphine*, Université Paris-Dauphine.

Senbet, M. and Gande, A. (2009) 'Financial Crisis and Stock Markets: Issues, Impact and Policies', presented at the annual conference of the Dubai Economic Council "Financial Crisis, Its Causes, Implications, and Policy Responses", Dubai, October 2009.

Sizemore, C. (2012), 'Not all sin stocks are created equal', *Market Watch: The Wall Street Journal* [online], available at: *http://www.marketwatch.com* (accessed March 2013).

Forum for Sustainable and Responsible Investment (2010), *2010 Report on Sustainable and Responsible Investing Trends in the United States*, Washington: US SIF.

Statman, M., Fisher, K. & Anginer, D. (2008), 'Affect in a Behavioural Asset Pricing Model', *SSRN working paper series* [online], available at: *http://ssrn.com* (accessed March 2013).

Statman, M. & Glushkov, D. (2008), 'The Wages of Social Responsibility', *SSRN working paper series* [online], available at: *http://ssrn.com* (accessed November 2012).

Steen, A. (2012), 'Investments: Stretching Morals With Sin Stocks', *FT Adviser* [online], available at: *http://www.ftadviser.com* (accessed March 2013).

Zajonc, R. (1980), 'Feeling and thinking: Preferences need no inferences', *American Psychologist*, 35(2), pp.151-175.