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Social Screens and Systematic Investor Boycott Risk

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Abstract

We model the pricing implications of screens adopted by socially responsible investors. The model reproduces the empirically observed abnormal return to sin stock and implies a premium for systematic investor boycott risk that affects targeted as well as nontargeted firms. The investor boycott premium is not displaced by litigation risk, measures of neglect effect, illiquidity, industry momentum, or concentration. The investor boycott risk factor is useful in explaining mean returns across industries, and its premium varies with the relative wealth of socially responsible investors and the business cycle.

I. Introduction

"Sin" stocks, that is, the stocks issued by firms engaged in socially or morally objectionable activities, have sizable abnormal positive returns (documented by Fabozzi, Ma, and Oliphant (2008), Hong and Kacperczyk (2009), Statman and Glushkov (2009), Salaber (2009), and others). Existing explanations view sin stocks as characterized by litigation risk, illiquidity, and neglect: aspects that raise average returns. In contrast, we relate the sin stock premium to systematic risk arising from the nonpecuniary preferences of investors engaged in "socially responsible investing" (SRI). These self-restricted investors in effect boycott sin stocks.

In aggregate, the SRI boycott causes unrestricted investors, interested purely in the pecuniary aspects of their holdings, to overweight boycotted assets in their portfolios, requiring extra compensation for risk. In an equilibrium model that

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supplements the segmented investor base frameworks of Errunza and Losq (1985) and Merton (1987), and builds on the disagreement-in-tastes view of Fama and French (2007), a stock's sensitivity to an investor-boycotted return aggregate captures the risk compensation supplementary to standard market risk. The returns of any stocks, not only sin stocks, are affected by their return covariances with the investor boycott risk factor. Thus, the boycott by investors of sin stocks extends to other stocks whose returns happen to be correlated with sin stocks (stocks of firms with similar payoff distribution patterns).

We extend the literature on the financial impact of investor boycotts in two directions. First, we study the financial impact of extensive industry-wide boycotts instead of the individual-event-driven boycotts examined by Teoh, Welch, and Wazzan (1999). Second, besides explaining the superior performance of sin stocks relative to regular stocks, our model clarifies the financial impact of investor boycotts on all stocks. The aggregate perspective on the SRI boycott impact is useful in explaining average stock return differences across industries. The boycott risk premium changes through time in a predictable way depending on the intensity of the boycott (popularity of SRI) and the business cycle.

Section II of this paper presents various aspects of sin-stock boycotts, while Section III offers a general-equilibrium theoretical perspective with implications. Measurement, data issues, and empirical results regarding the importance of systematic investor boycott risk are given in Sections IV–VI. Section VII confronts alternative explanations of the sin premium. Section VIII provides further validation of systematic boycott risk by relating its risk premium to variation in SRI over time, to the business cycle, and to covariances with aggregate sin–stock payoffs. Section IX concludes.

II. Sin Stocks and Investor-Boycotted Industries

A. Abnormal Returns of Boycotted Stocks

Stocks boycotted by investors generally fall into the category of sin stocks. Most studies on sin stocks focus on sin-stock or Vice-Fund performance relative to traditional benchmarks. Utilizing sin-firm data from 1970 to 2007, Fabozzi, Ma, and Oliphant (FMO) (2008) show that, on average, a portfolio of sin stocks produces an annual return of 19.02%, while the average market return is only 7.87% annualized. Hong and Kacperczyk (HK) (2009), using time-series regressions for the sample period 1965–2006, hold a portfolio of sin stocks and sell short a portfolio of nonsin stocks. After accounting for market size, past return, and market-to-book ratio, this strategy generates a return of 29 basis points per month. Statman and Glushkov (2009) construct a reverse sin portfolio, "accepted minus shunned," revised annually over the period 1991–2007. They find that this portfolio has a negative 2.6% annualized excess return by the Fama–French 3-factor benchmark and a negative 3.3% return by the capital asset pricing model (CAPM) benchmark.

The consensus on the superior sin-stock performance has inspired a stream of studies about sin premium determinants. Salaber (2007) explores the sin premium of European stocks from a legal and a religious perspective. She shows that Protestants require higher risk-adjusted returns on sin stocks than do Catholics.

Sin stocks further have higher risk-adjusted returns if they are subject to higher litigation risks and excise taxation. Salaber (2009) studies sin-stock returns over the business cycle. She finds an indication of higher risk in that an abnormal number of these stocks exit during recessions. Durand, Koh, and Tan (2013) link sin-stock performance worldwide to cultural variables. They find that in more individualistic cultures, sin stocks outperform other stocks.

FMO (2008) propose causes for the sin stocks' abnormal returns. They speculate that sin industries are typically less competitive and more subject to litigation and "headline risks." These risks lead to a permanent discount in valuation. They further attribute the positive risk-adjusted returns to initial IPO undervaluation resulting from the nature of the business of these firms. HK (2009) offer another type of explanation that ties the undervaluation of sin stocks to the lack of investor base. A reduced investor base may decrease liquidity, requiring a higher return for sin stocks. Additionally, HK show that due to the increasingly popular social screens, sin stocks have lower levels of institutional ownership and, hence, reduced analyst coverage. Further, the headline risk stemming from news about sin stocks generally being interpreted negatively may cause sin firms to avoid the media. Fang and Peress (2009) find empirically that reduced media coverage implies higher returns. In both scenarios, sin firms are relatively neglected. Merton's (1987) theory for the returns of neglected stocks suggests higher returns associated with undiversifiable idiosyncratic risk.

B. Selection of Investor-Boycotted Firms

Boycotted industries are controversial industries and difficult to categorize objectively. Therefore, we base our selection procedure on previous studies as well as on surveys of real practices in the investment industry (the U.S. Social Investment Forum (SIF) 1995–2012 biannual surveys).

Socially responsible investing as an investment category was implemented on a significant scale starting in the mid-1990s. After 1999, funds employing screens crossed the $1 trillion threshold (Table 1). According to the SIF 2012, more than one of every nine dollars under professional management in the United States is invested according to SRI guidelines. Over 90% of the funds following SRI principles use three or more screens to constrain their investments in controversial businesses. The top five screens based on the SIF surveys between 1995 and 2005 were tobacco, alcohol, gaming, weapons, and environment. While the first three are lumped together as sin industries (e.g., Salaber (2007), FMO (2008),

TABLE 1

Socially Responsible Investing Trends in the United States

Assets under professional management (pension funds, mutual fund families, foundations, religious organizations, and community development financial institutions) in the United States: The total amount (Total Assets); the amount considered to be managed, according to socially responsible investing principles (SRI Assets); and the amount of assets, a subset of the SRI Assets, subject to at least one negative screen prohibiting investment in particular industries (Screened Assets). The numbers are from the various editions of the *Thomson Reuters Nelson's Directory of Investment Managers*. Units are $1 trillion.

	1995	1997	1999	2001	2003	2005	2007	2010	2012
Screened Assets	$0.16	$0.53	$1.50	$2.01	$2.14	$1.69	$2.10	$2.51	$3.31
SRI Assets	$0.64	$1.19	$2.16	$2.34	$2.18	$2.29	$2.71	$3.07	$3.74
Total Assets	$7.00	$13.70	$16.30	$19.90	$19.20	$24.40	$25.10	$25.20	$33.30

and HK (2009)), the screen on environment is driven by concerns of global warming and fossil fuel divestment.[1]

To identify a representative portfolio of investor-boycotted stocks, we select a minimal list of habitually boycotted stocks and a more extensive list of less universally boycotted stocks. The first list has the advantage of excluding from classification as boycotted by investors those stocks not uniformly boycotted by most SRI funds over the period considered, while the second list provides a broader, more diversified portfolio. Alcohol, fossil fuel, gaming, weapons, and tobacco each is screened by around 80% or a higher fraction of the SRI funds (see Table 3). We take a value-weighted portfolio of all Center for Research in Security Prices (CRSP) firms in these industries as our extensive investor-boycott factor portfolio.

Several components of the extensive set of boycotted firms are questionable indicators of an investor boycott, arguing for concentrating on the narrower group of boycotted firms. First, including the gaming industry is problematic. Since the late 1990s, an increasing number of states in the United States have deregulated casino-style gambling. According to a survey of casino entertainment by the National Gaming Association, by 2013, 23 states had legalized casino-style gambling. The wave of legalization of casino-style gaming suggests it has recently become more socially acceptable. This observation is enforced by the significant drop in the percentage of gaming screens used by SRI portfolios, from its peak of 86% in 1999 to less than 20% in early 2003. If sensitivity to a boycott factor depressed prices of gaming firms, a reduction of this sensitivity would lead to a positive impact on returns, spuriously attributed to the boycott factor.

Second, including all fossil fuel firms is difficult. According to the "Stranded Assets Program," an Oxford University report commissioned by HSBC's Climate Change Centre of Excellence, oil and gas together account for about 10%, 11%, and 20% of the total market cap of the Russell 1000, the Standard & Poor's 500, and the Financial Times Stock Exchange 100, respectively. In contrast, coal is a much smaller and more fragmented industry. The coal industry's size and its salient pollution make it a more likely scapegoat among the three fossil industries. For instance, the world's largest sovereign wealth fund, the Government Pension Fund of Norway, has divested from 13 coal extractors without similar actions toward oil and gas companies.

Third, we follow the literature in dropping weapons as a morally questionable industry, following Salaber (2007) and HK (2009). The resulting narrower list of boycotted firms consists of alcohol, coal, and tobacco firms. Table 2 provides summary statistics regarding the boycotted stocks from 1963 to 2012. Over the entire sample period, there is an annual average of 33 stocks in our narrow boycott measure and 199 stocks in our broader boycott measure.

Selecting a limited number of clearly boycotted stocks is meant to deliver the best proxy for a more abstract larger portfolio of assets boycotted to different de-

[1]The primary goal of fossil fuel divestment is to pressure government and fossil fuel industries (oil, gas, and coal) to undergo "transformative change" with the objective of causing a drastic reduction in carbon emissions. This divestment campaign has gained prominence on university campuses and mission-driven institutions—quite similar to the history of divestment from South Africa in protest against South Africa's Apartheid regime.

TABLE 2
Profile of Boycotted Stocks

Table 2 presents the number of firms and average market capitalization ($1 million units) of investor-boycotted stocks for the most prevalent SRI screens, averaged over 10-year periods. The definitions of Tobacco, Alcohol, Coal, Fossil (Coal, Oil, and Gas), and Weapons follow the Fama–French SIC classifications. Stocks with Standard Industrial Classification (SIC) codes 2100–2199 are in the tobacco industry, SIC codes 2080–2085 represent the alcohol industry, and SIC codes 1200–1299 are in the coal industry. SIC codes 1300–1389 represent the oil and gas industry, and SIC codes 3769–3769, 3795, and 3480–3489 represent the weapons industry. Gaming stocks are identified following HK's (2009) NAICS codes: 7132, 71312, 713210, 71329, 713290, 72112, and 721120.

	Number of Firms						Average Market Capitalization ($millions)					
Year	Tobacco	Alcohol	Coal	Fossil	Weapons	Gaming	Tobacco	Alcohol	Coal	Fossil	Weapons	Gaming
1963–1972	11	12	4	49	4	N/A	409	206	154	188	188	N/A
1973–1982	10	19	9	170	8	N/A	1,055	230	221	199	253	N/A
1983–1992	7	17	11	265	9	9	6,763	817	200	290	760	287
1993–2002	6	22	8	200	10	29	15,061	1,712	485	854	2,273	647
2003–2012	6	13	9	144	9	17	26,985	2,562	3,052	3,015	4,362	3,346
Average	8	17	8	166	8	18	10,054	1,106	823	909	1,567	1,427

TABLE 3
Investment Screens in Previous Literatures

Table 3 consists of a survey of previous academic literature regarding investment screens applied to identify sin firms. NAICS stands for North American Industry Classification System, SIC stands for Standard Industrial Classification code, and Permno is a stock identifier. HK denotes Hong and Kacperczyk (2009). Other papers following the HK criteria are Salaber (2007), (2009) and Liu, Lu, and Veenstra (2014). KV is Kim and Venkatachalam (2011), and RHZ is Renneboog, Horst, and Zhang (2008), (2011). RHZ's ethical negative screens include animal testing, abortion, genetic engineering, and nonmarital insurance. RHZ's social negative screens cover workplace diversity, human rights, and labor standards. RHZ's environmental negative screens include firms that have low environmental standards, contribute to global warming, or operate nuclear power plants. FMO is Fabozzi, Ma, and Oliphant (2008), and LW is Lobe and Walkshäusl (2016). SRI (%) is the percentage of SRI funds employing the particular screen, as reported in the SIF for 1999.

Screen	SRI (%)	HK	KV	RHZ	FMO	LW
Tobacco	96	SIC	SIC	Y	Y	Y
Alcohol	83	SIC	SIC	Y	Y	Y
Gaming	86	NAICS	NAICS	Y	Y	Y
Weapons	81	(SIC)[a]		Y	Y	Y
Pornography			PERMNO	Y	Y	Y
Ethical	23[b]			Y	Y	
Social				Y		
Environmental	79			Y		Y
Region	World	United States	United States	World	World	World

[a] Only used in robustness tests.
[b] Abortion, Abortifacients, Contraceptives, and Family Planning in the SIF 1999 report.

grees, with each asset's weight in the portfolio depending positively on its market weight as well as the degree to which investors boycott it. Thus, while the combined market value of the average of 33 boycotted stocks is negligible, it is used as a proxy for a portfolio with a total market value more similar to or larger than the total value of capital invested in institutions with social screens. Our narrow measure is conservative in that only stocks pervasively and persistently shunned by socially responsible investors are included.

III. Theoretical Investor Boycott Implications

The financial market position of investor-boycotted stocks is interesting. Firms whose stocks are boycotted still have access to the financial market but face reduced demand from self-restricted investors. To attract sufficient investment, these firms must offer higher returns. HK (2009) offer this explanation for the sin-stock premium, based formally on Merton's (1987) "neglect" framework. In Merton (1987), idiosyncratic risk is priced because investors insist on exclusively holding stocks they are familiar with; thus, they have limited diversification opportunities. Neglected stocks face higher idiosyncratic risk as their risk is split over a smaller group of investors. HK point out that, in application to sin stocks, a risk premium then arises from two sources: limited participation causing the idiosyncratic risk to be divided over fewer investors (q_k decreases in Merton's equation (16)) and increased idiosyncratic risk inherent to sin firms who must deal with litigation risks (σ_k^2 increases in Merton's equation (16)).

The Merton (1987) model has limitations as an explanation for the sin premium. First, it is a one-factor model in which idiosyncratic risk is priced. It relies on dramatically reduced diversification opportunities to the extent that, in spite of assets having a strict factor structure, no investors can diversify sufficiently to "arbitrage" the pricing effect of idiosyncratic risk. In a world where all investors hold few assets, this makes more sense than in a setting where only some assets face reduced participation. Second, Merton's framework cannot examine the systematic impact of commonalities in the neglect of assets. It assumes a diagonal covariance matrix for return errors and provides no formal explanation for what neglected assets may have in common. Simple CAPM alphas will be increasing in the degree of an asset's neglect, but the lack of structure regarding which investors neglect particular assets makes it problematic to identify an additional risk factor.

A potentially more suitable framework for examining the systematic pricing effect of the boycott of sin stocks is that sketched by Fama and French (2007). They argue that investors may have nonpecuniary preferences for holding assets: "[investors] get direct utility from their holdings of some assets, above and beyond the utility from general consumption that the payoffs on the assets provide" (Fama and French (2007), p. 675). In the investor boycott case, this is disutility from holding sin stocks. Fama and French cite SRI as an example with specific reference to tobacco companies and gun manufacturers (p. 675).

As does Merton (1987), Fama and French (2007) point out that the simple CAPM fails to hold in this setting. Empirically, the implication is merely that there is no longer a reason for market CAPM alphas to be zero. Whereas Fama and French, in contrast to Merton, do not impose covariance restrictions, they ignore the commonalities in investor tastes that cause the CAPM to fail in a specific way and that may be captured by an additional systematic risk factor. As the direct distaste for assets follows a pattern and applies to a specific market segment, it is feasible to identify a systematic factor that not only describes but is sufficient for describing the way in which the CAPM fails to hold.

We follow the perspective of Fama and French (2007) to its logical conclusion when we identify distaste by particular investors for a specific group of assets. The resulting model is also formally similar to Merton (1987) with two crucial differences. First, market participation is sufficient to allow idiosyncratic risk to be diversified to the point where it has negligible pricing impact. Second, instead of the diagonal covariance structure in Merton, here, stock returns have a general covariance structure, which allows us to examine the importance of boycotting as a systematic risk variable. The resulting model setup resembles the segmented markets model of Errunza and Losq (1985) in that access to some markets is unavailable to a group of investors.[2]

A. The Theoretical Framework

The effect of social screens is incorporated in the model by assuming that a fraction of investors are self-restricted. These investors refuse to invest in assets whose underlying activities they find morally objectionable. An immediate implication is that two types of investors no longer have identical investment opportunity sets and choose different portfolios. The standard CAPM is no longer valid, and additional to the market factor, a second systematic risk factor emerges, which we refer to as the investor boycott risk factor or simply the boycott factor.

The formal model is presented in the Appendix. The introduction of a group of restricted investors (R-Investors) next to the traditional unrestricted investors (U-Investors) in an otherwise standard Sharpe–Lintner CAPM generates a 2-factor model that provides a specific boycott factor as well as implications concerning the determinants of the boycott risk premium and its effect on both sin and nonsin assets.

Figure 1 provides a synopsis of our model and its relation to Fama and French (2007). The portfolio frontier for the restricted investors (R-Frontier) lies entirely inside the unrestricted investors' frontier (U-Frontier). Hence, the tangency portfolio of the unrestricted investors (T_U) has a larger Sharpe ratio than the tangency portfolio of the restricted investors (T_R). Because all investors hold risky assets only in portfolios T_U and T_R, the market portfolio (M) must be a convex combination of the two, as shown. Thus, the Sharpe ratio of the market is below the maximum Sharpe ratio (SR_U). As we know from Roll (1977), the CAPM then fails so that assets have nonzero alphas when their returns are adjusted for market risk. This is essentially the reasoning in Fama and French (2007) (see their Figure 1). However, they stop short of explaining the levels of the alphas.

Also from Roll (1977), if we knew the tangency portfolio of the restricted investors the return on this portfolio would be a sufficient factor to explain the cross-section of the mean returns of all nonsin stocks; whereas the tangency portfolio of the unrestricted investors would explain the mean returns of both sin stocks and nonsin stocks. However, neither portfolio is directly observable. Unrestricted investors do not just hold the market portfolio but, to diminish the risk from sin stocks being over-represented in their portfolios (unrestricted investors as a group hold all sin stocks), hold fewer of those nonsin stocks positively correlated with sin stocks. Similarly, in equilibrium, the restricted investors do not just hold the portfolio of nonsin stocks, but hold more of those nonsin stocks positively correlated with the sin stocks they cannot hold.

Two alternative observable portfolios, the market portfolio M and the boycott portfolio B, are sufficient to attain the maximum Sharpe ratio SR_U at T_U (as shown in Figure 1) and, therefore, should price all assets.[3] These portfolios are

[2] Errunza and Losq (1985) consider international market segmentation where investors in one country are restricted from investing in the other country, but not the other way around. The differences between their model and ours are that they superimpose a factor structure on asset returns and assume constant absolute risk aversion, both of which we avoid.

[3] Equality of the maximum Sharpe ratios for the factor portfolio and for the asset portfolio is necessary and sufficient for the factors to price all assets. See, for instance, Grinblatt and Titman (1987).

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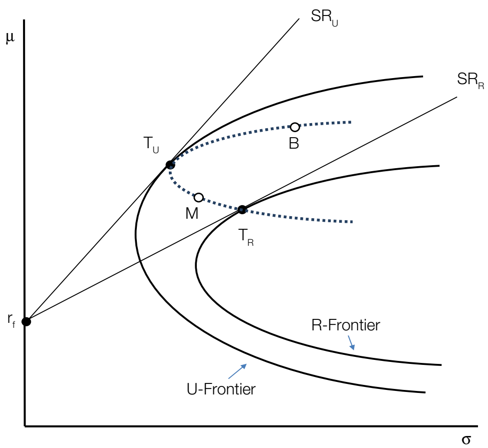
FIGURE 1
The Boycott and Market Factors

In Figure 1, the boycott portfolio B and the market portfolio M jointly represent the unobservable tangency portfolios of the restricted and unrestricted investor, and price all assets.



held in positive quantities by the unrestricted investors to reach their tangency portfolio (so that T_U lies in between M and B), whereas the restricted investors need only hold M and short B to reach their tangency portfolio (so that T_R lies to the right of M and the net holdings of the sin stocks are 0 at T_R). While T_R can be decomposed into M and B, both of these portfolios contain sin stocks, and the restricted investors, of course, would not hold these portfolios individually but just the combination with zero net holdings of sin stocks. The case in Figure 1 is typical in that the mean portfolio returns of the restricted investors are lower than those of the unrestricted ones. The mean return of the boycott portfolio must exceed the average market return, even though the market and boycott factor Sharpe ratios may be similar.

B. Implications and Intuition

1. Cross-Sectional Variation in Mean Returns

The formal model in the Appendix implies

$$\mu_i = \beta_{im}\mu_m + \beta_{ib}\mu_b. \tag{1}$$

The mean excess return of any asset i is determined by the asset's sensitivity to the market risk factor β_{im} as well as by its sensitivity to a boycott factor β_{ib}.[4] The

[4]The additional risk factor is unlikely to make a major difference in pricing all test assets: Portfolios selected by statistical criteria or typical firm characteristics, but not specifically along dimensions of social acceptability of the real activities of the underlying assets, will end up with very small boycott betas. Harvey, Liu, and Zhu (2016) expand on the issue of data snooping and publication biases to argue that the hurdle for accepting new risk factors should be high. While this is reasonable in general, the implication that finance research has uncovered too many risk factors is not warranted in the present context: simple nonhomogeneities across groups of investors are quite common (e.g., location, age, tastes, market access, tax circumstances, employment risk, family situation). Theoretically, these give

investor boycott factor in equation (A-11) is the zero investment return on the portfolio of all sin stocks hedged to remove the correlation of sin-stock returns with the remainder of the market. Borrowing the interpretation in Errunza and Losq (1985) translated to our alternative context, the boycott portfolio consists of two components: long, the value-weighted portfolio of sin stocks, and short, a hedge portfolio of nonsin stocks designed to offset as much as possible the risk of the sin portfolio. Thus, the boycott factor represents the risk characteristics of the part of the sin portfolio that is a distinct addition to the market, constituting a sufficient statistic of the risk diversification opportunities lacking for restricted investors.

The intuition for the two risk factors is that they capture the preferences and portfolio choices of two distinct groups of investors (restricted, R, and unrestricted, U). Theoretically, the (different) tangency portfolios for the representative investors of these two groups suffice as the risk factors. However, these portfolios are not observable. The unrestricted investors, for instance, do not simply hold the market portfolio but, in equilibrium as a group, hold all the sin stocks while reducing those holdings of nonsin stocks that have returns positively correlated with the sin stocks now overweighted in their portfolios relative to the market portfolio. The market portfolio and the boycott portfolio together represent the (unobservable) tangency portfolios of both investor types: the restricted investors hold the market portfolio and short the boycott portfolio (so that their net holdings of sin stocks are zero), while the tangency portfolio of the unrestricted investors consists of a mix of the market portfolio and the boycott portfolio.

In market equilibrium, a holder of the market portfolio or the boycott portfolio removes risk from the market and receives a systematic risk premium in return. Any asset is priced by how much risk it contributes to each of the two portfolios (β_{im}, β_{ib}) and by how much the market values the risk of each (μ_m, μ_b). One may take risks unrelated to these two portfolios, but this does not remove risk from the market so is not priced and does not affect mean returns.

2. Payoff Covariance

The price P_i of security i is the certainty-equivalent payoff discounted by the risk-free rate r_f:

$$(2) \qquad \begin{aligned} P_i &= \frac{\bar{x}_i - \gamma\, \Sigma_{im} - \delta\, \Sigma_{ib}}{1+r_f}, \\ \gamma &= \frac{1}{(q_R \bar{w}_R/\rho_R) + (q_U \bar{w}_U/\rho_U)}, \\ \delta &= \gamma \left(\frac{q_R \bar{w}_R/\rho_R}{q_U \bar{w}_U/\rho_U} \right), \end{aligned}$$

with q_R and q_U the number in each investor group, ρ_R and ρ_U the measures of relative risk aversion, and $\bar{w}_R$ and $\bar{w}_U$ the wealth of the representative investor in each group. Further, $\bar{x}_i$ is the expected payoff and Σ_{im} and Σ_{ib} are the payoff covariances of asset i with market portfolio payoffs and boycott portfolio payoffs,

rise to new risk factors along the lines of the model presented here. However, they are not likely to be pervasive, so careful construction of test assets is required to identify differences in exposure.

respectively. Since $\delta > 0$ (as long as restricted investors exist so that $q_R > 0$), equation (2) (Appendix equation (A-17)) shows that the price of boycott factor risk is positive and that the price of an asset is reduced based on its payoff covariance with the boycott factor. An asset's payoff covariance with the boycott portfolio return is typically, but not always, related to its sin content.

The lower the asset's price the higher its mean excess return, $\mu_i = (\bar{x}_i / P_i) - (1 + r_f)$. Thus, the existence of type-R investors raises the mean returns of assets correlated with the boycott factor. Boycotts increase the mean returns of assets positively correlated with the boycott factor regardless of whether they are sin stocks. The premium is not determined by whether the restricted investors boycott the asset but by how much its payoff covaries with the boycott factor. For instance, a sin firm and a nonsin firm may use the same inputs. If the boycott factor is also influenced by these input prices, the boycott has the effect of discouraging investment in the activities of both the sin stock and the nonsin stock.

If the goal of SRI is to increase the cost of capital of socially objectionable businesses and, consequently, reduce their presence, equations (1) and (2) suggest this goal is achievable. To the extent that the correlated assets are sin assets, the boycott accomplishes the restricted investors' desired objective to lower values of objectionable businesses, reducing their incentive to expand. Alternatively put, the lower prices for a given payoff distribution raise the expected returns and the cost of equity of these assets, reducing physical investment in related activities. Boycotting sin stocks is, thus, an effective but somewhat blunt instrument for discouraging morally or socially objectionable activity.

3. The Boycott Factor Risk Premium

Appendix equation (A-19) provides the boycott factor risk premium if both investor groups have equal relative risk aversion:

$$\mu_b = (1 + r_f) f \left(\frac{\theta_m \Sigma_b}{\bar{x}_b (1 - \mathrm{RWR})} \right), \tag{3}$$

$$\text{with} \quad f(\cdot) > 0 \quad \text{and} \quad f'(\cdot) > 0.$$

RWR is the relative wealth ratio, $\mathrm{RWR} \equiv q_R \bar{w}_R / q_M \bar{w}_M$, and θ_m is a measure of the market's average absolute risk aversion. It is easy to infer that μ_b is always positive and increases in RWR. The risk premium depends directly on the payoff variance of the boycott risk factor relative to the average payoff and the absolute risk aversion in the economy. RWR is total wealth invested by restricted investors over total market wealth. Intuitively, the pervasiveness of a boycott should affect the risk premium. If a larger fraction of investors participates in SRI, the risk of the sin portfolio is spread over fewer unrestricted investors who then require a larger boycott risk premium for holding these assets and others positively correlated with them.

4. Discussion

Unconstrained investors do not eliminate the sin premium, because, as a group, they hold all sin stocks so are overweighted in sin stocks relative to the market portfolio, to the point that changes in the holdings of these stocks affect portfolio risk, even given market risk and full diversification. In addition to the fact that (as of 1999) more than 10% of investment under management formally applies moral investment constraints, an unknown fraction of funds without formal constraints or screens as well as private investors are guided, at least in part, by such tastes. Thus, we argue that the group of restricted investors is large enough that arbitrage by unrestricted investors does not eliminate the return premium.

The reduced demand from the restricted investors lowers the price of boycotted stocks, which makes them more attractive for unrestricted investors. As these investors accumulate boycotted stocks in addition to their market holdings, the supplementary risk, as far as that unrelated to the market, starts to carry an additional risk premium in equilibrium necessary to entice the unrestricted investors to hold the surplus of boycotted stocks. Ultimately, underpricing resulting from the reduced investor base is only partially reversed by the actions of the unrestricted investors. The remaining underpricing covers the unrestricted investors for the extra risk not captured by the market factor.

The extra risk may be interpreted as a true investor boycott risk: returns on the group of sin stocks vary with investor tendencies to boycott socially undesirable activities. The number of restricted investors, and the extent of their sin-stock avoidance, changes with fluctuations in social norms and economic conditions. So, one way of viewing the boycott risk premium is as compensation for additional price risk resulting from sentiment swings regarding socially or morally objectionable ventures.

The boycott risk premium is mediated by the unrestricted investors' arbitrage, and this fact causes the risk premiums of individual assets to depend on the payoff distribution rather than just the sin content (zero–one in this simple model); it is the asset's covariance with the risk factor that matters rather than the asset's sin characteristic. The risk premium on the boycott beta increases when the number and market impact of self-restricted investors increases because a smaller group of arbitrageurs must absorb more boycotted shares, implying a further tilt in their portfolios toward boycotted stocks consistent with a larger risk premium beyond the regular market risk premium.

IV. From Theory to Measurement

A. Boycott Risk Factor

We test the 2-factor CAPM by finding appropriate factor proxies and specifying the test assets. The boycott factor return $r_b = (\mathbf{x} - \mathbf{p})' \bar{\mathbf{n}}_B / P_b$, with portfolio holdings $\bar{\mathbf{n}}_B$ given in Appendix equation (A-11), is the zero-investment return from holding the sin-stock portfolio and shorting a portfolio that accounts for the part of sin-stock payoffs already contained in the market. The resulting portfolio payoffs are the unique payoffs that the group of sin stocks contributes to the market. This portfolio can be well approximated by considering a zero-investment portfolio of sin stocks constructed to have no correlation with the rest of the market. To represent the theoretical concept of the value-weighted portfolio return of all stocks eschewed by restricted investors, we choose a value-weighted portfolio of the most unequivocally boycotted stocks, in the sense of being screened by many SRI funds.

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B. Test Assets

To work with test assets that display variation in the boycott betas, we rely on industry portfolios. The mean returns of industry portfolios have been hard to explain. Fama and French (1997) document the problems of their 3-factor model in accounting for differences in the cost of equity across industries. More recent research (e.g., Lewellen, Nagel, and Shanken (LNS) (2010) and Chou, Ho, and Ko (2012)) confirms that standard asset pricing models fail to explain cross-sectional differences in mean industry returns. The industry portfolios, moreover, are suitable test assets for our purposes, as they display significant variation in their real activities and so should differ along the dimension of moral and social desirability.

LNS (2010) emphasize that a good fit in multifactor models is superficial if the test assets have a strong factor structure. They propose augmentation of the popular 25 Fama–French size-sorted and book-to-market–sorted portfolios with additional test portfolios that have weaker factor structures, sorted, for example, by industry affiliation. Additionally, Lo and MacKinlay (2015) suggest that sorting on beta and other interesting characteristics known to be correlated with returns generates a data-snooping bias. This bias is exacerbated as more researchers sort on multiple characteristics (Conrad, Cooper, and Kaul (2003)). In contrast, sorting by industry affiliation is based on the nature of the firms' business and does not fall into the data-snooping trap.

Our model does not stipulate a new factor that prices all portfolios. The boycott factor is relevant only for pricing portfolios that differ systematically in their loadings on this factor. Typical well-diversified portfolios, be they sorted by beta, size, value, or momentum, for instance, are unlikely to display clear differences in their boycott factor loadings. However, most social screens (tobacco, gaming, alcohol) are industry based; accordingly, industry portfolios should display differences in exposure to the boycott factor. Industry portfolios, further, do not have a strong factor structure and generate considerable dispersion in average returns, presenting a challenge to any model. In fact, the test results of most existing asset pricing models do not hold up well when industry portfolios are involved (LNS (2010), Table 1).

C. Testable Implications

The cross-sectional evaluation criteria primarily follow LNS (2010). Our model predictions are the following. First, the sign of the coefficient estimates on the boycott beta should be positive, as predicted. Second, the risk premium magnitudes should be close to their average excess returns. Third, the difference between realized and predicted portfolio returns should be 0, on average. This is equivalent to verifying that the estimated second-pass intercept is 0 and may be interpreted as an indication that the risk-free asset is priced correctly. Fourth, by adding boycott factor betas in the second pass, the adjusted R^2 should show a significant improvement over competing models. Fifth, a proper model should yield the same risk premium for any set of test assets. Thus, in employing various test portfolios, we compare the magnitudes of the implied factor risk premiums.

Other implications of the model relate to the time-series properties of the boycott risk premium and the importance of return covariance rather than sin content per se. Sixth, the boycott risk premium should be positive but also vary over time depending on the economic importance of the group of responsible investors $q_R \bar{w}_R$ (the number of investors avoiding sin stocks times their average wealth), directly affecting the boycott risk premium in equation (3). Informal individual restraint in holding controversial stocks probably has existed for a long time, but explicit social screens were not prominent until the late 1990s. Therefore, the boycott risk premium is expected to be higher when a recent sample is used. Specifically, we hypothesize that the boycott risk premium should be increasing in the fraction of wealth invested by self-restricted investors (SRI investors).

Seventh, maintaining SRI principles has a cost (Adler and Kritzman (2008)) and may be viewed as a luxury good, which fewer individuals are likely to adopt and, to a lesser extent, if the economy is weak. Thus, if the economy is in a recession, we hypothesize that the boycott risk premium is lower: the boycott risk premium is procyclical. In contrast, conventionally, a weak economy implies a higher market risk premium, because investors are more risk averse in a recession (Chen (1991)). Nevertheless, the risk premium on sin stocks theoretically increases by less or decreases compared to nonsin stocks, causing the boycott risk premium to decrease. Eighth, from equation (2), higher payoff covariance between any asset and the boycott factor lowers the price of the asset and raises its expected return. The sin characteristic of the asset should correspond normally to the covariance with the boycott factor, but the covariance and not the sin content is the ultimate driver of the boycott risk premium.

V. Data

We admit all stocks listed on the New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and NASDAQ between Jan. 1963 and Dec. 2012, but exclude American depositary receipts, real estate investment trusts, closed-end funds, and primes and scores (share type codes 10 or 11). The primary test assets are the 30 (FF30) and 48 (FF48) value-weighted industry portfolios provided by Kenneth French. The market excess return and size, value, and momentum risk factors are also from this Web site (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/).

We employ two versions of the boycott factor: the narrow version based on all alcohol, coal, and tobacco firms; and the broad version based on all alcohol, fossil fuel, gaming, weapons, and tobacco firms. We identify the appropriate firms from historical Standard Industrial Classification (SIC) codes to guarantee that firms are classified in the appropriate industry at each time. We construct value-weighted boycott returns. Summary statistics for all of the risk factors are in the Internet Appendix (available at www.jfqa.org).

VI. Empirical Results

Table 4 presents the empirical comparison between the benchmark CAPM, Fama–French 3-factor model (FF3), and Carhart 4-factor model (FF4) against the boycott-factor-augmented versions of these models. Estimation employs the standard two-pass approach of Black, Jensen, and Scholes (1972) and Fama and MacBeth (1973). Our approach reflects the Black–Jensen–Scholes (BJS) method, commonly used since Fama and French (1992), in which factor loadings are estimated in the first pass using the full time series for each test asset, and their

TABLE 4
Model Comparison for the Boycott Factor

Table 4 presents the risk premiums estimated from the cross-sectional regressions of the CAPM, Boycott-CAPM, FF3, Boycott-FF3, FF4, and Boycott-FF4 models. The test assets are the FF30 and FF48 industry portfolios. The narrow boycott factor (BCTn) is the value-weighted return of the tobacco, alcohol, and coal industry firms. The broad boycott factor (BCTb) is the value-weighted return of the tobacco, alcohol, fossil, weapons, and gaming firms. The first-pass factor loadings are estimated based on sample period Jan. 1999–Dec. 2012, The BJS t-statistics are for the cross-sectional regression slopes with betas estimated over the full sample, and the GMM t-statistics are based on 12 monthly lags. R^2 is the adjusted R^2 for the cross-sectional fit between predicted and realized mean returns.

	Const.	MKT	SMB	HML	UMD	BCTn	R^2
Panel A. FF30 and Narrow Boycott Factor							
RP	0.415	0.111					−0.026
BJS-t	*1.315*	*0.236*					
GMM-t	*1.157*	*0.220*					
RP	−0.286	0.594				1.332	0.481
BJS-t	*−0.765*	*1.156*				*2.287*	
GMM-t	*−0.615*	*0.940*				*2.063*	
RP	0.584	−0.173	0.711	0.234			0.063
BJS-t	*1.657*	*−0.345*	*1.366*	*0.714*			
GMM-t	*1.778*	*−0.337*	*1.769*	*0.660*			
RP	−0.211	0.552	0.027	0.198		1.327	0.455
BJS-t	*−0.574*	*1.066*	*0.059*	*0.600*		*2.197*	
GMM-t	*−0.480*	*0.883*	*0.072*	*0.516*		*2.207*	
RP	0.301	0.159	0.583	0.356	1.761		0.420
BJS-t	*0.845*	*0.306*	*1.196*	*1.056*	*1.574*		
GMM-t	*0.731*	*0.260*	*1.419*	*0.950*	*1.895*		
RP	−0.148	0.542	0.155	0.287	0.855	1.045	0.557
BJS-t	*−0.438*	*1.054*	*0.332*	*0.841*	*0.829*	*2.088*	
GMM-t	*−0.385*	*0.876*	*0.369*	*0.745*	*0.848*	*2.294*	
Panel B. FF48 and Narrow Boycott Factor							
RP	0.479	0.068					−0.017
BJS-t	*1.523*	*0.150*					
GMM-t	*1.305*	*0.136*					
RP	−0.127	0.498				1.231	0.400
BJS-t	*−0.425*	*1.063*				*2.199*	
GMM-t	*−0.342*	*0.870*				*1.903*	
RP	0.372	0.061	0.221	0.213			0.035
BJS-t	*1.382*	*0.137*	*0.592*	*0.648*			
GMM-t	*1.466*	*0.124*	*0.841*	*0.571*			
RP	−0.039	0.426	0.126	0.173		1.270	0.415
BJS-t	*−0.140*	*0.933*	*0.343*	*0.524*		*2.294*	
GMM-t	*−0.112*	*0.746*	*0.459*	*0.452*		*2.267*	
RP	0.166	0.314	0.290	0.300	1.451		0.349
BJS-t	*0.598*	*0.678*	*0.757*	*0.905*	*1.479*		
GMM-t	*0.519*	*0.559*	*0.913*	*0.759*	*1.720*		
RP	−0.064	0.493	0.195	0.239	0.822	1.045	0.512
BJS-t	*−0.223*	*1.047*	*0.516*	*0.718*	*0.904*	*2.179*	
GMM-t	*−0.178*	*0.813*	*0.622*	*0.612*	*0.964*	*2.290*	
Panel C. FF30 and Broad Boycott Factor							
RP	0.119	0.161				1.080	0.682
BJS-t	*0.364*	*0.341*				*2.162*	
GMM-t	*0.284*	*0.295*				*1.993*	
RP	0.283	0.050	0.085	0.110		1.056	0.694
BJS-t	*0.833*	*0.101*	*0.187*	*0.330*		*2.080*	
GMM-t	*0.754*	*0.090*	*0.259*	*0.303*		*1.955*	
RP	0.313	−0.012	−0.008	0.042	−0.413	1.174	0.695
BJS-t	*0.878*	*−0.024*	*−0.018*	*0.123*	*−0.455*	*2.515*	
GMM-t	*0.746*	*−0.019*	*−0.022*	*0.126*	*−0.435*	*2.204*	

(continued on next page)

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TABLE 4 (continued)
Model Comparison for the Boycott Factor

	Const.	MKT	SMB	HML	UMD	BCTb	R^2
Panel D. FF48 and Broad Boycott Factor							
RP	0.102	0.213				1.066	0.644
BJS-t	*0.336*	*0.470*				*2.211*	
GMM-t	*0.254*	*0.395*				*1.996*	
RP	0.209	0.155	−0.045	0.116		1.113	0.675
BJS-t	*0.782*	*0.348*	*−0.123*	*0.349*		*2.236*	
GMM-t	*0.647*	*0.287*	*−0.169*	*0.305*		*2.049*	
RP	0.236	0.108	−0.096	0.084	−0.309	1.190	0.675
BJS-t	*0.856*	*0.237*	*−0.260*	*0.248*	*−0.374*	*2.492*	
GMM-t	*0.664*	*0.189*	*−0.340*	*0.226*	*−0.407*	*2.210*	

significance levels are from cross-sectional estimates for each time period using the constant factor loading estimates.[5]

A. The Boycott Risk Premium

We first consider the period since Jan. 1999 for which the boycott impact is likely to be clearest.[6] Consistent with the theory, the boycott factor is constructed as a zero-investment portfolio that is long sin stocks and short nonsin stocks and has all market correlation removed. As discussed, the boycott premium should be positive. The estimated boycott risk premium coefficient in Panel A of Table 4 confirms this prediction for the FF30 portfolios. The estimated monthly boycott risk premium is 1.33%, implying an annualized factor risk premium of around 16%, which is twice the market risk premium. This implies that stock returns are actually rewarded more for their associations with boycott risk than for market risk. This number is quite high but of similar magnitude as the excess sin returns found by FMO.

The magnitude of the boycott risk premium is similar to the average excess boycott factor return. The difference between the Boycott-CAPM implied risk premium and the average excess boycott factor is 0.56% per month, sizable but not of the order-of-magnitude difference that should raise a red flag, following LNS. The boycott factor is not only economically important, but is also statistically significant at the 5% level.

The empirically observed risk-adjusted sin-stock abnormal returns can be reconciled with the positive boycott risk premium. We infer from equation (1) that $\partial(\mu_i - \beta_{im}\mu_m)/\partial\beta_{ib} = \mu_b > 0$ for all i. The numerator is the risk-adjusted abnormal return (alpha) if the basic CAPM applies. In the investment world, this abnormal return is what a "vice fund" typically would brag about. If a vice fund only picks sin stocks, its fund index is highly correlated with the boycott factor, implying a high β_{ib}. Thus, a vice fund is expected to beat the market index, which has relatively low β_{mb}. The tobacco, alcohol, and coal industries are indeed sensitive

[5]The advantage of this method over the rolling estimates of the Fama–MacBeth approach is that factor loadings are estimated more efficiently if they are stationary. See Chan and Chen (1988) on this issue.

[6]The period Jan. 1999–Dec. 2012 includes 168 months. While SRI funds existed before 1999 (see Table 1), it is important to avoid including a transition period during which the boycott premium increased substantially, as this would imply falling prices, generating spuriously low average returns.

to the boycott factor, with respective boycott betas of 1.20, 0.33, and 0.64 (see the Internet Appendix for the boycott betas of all industries). If the excess returns are boycott risk adjusted, the abnormal return should disappear. The relatively small and insignificant intercept of −0.29% for the boycott-augmented CAPM in Table 4 supports this claim.

B. Model Comparisons

Panel A of Table 4 presents six models, of which three are boycott factor augmented. The Carhart model (FF4) has the highest R^2 among the three competing base models. Nevertheless, when the FF4 factors are augmented with the boycott factor, the adjusted R^2 improves by more than 10%. The most notable R^2 improvement is when the boycott factor is added to the CAPM model.[7] The boycott factor addition raises the R^2 by almost 50 percentage points. Similar improvement is observed when the boycott factor is added to the FF3 model. The boycott factor is significantly positive at the 5% level, and other factors are insignificant, reflecting the poor performance of traditional factor models in explaining mean returns across industry portfolios.

The improved explanatory power for expected return differences is accompanied by decreases in the intercepts. Whenever the boycott factor is included in a model, the second-pass intercept in absolute value is generally about 0.15% per month closer to 0. The actual decrease in the intercept is around 0.70% per month. This is approximately the amount that is elsewhere claimed as the sin stocks' abnormal returns (Salaber (2009) and FMO (2008)).

To visually compare the performance of our boycott-augmented specifications against the other models, we plot the fitted expected returns against the realized average monthly test portfolio returns (shown for the CAPM and FF4 models and their boycott-factor-augmented versions). When $\hat{\beta}_{im}$ alone is used, the predicted expected returns show virtually no dispersion, whereas the actual average returns vary substantially across the 30 industry portfolios (Graphs A and B of Figure 2). The performance improves when $\hat{\beta}_{ib}$ is added (Graphs C and D of Figure 2).

C. The Broad Boycott Factor and Other Sin Screens

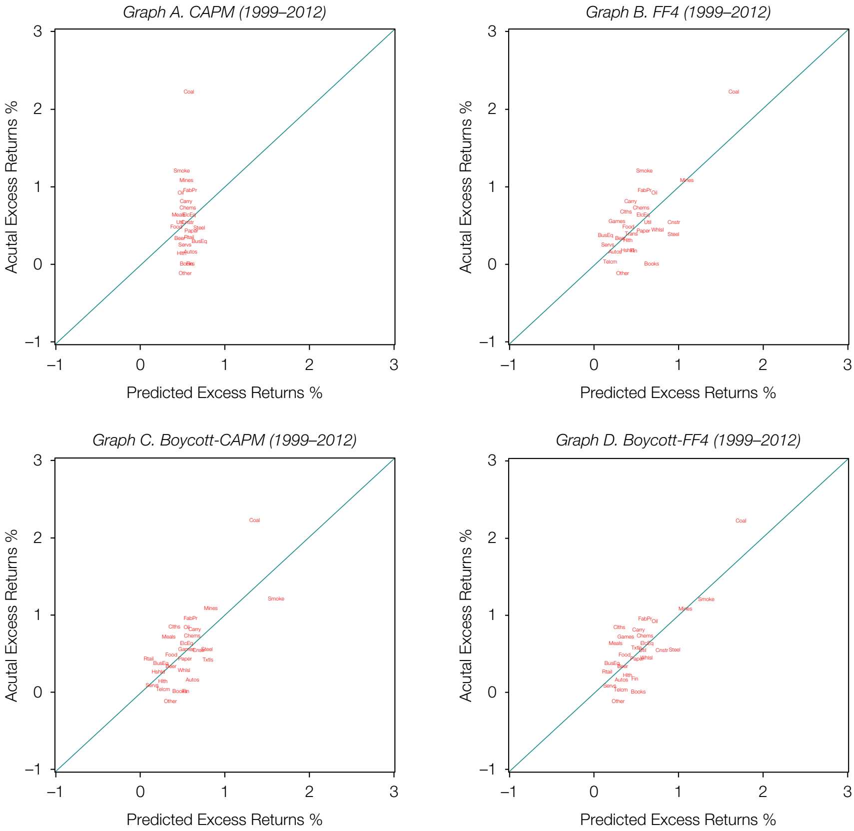
To examine the robustness of our results regarding the choice of boycotted industries, we consider the broader version of the boycott factor based on screening all alcohol, fossil fuel, gaming, weapons, and tobacco firms. Table 2 indicates that this adds up to an annual average number of around 200 boycotted firms. The broader boycott factor BCTb has correlation with the narrower boycott factor BCTn of 62% for Jan. 1999–Dec. 2012. Its mean return is 1.21% a month compared to 0.77% for BCTn.

[7]We also consider a conditional CAPM perspective intermediate between the CAPM and the boycott-augmented CAPM that could provide an interesting alternative explanation for the sin premium if the market betas of sin stocks were positively correlated over time with the market return. However, using the rolling beta approach in Petkova and Zhang (2005), we find that the time-varying betas for sin industries are either negatively correlated or uncorrelated with the market risk premium; accordingly, the conditional CAPM cannot explain the sin premium (results are in the Internet Appendix).

FIGURE 2

Actual versus Predicted Mean Returns

In Figure 2, we present the Fama–French 30 industry portfolio actual mean excess returns plotted against the mean excess returns predicted by the CAPM model (Graph A), the FF4/Carhart (1997) 4-factor model (Graph B), the Boycott-CAPM (Graph C), and the Boycott-FF4 model (Graph D) using monthly data for 1999–2012.



Panels C and D of Table 4 confirm that replacing the narrow boycott factor BCTn by the broad boycott factor BCTb has only a modest impact on the results for Jan. 1999–Dec. 2012. The magnitude and significance of the boycott risk premium are similar, as are the R^2 and intercept.[8]

D. Alternative Test Assets and Extended Time Series

If the portfolios have sufficient variation in their risk sensitivities, a good asset pricing model should yield the same risk premium regardless of the choice

[8]Results for all cases with the narrow and broad sin screens, as well as for intermediate choices of sin screens, are in the Internet Appendix and are quite similar for 1999–2012 and 1963–2012. The exception is the broad sin screen for 1963–2012 for which the boycott risk premium is smaller and not statistically significant for either the FF30 or FF48 test assets. However, the broad sin screen is problematic for the extended period because the gambling industry classification was not available through much of the period before 1999 and because of the changing nature of fossil fuel's image over the full period.

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of test portfolios. Panel B of Table 4 provides the implied risk premium for the FF48 industry returns as alternative test assets. The market and boycott risk premium magnitudes are consistent across the sets of test assets for all boycott-risk-enhanced specifications. For the FF48 industry case, the boycott risk premium is a bit smaller, 1.23% per month versus 1.33% per month for the FF30 industries. The boycott risk premiums are again significant at the 5% level. The intercepts are even closer to zero and the fit improves again dramatically when the boycott factor is added.

We further consider the traditional FF25 size- and value-sorted assets combined with the FF30 portfolios, as suggested by LNS, and the FF25 assets by themselves in the Internet Appendix. Because the FF25 assets are unlikely to have much dispersion in their boycott factor sensitivities, we expect these test portfolios to perform relatively poorly for our model. For the F55 case, the boycott risk premium continues to be significant (only marginally for the augmented CAPM), with high R^2 and similar magnitude. In the FF25 case, the Fama–French factors already explain a significant fraction of cross-sectional variation in mean returns; the boycott-augmented model, with correction for the Fama–French and Carhart factors, has a boycott risk premium with similar magnitude as the other test assets but not significant. A reason that even the FF25 test assets perform reasonably here may be that selecting on value causes boycotted stocks, having relatively low prices, to be put in high book-to-market portfolios. Thus, the value effect would arise here because value stocks tend to load more highly on the boycott factor. The Internet Appendix illustrates that, indeed, for every size class, high book-to-market portfolios load more on the boycott factor.

While SRI screens became economically significant in the late 1990s, it is probable that private investor boycotts, that is, a decreased appetite for morally or socially undesirable stocks in particular industries, had a market impact well before that time. To investigate this possibility, we extend our sample back to 1963. The Internet Appendix shows that the results are quite similar for all sets of portfolios, with sizable improvements in the R^2 when the boycott factor is added, significant boycott factor risk premiums (except for the FF25 assets), and small intercepts. The difference is that the boycott factor risk premiums, although again similar across specifications, are substantially smaller, about 40% of the size for the post-1999 period. The smaller boycott risk premium is consistent with our model given that, in the period before SRI became popular, a smaller fraction of investors (lower RWR) restricted itself from investing in sin stocks.[9]

E. Controlling for Industrywide Characteristics

Do the boycott risk premiums substitute for other known determinants of industry portfolio returns? Chou et al. (2012) find that, in addition to the value and size attributes, a major part of the variation in industry returns is explained

[9] As the sample here extends to more than 50 years, the betas are less likely stationary over the full period. The change in social norms and passage of legislation over time, in addition to basic changes in operations, may change investors' perception of particular industries. See, for instance, Liu, Lu, and Veenstra (2014). Thus, we also consider the Fama–MacBeth approach. The results are in the Internet Appendix and are similar to the BJS results.

by i) the industry concentration of Hou and Robinson (2006) and ii) the industry momentum of Moskowitz and Grinblatt (1999).

Considering industry concentration is important in the sin context, since FMO argue a common characteristic of sin industries is that they are less competitive. We follow Hou and Robinson in measuring industry concentration by the Herfindahl Index (HHI). We obtain the HHI for firm level sales (SALE from the Compustat North American Annual File) by industry and include it in our cross-sectional regressions.[10] Table 5 shows that adding the HHI has no noteworthy impact on the boycott risk premium.

Industry momentum is an important control; as Table 4 shows, even unspecified momentum is a powerful determinant of industry returns. Moskowitz and Grinblatt (1999) find that observed momentum effects for an individual asset are largely due to momentum throughout the asset's industry. If sin industries have larger momentum risk, this may explain the sin premium. Table 4 shows that including the Carhart momentum risk decreases the boycott risk premium, but it does so by less than a quarter of its value while retaining significance. As the Carhart factor reflects systematic momentum risk only for a 1-year lag and may not capture idiosyncratic momentum, we adopt the approach of Moskowitz and Grinblatt using their momentum lengths and industry-specific momentum metric

TABLE 5
Industry Controls

Table 5 shows the narrow boycott risk premium after controlling for industry concentration (the industry's Herfindahl Index (HHI)) and lagged 6-month industry momentum (IM_6). The risk premiums are estimated by BJS cross-sectional regressions with boycott factor loadings estimated from Jan. 1999 to Dec. 2012. Panel A (Panel B) reports the risk premiums based on the FF30 (FF48) industry portfolios. The *t*-statistics are in italics.

Panel A. FF30							*Panel B. FF48*						
MKT	SMB	HML	UMD	BCTn	HHI	IM_6	MKT	SMB	HML	UMD	BCTn	HHI	IM_6
0.121					1.421		0.129					0.740	
0.257					*1.728*		*0.286*					*1.519*	
0.653				1.513	−0.861		0.510				1.176	0.377	
1.208				*2.104*	*−0.808*		*1.088*				*2.097*	*0.802*	
0.220	0.480	0.284	1.808		1.297		0.406	0.219	0.244	1.488		0.744	
0.429	*1.011*	*0.838*	*1.603*		*1.683*		*0.870*	*0.573*	*0.738*	*1.510*		*1.696*	
0.534	0.161	0.283	0.889	1.015	0.107		0.551	0.147	0.201	0.897	0.980	0.576	
1.031	*0.343*	*0.834*	*0.844*	*1.819*	*0.146*		*1.165*	*0.390*	*0.604*	*0.978*	*2.032*	*1.304*	
0.026					1.416	0.044	0.031					0.642	0.034
0.057					*1.774*	*1.503*	*0.071*					*1.354*	*1.438*
0.483				1.424	−0.631	0.043	0.358				1.193	0.317	0.034
0.941				*2.000*	*−0.630*	*1.733*	*0.782*				*2.083*	*0.680*	*1.516*
0.136	0.410	0.390	1.719		1.146	0.025	0.269	0.227	0.268	1.424		0.575	0.021
0.266	*0.845*	*1.067*	*1.530*		*1.499*	*1.107*	*0.577*	*0.595*	*0.797*	*1.463*		*1.294*	*1.179*
0.396	0.225	0.384	1.090	0.978	0.215	0.027	0.398	0.187	0.233	0.868	1.051	0.401	0.021
0.772	*0.457*	*1.061*	*1.031*	*1.700*	*0.286*	*1.237*	*0.840*	*0.492*	*0.693*	*0.952*	*2.104*	*0.909*	*1.169*

[10]We note that our industry classification differs from that in Hou and Robinson (2006). Likely owing to the alternate industry grouping, our results are opposite to those in Hou and Robinson when the HHI is included by itself: a higher HHI (more concentration), instead of lowering, raises industry returns, and this effect is marginally significant. Once we add the boycott risk sensitivities the HII effect becomes insignificant and sometimes reverses. This occurs probably because boycott risk sensitivities (related to sin content) and concentration are positively correlated, since sin firms face less competition as FMO suggest. Including the HII somewhat strengthens the boycott premium (likely because it removes the confounding impact of the higher concentration of typical sin industries).

(1-, 3-, 6-, 9-, and 12-month lagged industry excess returns). The Internet Appendix provides the results for all these lags. In Table 5, we consider only the most significant 6-month lag. For 1999–2012, the boycott risk premium stays robustly significant and of similar size after including industry momentum for each lag, for the FF30 and FF48 test assets. The Internet Appendix also provides the results for the full period (1963–2012 and 1969–2012 for the FF30 and FF48 test assets, respectively). Again, the boycott risk premium significance and size are not significantly changed for the FF30 test assets and all momentum lags. The exception is the 1-month momentum lag for the FF30 assets where the boycott risk premium is reduced and now only marginally significant. For the FF48 assets, the size of the boycott risk premium is reduced in the full sample and becomes insignificant in three out of five cases (the 1-, 3-, and 6-month momentum lags).[11]

VII. Alternative Explanations

We compare our systematic investor boycott risk view of the sin premium to alternative explanations that sin firms i) face more litigation risk (FMO (2008)), ii) are less liquid (HK (2009)), or iii) are neglected (Fang and Peress (2009) and HK (2009)).

A. Litigation Risk or Systematic Boycott Risk

The abnormal returns observed for sin firms in previous research may merely be compensation for the idiosyncratic risk of operating in a legally hostile environment that matters in a Merton (1987) world. To rule out the possibility that cross-sectional returns are driven by the idiosyncratic risk of litigation issues associated with each industry, we construct a variable LTG as a proxy for litigation risk.[12]

To test the influence of the litigation "characteristic," we adopt the methodology employed by Jagannathan and Wang (1996), (1998). We include LTG as a proxy for a characteristic: the degree of sinfulness of an industry as revealed through litigation. If our boycott factor is indeed a systematic risk factor, this additional proxy for sinfulness or boycott risk should not explain any residual variation in average returns across the industry portfolios.

Before proceeding to test if the boycott factor is a proper risk factor, we need to validate our proxy. Table 6 shows that the litigation variable is both economically and statistically significant. For the FF30 and FF48 portfolios as test assets, a 100% increase in the industry's proportional number of lawsuits increases average monthly portfolio returns by 5.5% and 4.3%, respectively. Including the proxy also raises the cross-sectional R^2 about 10% in both cases and significantly reduces the pricing errors. Our litigation-based proxy, LTG, appears to be a good indicator for the industry characteristics associated with the sin premium.

[11]Reduced significance might be attributed to the fact that, for industry portfolios (as opposed to individual firms), the industry momentum factor (lagged industry returns drawn from the same distribution as current industry returns) is spuriously correlated with current industry returns.

[12]For each FF30 or FF48 industry, we count the total nonmissing number of after-tax settlement entries (Annual Item SETA in Compustat North American), both Litigation and Insurance, and scale them by the total number of firm-year observations for this industry to obtain LTG.

TABLE 6
Alternative Explanations

In Table 6, the risk premiums are for the narrow boycott factor in variants with FF4 (Carhart) factors and the Pástor–Stambaugh (2003) systematic liquidity factor (SLQ), together with industry characteristics litigation (LTG), neglect (NGL), and idiosyncratic liquidity (ILQ). The estimates are from BJS cross-sectional regressions with factor loadings from Jan. 1999–Dec. 2012. R^2 is the adjusted R^2 for the cross-sectional fit between predicted and realized mean returns. The t-statistics are in italics. Panels A and B show these results for the FF30 and FF48 test assets, respectively.

Panel A. FF30

	MKT	SMB	HML	UMD	BCTn	LTG	NGL	ILQ	SLQ	R^2
RP	0.065					5.483				0.083
t-stat.	*0.139*					*2.053*				
RP	0.573				1.291	0.704				0.463
t-stat.	*1.095*				*2.135*	*0.321*				
RP	0.142						−0.177			0.153
t-stat.	*0.302*						*−1.992*			
RP	0.607				1.375		0.014			0.462
t-stat.	*1.180*				*2.184*		*0.195*			
RP	0.102							−0.306		0.024
t-stat.	*0.218*							*−1.180*		
RP	0.575				1.288			−0.084		0.467
t-stat.	*1.140*				*2.291*			*−0.360*		
RP	−0.156								1.453	0.560
t-stat.	*−0.333*								*1.933*	
RP	0.239				0.957				1.146	0.759
t-stat.	*0.510*				*1.959*				*1.612*	
RP	−0.142					2.693	−0.066	0.025	1.332	0.604
t-stat.	*−0.301*					*1.168*	*−0.850*	*0.114*	*1.805*	
RP	0.238				1.041	1.519	0.044	0.119	1.221	0.747
t-stat.	*0.505*				*1.970*	*0.651*	*0.649*	*0.561*	*1.693*	
RP	−0.216	0.418	0.139	0.746		3.382	−0.024	0.058	1.067	0.604
t-stat.	*−0.425*	*0.860*	*0.423*	*0.796*		*1.378*	*−0.378*	*0.310*	*1.666*	
RP	0.139	0.141	0.028	−0.065	1.052	1.587	0.047	0.194	1.319	0.733
t-stat.	*0.280*	*0.297*	*0.083*	*−0.074*	*2.026*	*0.664*	*0.745*	*1.098*	*2.054*	

Panel B. FF48

	MKT	SMB	HML	UMD	BCTn	LTG	NGL	ILQ	SLQ	R^2
RP	0.087					4.297				0.096
t-stat.	*0.192*					*2.030*				
RP	0.470				1.358	1.967				0.412
t-stat.	*1.004*				*2.272*	*1.016*				
RP	0.107						−0.128			0.091
t-stat.	*0.236*						*−1.880*			
RP	0.549				1.347		−0.016			0.441
t-stat.	*1.022*				*2.191*		*−0.288*			
RP	0.098							−0.216		0.033
t-stat.	*0.217*							*−1.258*		
RP	0.559				1.358			−0.025		0.439
t-stat.	*1.080*				*2.483*			*−0.103*		
RP	−0.119								1.314	0.444
t-stat.	*−0.261*								*1.902*	
RP	0.237				0.942				1.064	0.638
t-stat.	*0.532*				*1.856*				*1.598*	
RP	−0.036					2.453	−0.082	−0.047	1.132	0.551
t-stat.	*−0.078*					*1.059*	*−1.070*	*−0.283*	*1.674*	
RP	0.203				0.765	1.823	−0.032	−0.012	1.033	0.650
t-stat.	*0.459*				*1.488*	*0.809*	*−0.427*	*−0.070*	*1.568*	
RP	0.145	0.021	0.151	0.564		2.201	−0.074	−0.052	0.840	0.570
t-stat.	*0.330*	*0.056*	*0.456*	*0.669*		*0.990*	*−1.080*	*−0.367*	*1.384*	
RP	0.241	0.077	0.078	0.330	0.781	2.057	−0.031	0.026	0.903	0.643
t-stat.	*0.552*	*0.200*	*0.235*	*0.399*	*1.591*	*0.927*	*−0.427*	*0.179*	*1.478*	

When the boycott factor loadings implied by equation (1) are added in Table 6, the t-values for the LTG coefficients drop significantly from 2.05 to 0.32 for the FF30 portfolios and from 2.03 to 1.02 for the FF48 portfolios. The magnitudes of the characteristic coefficients also decrease substantially. In contrast, the boycott factor risk premiums remain economically and statistically significant. The magnitudes and t-values for $\hat{\beta}_{ib}$ are similar to before LTG was added. Therefore, we rule out that average industry portfolio returns are explained by litigation-risk-type characteristics instead of our systematic boycott risk factor.

B. Liquidity or Systematic Boycott Risk

1. Idiosyncratic Liquidity Risk

The boycott risk premium may be a liquidity-related phenomenon. Boycotted stocks have a smaller investor base: Restricted investors do not hold these stocks. We argue that the reduced investor base causes arbitrageurs to hold these stocks in excess and that it is their concomitant increase in portfolio risk that generates the boycott risk premium. However, an alternative explanation is that the reduced investor base implies that in a liquidity-driven sell situation, boycotted stocks cannot be moved, unless there is a ready unrestricted investor.

Investor-boycotted stocks may be less liquid for other reasons. Advertising to attract additional investors is difficult for these firms. The "headline risk" proposed by FMO (2008) refers to the risk that news stories about a controversial business, true or not, will be interpreted as bad. Norm-violating firms are then better off operating under the social radar. Furthermore, HK (2009) find that sin firms have fewer institutional investors compared to regular firms. These findings suggest potentially less liquidity for boycotted stocks.

To examine the liquidity perspective against our risk perspective, we follow Amihud (2002) in constructing a measure of illiquidity from the asset's return impact per dollar of trading volume. If the lack of a broad investment base represents an arbitrage opportunity, it may persist only if large impediments prevent unrestricted investors from trading on it (see Fang and Peress (2009)). Illiquidity might be a friction that prevents these investors from arbitraging the difference. The sin premium may be compensation for illiquidity instead of the boycott premium claimed in Section VI.

To rule out the illiquidity premium explanation, we use Amihud's (2002) illiquidity measure as a portfolio characteristic. In Table 6, when we incorporate this measure, ILQ, as an industry characteristic in the second pass, the implied illiquidity premium is statistically insignificant and negative rather than positive as expected. This suggests that the industry-specific illiquidity is not compensated and certainly cannot explain the boycott premium. More pertinently, Table 6 shows that including the illiquidity characteristic does not affect the boycott risk premium.

2. Systematic Liquidity Risk

An alternative mechanism by which liquidity may affect returns is via the Pástor–Stambaugh (2003) aggregate liquidity risk factor. Boycotted firms, being presumably less liquid, may have higher sensitivity to a market liquidity factor. Stocks whose highest returns occur when market liquidity is high will require

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higher rates of return. The second-pass results in Table 6 show that the systematic liquidity factor (SLQ) has significant explanatory power for the FF30 and FF48 test assets. However, the boycott factor continues to have significant additional explanatory power for these test assets. Neither the sensitivity to liquidity nor the boycott factor sensitivity muffles the importance of the other. When one factor is added to the model, the economic importance of the other factor decreases somewhat. The addition of the boycott factor dramatically lowers the intercept, which is not the case when the liquidity factor is added. Although market liquidity risk is separately relevant in pricing the industry portfolios, it does not diminish the importance of boycott risk.

C. Neglect Effect or Systematic Boycott Risk

Sin firms may be neglected by investors for reasons not directly related to their sin content. First, Barber and Odean (2008) show that investors are net buyers of attention-grabbing stocks. However, sin stocks often avoid attention due to headline risk: Under constant public scrutiny, news is almost always interpreted as bad for these firms. Second, HK (2009) find that sin stocks are followed by fewer analysts. In Merton's (1987) view, the resulting poor information availability for these firms implies they will not be in the subset of stocks that investors choose to follow.

Arbel, Carvell, and Strebel (1983) find that neglected firms have positive abnormal returns after the usual risk adjustment. Hong, Lim, and Stein (2000) find that stocks lightly covered by analysts earn higher future returns, while Fang and Peress (2009) find that stocks lightly covered by the media earn higher future returns. It is then possible that it is the neglect following from light analyst and media coverage of sin firms rather than their sin content per se that is responsible for the sin premium. To rule out this possibility, we construct analyst coverage as a proxy for the neglect effect.

For each industry, we take the log of the number of analysts in the industry scaled by the industry's market capitalization. We use this ratio as a proxy for analyst coverage.[13] The top three least covered industries among the FF30 industries are tobacco, coal, and alcohol (not shown). The overall ranking by analyst coverage is consistent with the results reported by HK (2009) that sin industries are less covered by financial analysts.

Table 6 shows that our analyst coverage ratio is a good proxy for the neglect effect. The significant negative coefficient on the coverage ratio in Table 6 is consistent with HK: The neglect issue is alleviated by analyst coverage; expected payoffs are not discounted as much as when there is zero coverage. The −0.177 coefficient means that a 1% increase in the number of analysts (per dollar market cap) decreases expected return in this industry by 0.177% per month. This number is statistically significant, suggesting that the neglect effect affects equity pricing.

However, when we add the boycott factor loadings to the CAPM along with the coverage ratio, the boycott factor dominates. Analyst coverage no longer af-

[13] We follow Hong, Lim, and Stein (2000) in constructing this analyst coverage proxy using the Institutional Brokers' Estimate System History Summary File (STATSUM_EPSUS) and the CRSP Monthly Stock File.

fects the required return. The significance and magnitudes of the boycott risk premium continue to be quite consistent across all specifications. This suggests that our boycott factor is indeed a systematic risk factor, overshadowing the characteristic-based risk source suggested by HK ((2009), p. 17).

Table 6 also presents the result of including each characteristic (LTG, NGL, and ILQ) and systematic liquidity (SLQ) jointly with the boycott risk factor and the standard systematic risk factors. The characteristics are insignificant in all cases. For the FF30 test assets, the boycott risk premium again keeps its magnitude and significance. Regarding the FF48 assets, the magnitude of the boycott risk premium is somewhat reduced and marginally significant for the narrow boycott factor. In the Internet Appendix, we also present alternative model results for the broad boycott factor. These are very similar except that the boycott risk premium is significant (instead of marginally significant) for the FF48 asset case. Overall the characteristics used in the previous explanations of the sin premium appear to simply proxy for boycott risk sensitivities.

VIII. Validating the Boycott Premium as a Systematic Risk Premium

We examine implications beyond explanatory power for cross-sectional mean returns. First, return premiums must be related more directly to payoff covariances than to sin characteristics. Second, fluctuations in the boycott premium should be consistent with the theory.

A. Portfolios Sorted by Boycott Factor Loadings

The theory implies that investor boycotts can increase investment hurdle rates (required returns) of targeted firms, but they can also affect the hurdle rates of firms whose returns happen to be statistically positively correlated with targeted firms. Therefore, any stocks without the sin characteristic that nonetheless have similar exposure to the boycott factor (maybe because of shared inputs or other unpriced common factors) ought to have similar returns. To explicitly illustrate this implication, we construct a portfolio of stocks that are clearly nonsin. We employ all sin criteria used by either practitioners or researchers and consider the union of these criteria. The advantage of including all these criteria is that we avoid a gray area, so that remaining stocks that are statistically positively correlated with the boycott factor are clearly not sin stocks.

We remove all stocks that, either by SIC or NAICS code, are classified in any 1 of the 8 screens listed in Table 3. Additionally, we identify the industry classifications of the stocks that were at any point in time included in the vice fund.[14] For example, Playboy is part of the vice fund stock holdings, and the SIC code of Playboy, 2721, is the industry classification. We consider the entire set of firms so classified as sin firms for this purpose.

Our "sin net" captures 2,766 sin firms out of the 9,912 firms that are admitted into our data set. Approximately 28% of the firms are filtered out by this exten-

[14]Vice fund data are from the Thomson Reuters Mutual Fund Holdings (S12 file, fund identifier 7386). The vice fund data start from 2002 and provide updated holdings on a quarterly basis.

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sive sin screen. We obtain boycott factor loadings for the remaining stocks (with superscript N indicating nonsin stocks).

$$(4)\quad r_{it}^{N} \quad = \quad \alpha_i + \beta_{1i}\text{MKT}_t + \beta_{2i}\text{SMB}_t + \beta_{3i}\text{HML}_t + \beta_{4i}\text{UMD}_t + \beta_{5i} r_{bt} + \varepsilon_{it}.$$

Nonsin stocks are ranked by the sin factor loadings generated from equation (4). These stocks are assigned to five portfolios based on their individual rankings. The equal-weighted monthly mean excess returns are reported in Panel A of Table 7 for each of the five portfolios of nonsin stocks and also for five portfolios of sin stocks from the narrow boycott factor, similarly sorted by their boycott betas. In general, stocks more susceptible to the boycott factor have relatively higher monthly excess returns whether they are sin stocks or nonsin stocks. Predictably, this pattern is not as strong as when sin stocks are included, since we removed most of the stocks with high boycott factor loadings. This is clear by comparing in Panel A the boycott betas for the sin stocks (average boycott beta of 0.60) and the nonsin stocks (average boycott beta −0.05).

We then construct a zero-investment portfolio p by taking a long position in the quintile of nonsin stocks that are most positively correlated with the boycott factor and a short position in the quintile of nonsin stocks that are least positively correlated with the boycott factor. The zero-investment portfolio is regressed on the FF3 or FF4 (Carhart) risk factors:

$$(5)\quad r_{pt}^{N} \quad = \quad \alpha_p + \beta_{1p}\text{MKT}_t + \beta_{2p}\text{SMB}_t + \beta_{3p}\text{HML}_t + \beta_{4p}\text{UMD}_t + \varepsilon_{pt}.$$

TABLE 7

Excess Returns of Portfolios Sorted by Boycott Factor Loadings

In Panel A of Table 7, beginning with all NYSE/AMEX/NASDAQ stocks, we remove stocks with any sin characteristics: those by SIC or NAICS code, classified under the 8 screens in Table 3, as well as the industry classifications of the stocks that were at any time included in the vice fund. The remaining stocks are sorted by the boycott factor loadings obtained by regressing individual nonsin stock returns on FF3 factors or FF4 factors plus the narrow boycott factor for Jan. 1999–Dec. 2012. All nonsin stocks are assigned to 5 portfolios by boycott factor loadings. Similarly, all sin stocks in the (narrow) boycott factor are assigned to 5 portfolios by boycott factor loadings. We present the boycott betas from either the augmented FF3 or FF4 model (BCT β) and the equal-weighted average monthly excess returns of each portfolio (FF3 or FF4). In Panel B, the risk-adjusted return of a zero-investment strategy using only nonsin stocks (using the criteria described in Panel A) is obtained based on equation (5). The time-series regression result is reported. The dependent variable is the return on an equal-weighted portfolio, with long being the most boycott-sensitive and short the least boycott-sensitive nonsin stocks.

Panel A. Risk-Adjusted Returns of Sin- and Nonsin-Stock Quintiles Sorted by BCT Loadings

BCT-Loading Ranked	Sin Stocks				Nonsin Stocks			
	BCT β	FF3	BCT β	FF4	BCT β	FF3	BCT β	FF4
Average	0.569	1.074	0.602	1.108	−0.058	0.840	−0.054	0.833
1 (Least)	−0.676	0.904	−0.585	1.132	−1.042	0.515	−1.041	0.405
2	0.031	0.761	0.082	0.877	−0.233	0.822	−0.231	0.815
3	0.300	0.998	0.302	0.827	−0.007	0.949	−0.006	0.994
4	0.848	1.291	0.851	1.291	0.191	0.972	0.188	0.963
5 (Most)	2.341	1.415	2.361	1.415	0.800	0.943	0.819	0.986
5−1	3.017	0.511	2.946	0.283	1.842	0.428	1.860	0.581

Panel B. Risk-Adjusted Returns for Nonsin Stocks with Large BCT Loadings

Factors	Estimate	*t*-Stat.	Estimate	*t*-Stat.
Alpha	0.445	1.626	0.420	1.596
MKT	−0.169	−2.825	−0.056	−0.900
SMB	−0.272	−3.390	−0.271	−3.463
HML	0.009	0.114	0.090	1.155
UMD			0.130	2.768

The results in Panel B of Table 7 suggest that stocks with clearly no sin characteristics nevertheless may earn a boycott risk premium if their returns happen to be correlated with sin stocks so that they have positive sensitivity to the boycott risk factor. The alpha is fairly sizable at around 5% annualized but is only marginally significant.

B. Payoff Covariance or Sin Characteristic

Looking directly at payoff covariance may provide an indication that it is not the sin character but rather covariance with the boycott factor that drives average returns. To this end, we identify the systematic component of an asset's variation in earnings:

$$X_{it} = a_i + b_{iM} X_{Mt} + b_{iB} X_{Bt} + \varepsilon_{it}, \quad (6)$$

where X_{it} represents the payoffs (we use earnings before extraordinary items, item IB from the Compustat North American Merged Fundamental Annual File data) of firm i at time t, and $X_{Mt}$and X_{Bt} represent market and boycott factor payoffs, respectively. The coefficient b_{iB} reflects asset i's systematic risk stemming from covariance with aggregate boycott factor payoffs. If estimated boycott betas $\hat{\beta}_{iB}$ are measures of an asset's underlying systematic risk, they should be directly related to the estimated boycott payoff covariances $\hat{b}_{iB}$:

$$\hat{\beta}_{iB} = \gamma_0 + \gamma_1 \hat{b}_{iB} + \gamma_2 C_i + \eta_i, \quad (7)$$

with $\gamma_1 > 0$ and little additional explanatory power for characteristics variables C_i (i.e., $\gamma_2 = 0$).

The boycott betas and boycott payoff covariances (the latter obtained as the b_{iB} estimates from equation (6)) are significantly positively correlated as expected (the numbers are in the Internet Appendix for all industries). For the FF30 assets, the correlation is 0.750 for the recent sample period (starting 1999) and 0.903 for the full period (starting 1963); for the FF48 assets, the correlation is 0.661 for the recent period (starting 1999) and 0.837 for the full period (starting 1969 for the 48 industries).

Table 8 provides the regression results for equation (7). For both the FF30 and FF48 test assets in the 1999–2012 period, the γ_1 estimates are positive and strongly significant (results for 1963–2012 are similar, as shown in the Internet Appendix). In addition, once payoff covariances are taken into account, the characteristics variables (neglect, idiosyncratic liquidity, and litigation) and industry controls (only concentration here since the average momentum by industry is almost perfectly correlated with each industry's average return) have little explanatory power for the boycott betas.[15]

[15]Replacing the boycott beta by the boycott payoff covariance in the models in Table 4 should work if it is truly the fundamental boycott risk that is priced. However, asset prices respond not just to current earnings but also to information about future earnings. The latter fundamental is better captured by the boycott beta than by the payoff covariance. The Internet Appendix shows that the boycott payoff covariance is priced significantly (for the FF30 and FF48 test assets over the post-1990 and post-1963 test periods) but does not perform as well as the boycott beta, as its contribution to the explanation of average industry returns (cross-sectional R^2) is substantially lower.

TABLE 8

Boycott Loadings and Payoffs

In Table 8, we show the relationship between industry portfolios' estimated boycott factor loadings $\hat{\beta}_{iB}$ and their estimated earning sensitivities $\hat{b}_{iB}$ to the aggregate earnings of boycotted industries: $\hat{\beta}_{iB} = \gamma_0 + \gamma_1 \hat{b}_{iB} + \gamma_2 C_i + \eta_i$, where C_i controls for industry-specific characteristics. The $\hat{\beta}_{iB}$ and $\hat{b}_{iB}$ are provided in the Internet Appendix. The control variables are litigation (LTG), neglect (NGL), idiosyncratic liquidity (ILQ), the Pástor–Stambaugh (2003) systematic liquidity factor (SLQ), and the Herfindahl index (HHI) based on sales.

	Panel A. FF30 (1999–2012)							*Panel B. FF48 (1999–2012)*						
$\hat{\beta}_{iB}$	LTG	NGL	ILQ	SLQ	HHI	$\hat{b}_{iB}$	R^2	LTG	NGL	ILQ	SLQ	HHI	$\hat{b}_{iB}$	R^2
Estim	3.179						0.090	2.266						0.072
t-stat.	*1.963*							*2.162*						
Estim		−0.146					0.334		−0.104					0.217
t-stat.		*−3.940*							*−3.740*					
Estim			−0.163				0.027			−0.106				0.023
t-stat.			*−1.350*							*−1.440*				
Estim				0.217			0.002				0.169			−0.001
t-stat.				*1.025*							*0.978*			
Estim					1.555		0.223					0.494		0.065
t-stat.					*3.053*							*2.062*		
Estim						0.294	0.564						0.283	0.437
t-stat.						*6.210*							*6.127*	
Estim	0.301	−0.116	−0.141	−0.008	0.395		0.286	0.717	−0.117	−0.117	−0.054	−0.178		0.217
t-stat.	*0.181*	*−1.650*	*−1.230*	*−0.037*	*0.469*			*0.617*	*−2.950*	*−1.600*	*−0.316*	*−0.560*		
Estim	−0.356	−0.092	0.079	0.306	−0.596	0.312	0.687	0.497	−0.072	−0.009	0.130	−0.168	0.249	0.503
t-stat.	*−0.320*	*−1.970*	*0.919*	*1.979*	*−1.020*	*5.625*		*0.535*	*−2.190*	*−0.147*	*0.927*	*−0.663*	*5.014*	

C. The Boycott Risk Premium

The boycott risk premium should vary with the economic clout of self-restricted investors. We consider the implications of this connection. First, as boycotting sin stocks becomes more popular with investors, the boycott premium should increase. However, the willingness of investors to forgo investment returns may vary endogenously over the business cycle. Thus, second, since responsible investing is costly (Adler and Kritzman (2008)), if responsible investing is a luxury good, the extent of it should decrease in a recession, causing a decrease in the boycott risk premium.

Accordingly, we estimate

$$\text{BCT}_t = c_0 + c_1 \text{YMP}_{t-1} + c_2 \text{RWR}_{t-1} + e_t. \tag{8}$$

BCT_t is the boycott risk premium estimated for each quarter from the second-pass cross-sectional regressions. YMP_{t-1} captures the state of the economy, aggregated output relative to potential, for which a low value designates a recession. If responsible investing is a luxury good, then we expect $c_1 > 0$. The aggregate preference for responsible investing is captured by the restricted wealth ratio, RWR_{t-1}. More interest in responsible investing should imply a higher boycott premium: $c_2 > 0$.

We measure YMP_{t-1} as the previous quarter's log aggregate output minus log potential output, both available from the St. Louis Fed (seasonally adjusted real gross domestic product (GDP), GDPC1, and potential output (GDPPOT)). We measure RWR_{t-1} as the ratio of investment in mutual funds that hold *no sin stocks* in the previous period to total investment in mutual funds. The Thomson Reuters S12 data identify mutual fund holdings of sin stocks starting in 1980, thus restricting our sample period from 1980Q1 to 2012Q4. For any mutual fund with reporting date during a particular quarter, we identify whether it holds any of the sin stocks in our narrow boycott factor. If it holds sin stocks, it is classified as unrestricted; if it holds no sin stocks, it is classified as restricted (for the particular quarter). This measure is lagged by one reporting period, which is two quarters.[16]

Figure 3 illustrates the pattern of comovement of BCT_t and RWR_t over the business cycle. BCT_t has a quarterly mean return of 1.63%, varying from a high of 74.6% to a low of −19.7%, and a standard deviation of 10.7%. RWR_t has a mean level of 44.7%, varying between 13.6% and 84.6%, with a standard deviation of 12.3%. Since BCT_t, in particular, is a highly volatile series, and we focus on required returns, we show a (1-year) moving average of both variables. Providing a more precise timing of events is difficult, because mutual funds report biannually so that changes in restricted wealth are hard to pinpoint.

Comparing the 1-year moving average of the boycott risk premium with the 1-year moving average of the restricted wealth ratio lagged by one reporting period (two quarters), the series move together quite closely with a correlation coefficient of 0.36 that is statistically highly significant. Figure 3 captures the steep

FIGURE 3

Boycott Risk Premium and Boycott Intensity

In Figure 3, we show the 1-year moving average of the restricted wealth ratio, RWR (dotted line), lagged by 2 quarters, and the 1-year moving average of the quarterly boycott risk premium, BCT (solid line), from monthly BJS cross-sectional regressions of the FF30 industry portfolio excess returns on the boycott factor loadings. Shaded areas are NBER-defined recession periods. The left vertical axis is the boycott risk premium scale in percentage terms, and the right vertical axis is the restricted wealth ratio scale in percentage terms. RWR has a mean value of 44.69% and a standard deviation of 12.25%. BCT has a mean value (annual) of 9.19% and a standard deviation of 17.36%. The correlation between these series is 0.363 with $p < 0.0001$.

[16]There are several reasons for the 2-quarter lag. First, throughout much of the sample period, funds are required to report their holdings only twice annually. Second, holdings commonly are valued several months after they are reported, using then prevailing asset prices. Third, existing mutual funds newly classified as restricted must have been selling sin stocks in the preceding quarter, thus in effect participating in the boycott at that time. The 2-quarter lag in the restricted wealth ratio means that investors are able to forecast the boycott premium in real time, which is consistent with a time-varying risk premium.

ascent in the boycott risk premium when SRI takes off in the late 1990s. After 2002, the boycott risk premium diverges, falling in relation to the relative wealth ratio. A possible explanation is that the vice fund started operating in 2002, making risk arbitrage (especially international arbitrage) by unconstrained investors easier and cheaper. Figure 3 also illustrates clearly that the boycott premium decreases during recessions (the shaded areas), as we expect if responsible investing is a luxury.

More formally, we estimate equation (8). Table 9 shows that, individually, both YMP_{t-1} and RWR_{t-1} have the predicted positive sign on BCT_t at the 5% level of significance. When we use both variables jointly to explain BCT_t, the business cycle variable loses its significance. A plausible reason is that both relative socially responsible wealth (RWR_t) and the business cycle measure (YMP_t) are alternative proxies for q_R (the number of self-restricted investors) with some overlapping information. The conclusion is unaltered when we add the FF4 risk factors. These risk factors have limited explanatory power for BCT_t. The exception is the value premium HML_t, which has a significant positive impact on BCT_t consistent with our observation that sin stocks are underpriced and behave like value stocks.

Thus, while the lagged restricted wealth ratio consistently positively and significantly explains the boycott risk premium, the business cycle measure posi-

TABLE 9

Determinants of the Boycott Risk Premium

In Table 9, the dependent variable is the boycott risk premium from monthly BJS (constant beta) cross-sectional regressions of the FF30 industry portfolio excess returns on the narrow boycott factor loadings. This monthly boycott risk premium is compounded to quarterly holding period returns. MKT, SMB, HML, and UMD are the four monthly Carhart (1997) factors compounded into quarterly frequency. YMP is the log difference between current seasonally adjusted real GDP and current real Potential GDP, both obtained from the St. Louis Federal Reserve Economic Database, lagged by 1 quarter. RWR is the restricted wealth ratio lagged by 2 quarters (one required reporting period). The last column reports the adjusted R^2. The t-statistics are in italics.

BCTn	MKT	SMB	HML	UMD	RWR	YMP	R^2
Estim					0.212		0.052
t-stat.					*2.836*		
Estim						0.719	0.021
t-stat.						*1.945*	
Estim					0.193	0.600	0.064
t-stat.					*2.566*	*1.630*	
Estim	0.053	−0.186	0.585	−0.037			0.099
t-stat.	*0.441*	*−0.890*	*3.709*	*−0.312*			
Estim	0.059	−0.207	0.586	−0.001	0.207		0.151
t-stat.	*0.499*	*−1.010*	*3.805*	*−0.011*	*2.895*		
Estim	0.052	−0.132	0.574	−0.073		0.694	0.118
t-stat.	*0.435*	*−0.634*	*3.672*	*−0.615*		*1.915*	
Estim	0.055	−0.165	0.576	−0.033	0.187	0.544	0.160
t-stat.	*0.468*	*−0.807*	*3.752*	*−0.284*	*2.589*	*1.506*	

tively affects the boycott risk premium, as expected (if SRI is a luxury good), but is only marginally significant.[17,18]

IX. Conclusion

Self-restricted investors face reduced investment opportunities. The violation of the identical investment opportunities assumption necessary for the Sharpe–Lintner CAPM gives rise to an additional source of risk: an investor boycott risk factor. Absorption of boycotted stocks by unrestricted investors requires compensation for the extra risk of holding these stocks in excess of the otherwise efficient market weights. We derive an investor-boycott-augmented CAPM by explicitly segregating the investor base into self-restricted and unrestricted groups. The model implies that the risk premiums of any stocks are linear combinations of the market and boycott risk factors and sheds light on the commonly observed abnormal return on sin stocks. The perceived superior performance of sin stocks identified in previous studies is because of their close association with the boycott factor.

In a 2-stage cross-sectional regression framework, we evaluate the CAPM, FF3, and FF4 models relative to their investor-boycott-augmented versions by considering the incremental contribution of the proposed boycott factor to each model's explanatory power. We find that the boycott risk premium is both theoretically and empirically positive. The magnitude of the boycott risk premium is generally close to the average return of the portfolio of boycotted stocks regardless of the choice of test assets. The boycott risk factor is particularly powerful in explaining differences in average returns across industries.

While boycotted firms face beyond-normal litigation risk, neglect, and illiquidity, the boycott risk premium cannot be driven out by the litigation risks suggested by FMO (2008), the neglect effect of Merton (1987) and HK (2009), the measures of idiosyncratic liquidity (Amihud (2002)), or the systematic liquidity exposure (Pástor and Stambaugh (2003)). Similarly, accounting for standard industry characteristics, such as industry momentum and concentration, does not diminish the importance of the boycott risk premium.

The boycott risk premium rises with our SRI intensity measure and falls during recessions when restricted investors may be less willing to sacrifice for their principles. Investor boycott factor loadings relate closely to covariances of firm payoffs with aggregate payoffs of sin firms, suggesting a real basis for the boycott factor loadings. The overall coherence of the results derived from the boycott perspective provides a strong indication that nonpecuniary preferences regarding the underlying activities funded by financial investment have pervasive pricing effects.

[17]The significant link between the boycott risk premium and future aggregate output is also consistent with the result in Liew and Vassalou (2000) that (the size and value factor) risk premiums forecast aggregate output. In the Merton (1973) view, all risk factors other than the market factor are state variables reflecting future investment opportunities. A risk factor realization must then represent a change in future investment opportunities that should be accompanied by a change in future aggregate output. Our model neither requires nor rules out such a link.

[18]The Internet Appendix provides results for when we control for surprise shocks to the restricted wealth ratio and the business cycle measure. These results are similar.

Appendix. The Formal Model

Investor type U (the representative unrestricted investor) in the traditional CAPM setting fully consumes terminal wealth: $c_U = w_U$, with w_U being the end of period wealth of the unrestricted investor. The investment problem of an unrestricted investor then is

(A-1) $$\max_{\mathbf{n}_U} \mathrm{E}[U(w_U)], \quad \text{s.t. } w_U = (\bar{w}_U/P_f) + \mathbf{n}_U'(\mathbf{x}-\mathbf{p}).$$

The wealth constraint follows from $w_U = \mathbf{n}_U'\mathbf{x} + \mathbf{n}_U^f$, where $\mathbf{n}_U$ is a vector representing the number of shares Investor U purchases in each of N risky assets, and $\mathbf{x}$ is the vector of payoffs per share in each of N risky assets; n_U^f is the number of risk-free discount bonds with unit payoff purchased by Investor U, and $\bar{w}_U = \mathbf{n}_U'\mathbf{P} + n_U^f P_f$, where $\bar{w}_U$ is the initial wealth of Investor U, $\mathbf{P}$ the vector of risky asset prices, and P_f the price of the discount bond. The constraint in equation (A-1) is obtained by eliminating n_U^f from the initial and final wealth equations and defining $\mathbf{p} = \mathbf{P}/P_f$. The first-order conditions for the investment choices are as follows:

(A-2) $$\mathrm{E}[U'(w_U)(\mathbf{x}-\mathbf{p})] = 0.$$

Assuming payoffs $\mathbf{x}$ are multivariate normally distributed, we apply Stein's lemma after using the definition of covariance in equation (A-2) to obtain

(A-3) $$\bar{\mathbf{x}} - \mathbf{p} = \theta_U \boldsymbol{\Sigma}\, \mathbf{n}_U,$$

where $\theta_U = -\mathrm{E}[U''(w_U)]/E[U'(\mathbf{w}_U)]$ is akin to the absolute risk aversion, which depends on the initial wealth of Investor U and other model parameters (unless we assume constant absolute risk aversion utility). $\boldsymbol{\Sigma}$ is the covariance matrix for risky asset payoffs and $\bar{\mathbf{x}}$ the expected payoffs of risky assets.

Investor type R (the representative restricted investor) is similar but chooses to boycott sin stocks. Final perceived consumption for Investor R is given by $w_R = \mathbf{n}_R'\mathbf{x} + n_R^f$. With $\bar{w}_R = \mathbf{n}_R'\mathbf{P} + \mathbf{n}_R^f P_f$, Investor R's decision problem is

(A-4) $$\max_{\mathbf{n}_R} \mathrm{E}[U(w_R)], \quad \text{s.t. } w_R = (\bar{w}_R/P_f) + \mathbf{n}_R'(\mathbf{x}-\mathbf{p}),$$

where $\mathbf{n}_R$ is a vector of the shares Investor R purchases in N_N risky nonsin assets. The first-order conditions are

(A-5) $$\mathrm{E}[U'(w_R)(\mathbf{x}-\mathbf{p})] = 0,$$

implying

(A-6) $$\bar{\mathbf{x}}_{\mathbf{N}} - \mathbf{p}_{\mathbf{N}} = \theta_R \boldsymbol{\Sigma}_{\mathbf{N}} \mathbf{n}_R,$$

where the matrix of asset payoff covariances is partitioned into sin (S) and nonsin (N) firms: $\boldsymbol{\Sigma} = \begin{pmatrix} \boldsymbol{\Sigma}_{\mathbf{N}} & \boldsymbol{\Sigma}_{\mathbf{NS}} \\ \boldsymbol{\Sigma}_{\mathbf{SN}} & \boldsymbol{\Sigma}_{\mathbf{S}} \end{pmatrix}$, where $\boldsymbol{\Sigma}_{\mathbf{N}}$ represents the payoff covariance matrix of all stocks not boycotted and $\bar{\mathbf{x}}_{\mathbf{N}}$ and $\mathbf{p}_{\mathbf{N}}$ are the vectors of mean payoffs and prices, respectively, of the nonboycotted stocks.

Assuming q_U investors of type U and q_R investors of type R, the demand for assets may be obtained and set equal to the exogenous supply of shares, $\bar{\mathbf{n}} = \begin{pmatrix} \bar{\mathbf{n}}_{\mathbf{N}} \\ \bar{\mathbf{n}}_{\mathbf{S}} \end{pmatrix}$, and to zero for the risk-free asset, yielding the conditions for market equilibrium:

(A-7) $$\bar{\mathbf{n}} = q_U \mathbf{n}_U + q_R \mathbf{n}_R, \quad 0 = q_U n_U^f + q_R n_R^f.$$

Solving for the risky asset demands of both groups from equations (A-3) and (A-6) gives

(A-8) $$\mathbf{n}_U = (\theta_U \boldsymbol{\Sigma})^{-1}(\bar{\mathbf{x}} - \mathbf{p}), \quad \mathbf{n}_R = (\theta_R \boldsymbol{\Sigma}_{\mathbf{N}})^{-1}(\bar{\mathbf{x}}_{\mathbf{N}} - \mathbf{p}_{\mathbf{N}}).$$

Substituting into equation (A-7) yields

$$\text{(A-9)} \qquad \bar{\mathbf{n}} = \left[(\boldsymbol{\Sigma}\theta_U/q_U)^{-1} + \begin{pmatrix} \mathbf{I} \\ \mathbf{0} \end{pmatrix} (\boldsymbol{\Sigma}_\mathbf{N}\theta_R/q_R)^{-1} \begin{pmatrix} \mathbf{I} & \mathbf{0} \end{pmatrix} \right] (\bar{\mathbf{x}} - \mathbf{p}).$$

A standard inversion identity states that given matrices $\mathbf{X}_1, \mathbf{X}_2, \mathbf{X}_3$, and $\mathbf{X}_4$, with $\mathbf{X}_1$ and $\mathbf{X}_4$ invertible, we have (Söderström (2002), pp. 165–166) the following: $(\mathbf{X}_1^{-1} + \mathbf{X}_2\mathbf{X}_4^{-1}\mathbf{X}_3)^{-1} = \mathbf{X}_1 - \mathbf{X}_1\mathbf{X}_2(\mathbf{X}_4 + \mathbf{X}_3\mathbf{X}_1\mathbf{X}_2)^{-1}\mathbf{X}_3\mathbf{X}_1$. Use this identity to manipulate the inverse of the term in brackets in equation (A-9):

$$\text{(A-10)} \qquad \left[(\boldsymbol{\Sigma}\theta_U/q_U)^{-1} + \begin{pmatrix} \mathbf{I} \\ \mathbf{0} \end{pmatrix} (\boldsymbol{\Sigma}_\mathbf{N}\theta_R/q_R)^{-1} \begin{pmatrix} \mathbf{I} & \mathbf{0} \end{pmatrix} \right]^{-1}$$
$$= (\theta_U/q_U) \left[\boldsymbol{\Sigma} - \left(\frac{(\theta_U/q_U)}{(\theta_U/q_U) + (\theta_R/q_R)} \right) \boldsymbol{\Sigma} \begin{pmatrix} \boldsymbol{\Sigma}_\mathbf{N}^{-1} & \mathbf{0} \\ \mathbf{0} & \mathbf{0} \end{pmatrix} \boldsymbol{\Sigma} \right].$$

Then

$$\text{(A-11)} \qquad \bar{\mathbf{x}} - \mathbf{p} = \gamma \boldsymbol{\Sigma}\bar{\mathbf{n}} + \delta \boldsymbol{\Sigma}\bar{\mathbf{n}}_\mathbf{B}, \bar{\mathbf{n}}_\mathbf{B} = \begin{pmatrix} -\boldsymbol{\Sigma}_\mathbf{N}^{-1}\boldsymbol{\Sigma}_\mathbf{NS}\bar{\mathbf{n}}_\mathbf{S} \\ \bar{\mathbf{n}}_\mathbf{S} \end{pmatrix},$$
$$\gamma = \frac{1}{(q_R\bar{w}_R/\rho_R) + (q_U\bar{w}_U/\rho_U)}, \qquad \delta = \gamma \left(\frac{q_R\bar{w}_R/\rho_R}{q_U\bar{w}_U/\rho_U} \right),$$

where $\bar{\mathbf{n}}_\mathbf{B}$ represents the boycott portfolio of shareholdings; $\bar{w}_R$ and $\bar{w}_U$ are the average wealth levels; and ρ_R and ρ_U are measures of relative risk aversion of the investor types, with $\rho_R \equiv \theta_R\bar{w}_R$ and $\rho_U \equiv \theta_U\bar{w}_U$.

Convert equation (A-11) into an expression for mean returns rather than expected net payoffs, using $1 + r_i^s = x_i/P_i$. Therefore, $x_i - p_i \equiv x_i - (P_i/P_f)$ equals $P_i(r_i^s - r_f)$, because $P_f \equiv 1/(1+r_f)$. Define the excess return $r_i \equiv r_i^s - r_f$ and the mean excess return $\mu_i \equiv \mu_i^s - r_f$. Since $1 + r_i^s = x_i/P_i$, the covariance matrix of risky asset returns $\boldsymbol{\sigma}$ is related to the covariance matrix of risky asset payoffs $\boldsymbol{\Sigma}$ such that, for a specific element σ_{ij} of this matrix, we have $\sigma_{ij} = \Sigma_{ij}/P_iP_j$. Then, for a particular element of equation (A-11),

$$\text{(A-12)} \qquad \mu_i = \gamma P_m\sigma_{im} + \delta P_b\sigma_{ib},$$

where m represents the market, $P_m = q_m\bar{w}_m = q_U\bar{w}_U + q_R\bar{w}_R$ is the cost of the market portfolio, and P_b is the cost of the boycott portfolio. Apply equation (A-12) to the market portfolio and the boycott portfolio to obtain

$$\text{(A-13)} \qquad \mu_m = \gamma P_m\sigma_m^2 + \delta P_b\sigma_{mb}, \qquad \mu_b = \gamma P_m\sigma_{bm} + \delta P_b\sigma_b^2.$$

Then solve equation (A-13) for γP_m and δP_b, and substitute into equation (A-12) to generate equation (1) in the text:

$$\text{(A-14)} \qquad \mu_i = \beta_{im}\mu_m + \beta_{ib}\mu_b,$$

where β_{im} and β_{ib} are the population values of the slope estimates for a linear regression of the return of asset i on the market portfolio return and the boycott portfolio return:

$$\text{(A-15)} \qquad \beta_{ib} = \frac{\sigma_{ib}\sigma_m^2 - \sigma_{im}\sigma_{mb}}{\sigma_b^2\sigma_m^2 - \sigma_{bm}^2}, \qquad \beta_{im} = \frac{\sigma_{im}\sigma_b^2 - \sigma_{ib}\sigma_{mb}}{\sigma_b^2\sigma_m^2 - \sigma_{bm}^2}.$$

From (A-11), the risky assets relative price vector is solved in terms of underlying variables:

$$\text{(A-16)} \qquad \mathbf{p} = \bar{\mathbf{x}} - (\gamma \boldsymbol{\Sigma}\bar{\mathbf{n}} + \delta \boldsymbol{\Sigma}\bar{\mathbf{n}}_\mathbf{B}).$$

Premultiplying by a vector of holdings of portfolio i yields, for a specific portfolio i,

$$p_i \quad = \quad \bar{\mathbf{n}}_i' \mathbf{p} \quad = \quad \bar{x}_i - \gamma\, \Sigma_{im} - \delta\, \Sigma_{ib}, \tag{A-17}$$

which becomes equation (2) in the text given $p_i = P_i/P_f = P_i(1+r_f)$.

Since $q_R > 0$ if restricted investors exist, it follows that $\delta > 0$ (defined in equation (A-11)), meaning that the price of boycott risk is positive: the larger a portfolio i's payoff covariance, $\Sigma_{ib} \equiv \bar{\mathbf{n}}_i' \boldsymbol{\Sigma}\, \bar{\mathbf{n}}_{\mathbf{B}}$, with the boycott factor payoff, the lower its price relative to the risk-free asset, $p_i = P_i/P_f = P_i(1+r_f)$, and the higher its expected excess return, $\mu_i = (\bar{\mathbf{n}}_i' \bar{\mathbf{x}}/P_i) - (1/P_f)$.

The boycott risk premium, μ_b, can be derived from equation (A-11) and the construction of the boycott factor as $x_b - p_b \equiv \bar{\mathbf{n}}_{\mathbf{B}}'(\mathbf{x} - \mathbf{p})$. Taking the expected value, we have $\bar{x}_b - p_b = (\gamma + \delta)\, \Sigma_b$, with $\Sigma_b = \bar{\mathbf{n}}_{\mathbf{S}}'(\boldsymbol{\Sigma}_{\mathbf{S}} - \boldsymbol{\Sigma}_{\mathbf{SN}} \boldsymbol{\Sigma}_{\mathbf{N}}^{-1} \boldsymbol{\Sigma}_{\mathbf{NS}})\, \bar{\mathbf{n}}_{\mathbf{S}}$, which is strictly positive because $\boldsymbol{\Sigma}$ is positive definite. Since we can write the mean return as $\mu_b = [(\bar{x}_b - p_b)/p_b]/P_f$, we have

$$\mu_b \quad = \quad \frac{(\gamma+\delta)\, \Sigma_b (1+r_f)}{\bar{x}_b - (\gamma+\delta)\, \Sigma_b}. \tag{A-18}$$

The denominator reflects the price of the boycott factor portfolio: $P_b = [\bar{x}_b - (\gamma + \delta)\, \Sigma_b]/(1+r_f)$. The price of this portfolio must be positive in general equilibrium. This holds because the boycott portfolio represents the value of the payoffs from sin stocks after hedging the payoffs already available in the market. Since the sin stocks could not otherwise exist in positive supply (at least not in our one-period context), the value of the residual payoffs is positive.

If we assume the relative risk aversion of both investor groups is equal, $\rho_R = \rho_U$, then from equations (A-11) and (A-18), we obtain equation (3) in the text:

$$\mu_b \quad = \quad (1+r_f) f \left(\frac{\theta_m \Sigma_b}{\bar{x}_b (1 - \mathrm{RWR})} \right), \tag{A-19}$$

with $f(\cdot) > 0$, $f'(\cdot) > 0$, and $\mathrm{RWR} \equiv \frac{q_R \bar{w}_R}{q_M \bar{w}_M}$. It follows that μ_b is always positive and increases in RWR.

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