What is the cost of faith? An empirical investigation of Islamic purification

Mark C. Hutchinson, Mark Mulcahy, John O'Brien

PII: S0927-538X(17)30255-X
DOI: doi: 10.1016/j.pacfin.2017.05.005
Reference: PACFIN 936

To appear in: *Pacific-Basin Finance Journal*

Received date: 9 August 2016
Revised date: 7 April 2017
Accepted date: 22 May 2017

Please cite this article as: Mark C. Hutchinson, Mark Mulcahy, John O'Brien , What is the cost of faith? An empirical investigation of Islamic purification, *Pacific-Basin Finance Journal* (2017), doi: 10.1016/j.pacfin.2017.05.005

What is the cost of faith? An empirical investigation of Islamic purification

Mark C. Hutchinson[a], Mark Mulcahy[a*], and John O'Brien[a]
[a]*Cork University Business School, University College Cork, College Road, Cork, Ireland*
* Corresponding author. *Email*: mark.mulcahy@ucc.ie, *Phone:* +353 21 4903212. Mark Hutchinson can be reached at m.hutchinson@ucc.ie or +353 21 4902597. John O'Brien can be reached at j.obrien@ucc.ie or +353 21 4902613.

Abstract

Based on the *Qur'anic* prohibition against interest (*riba*), this paper quantifies the true cost of purification for the first time. The extant literature focuses on the performance of various Islamic portfolios but the returns of these funds are pre-purification. This is a significant oversight given that, for some scholars, the entire permissibility of the industry rests on purification. By comparing the impact on returns of three purification methodologies we show that purification adversely and statistically significantly impacts portfolio returns and that the choice of purification methodology also matters. Our results are robust to alternative portfolio construction methodologies and standardised tax rates. The implications are that purification is not a trivial matter for compliant Muslim investors — comprehensive *shari'ah* compliance has a significant faith and financial implications for compliant Muslim investors such that it could be argued that, by ignoring the impact of purification on returns, the findings of the extant literature are incomplete.

Keywords: Islamic finance, Mutual funds, Purification, *shari'ah* compliant

JEL Classification: G11, G18

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

1. Introduction

In Islam the philosophy of investing in equities based on religious beliefs means that all investments must be in compliance with *shari'ah* and any remaining contaminated (*haram*) elements must be purified[1]. According to data from Thomson Reuters the total number of *shari'ah* compliant mutual funds reached 943 in 2014, double the number in 2008. Central to the continued growth in faith-based investments is the $1.9 trillion global Islamic finance industry (Islamic Financial Services Board, 2011). While this growth has garnered significant attention in the extant academic literature about the impact of the application of *shari'ah* on the performance of *shari'ah* funds (Abdelsalam *et al*., 2014; Abdullah *et al*., 2007; Capelle-Blancard and Monjon, 2014; Hussein and Omran, 2005; Nainggolan *et al*., 2015), the literature is almost completely silent about purification (Mulcahy, 2013). Given that, for some *shari'ah* scholars, the credibility of the entire industry rests on the application of ex-post purification, it can be argued that studies that utilise pre-purified returns to draw conclusions about the performance of *shari'ah* portfolios do so in error such that there is a pressing need to investigate the true cost of purification. In this paper, we directly estimate the cost of purification for the first time. Our results are striking, showing that purification has a negative impact on portfolio performance of up to 0.95 percent per annum.

Given that there are numerous purification methodologies of varying rigour suggested in Islamic textbooks and by industry standards bodies, we also investigate whether applying these different suggested methods produce meaningfully different purification costs. In addressing this issue we find that, depending upon the rigour of the purification method used, the effect on portfolio returns differs by as much as 0.89 percent per annum.

Our findings, which significantly advance the Islamic finance literature, are closely related to the growing literature on socially responsible investing (SRI) which, historically,

[1] Purification refers to the need to donate to charity all impure components deemed unacceptable under *shari'ah* (Elgari, 2000).

was motivated solely by religious concerns (Ferruz *et al*., 2012). According to the US Social Investment Forum's biannual surveys between 1995 and 2005, over 90% of the funds following SRI guidelines exclude investment in companies in at least three industries; the most common reasons for boycott are tobacco, alcohol, gaming, and weapons (Luo and Balvers, 2015). Collectively referred to as sin stocks, the performance of portfolios that exclude (and solely include) these equities has been extensively studied in the extant literature (Adler and Krtizman, 2008; Fabozzi *et al*., 2008; Hong and Kacperczyk, 2009; Kreander *et al*., 2005; Statman and Glushkov, 2009). We add to this literature by providing direct estimates of the financial costs of purification from implementing Islamic faith based investment policies for the first time.

In summary our paper makes several key contributions to the Islamic finance and more broadly to the SRI literature. First, using data for the S&P 500 index from 1994–2014, we provide direct estimates of the financial cost of purification. That is, instead of using funds data contaminated by factors relating to, *inter alia*, managerial skill and market timing issues we construct a benchmark portfolio to allow us to isolate the true cost of *shari'ah* purification for the first time. Second, because in the process of constructing the benchmark portfolio we first construct a compliant portfolio using *shari'ah* stock screens to eliminate non-compliant industries and companies from consideration, we also, as an interim analysis, estimate the risk and return impact of these *shari'ah* stock screens versus the broader index from which these *shari'ah* compliant companies are drawn. Contrary to Derigs and Marzban (2009) our results indicate that the risk and return from this compliant Islamic portfolio are not statistically significantly different from the risk and returns from a replicated S&P 500 index, i.e. Islamic investors do not have to trade off financial performance for non-financial utility, based upon just screening. Third, we carry out a comprehensive empirical evaluation of three alternate purification methodologies suggested by the literature. The results of these

purification tests indicate a significant negative impact on portfolio returns versus the benchmark portfolio for all methodologies, i.e. purification has a non-trivial cost for compliant Muslim investors. Most interesting is the sensitivity of our results to the purification methodology used. These results have important practical and faith based implications for the growing Islamic funds industry.

The remainder of the paper is organised as follows. Section 2 describes the relevant SRI, Islamic finance and purification literature, while Section 3 describes the data and methodology used to empirically investigate the effect of these purification techniques on portfolio performance. Section 4 presents the results of these tests and robustness tests while Section 5 concludes.

2.0 Literature Review

SRI is defined as the use of ethical criteria to select and manage stock portfolios and was (until recently broadened to include environmental, governance, social, and sustainability concerns) synonymous with faith based investing (Kurtz, 2008). Although Girard *et al*., (2007) and Renneboog *et al*. (2008a) find that SRI funds underperform, more recent research has shown that SRI funds outperform conventional funds during crisis periods and underperform them during non-crisis periods (Becchetti *et al*., 2015; Nofsinger and Varma, 2014). Notwithstanding these contributions, most SRI studies find no statistically significant evidence that the performance of socially responsible funds is different from that of conventional ones (Bauer *et al*., 2005; Bauer *et al*., 2006; Bauer *et al*., 2007; Gregory and Whittaker, 2007; Goldreyer and Diltz, 1999; Hamilton *et al*., 1993; Kreander *et al*., 2005; Mallin *et al*. 1995; Shank *et al*., 2005; Statman, 2000).

Shari'ah compliant investing and SRI are closely related (Al-Khazali *et al*., 2014; BinMahfouz and Hassan, 2013)). In Islam the philosophy of investing in equities based on

religious beliefs means that all investments must be in compliance with *shari'ah* such that shares of firms tainted with impure components are *haram*. Impure components consist of, *inter alia*, *riba* which in modern Islamic finance has become synonymous with interest-related activity and is unequivocally prohibited in the *Qur'an* (Kuran, 2005; Mulcahy, 2013). Given the size and complexity of modern firms, from an Islamic perspective most are tainted in some way by impure components such that the practical effect of absolute compliance with *shari'ah* principles is that investment in equities would be, *ipso facto*, off limits for Muslim investors (McMillen, 2011; Moore, 1997). Faced with this conundrum contemporary *shari'ah* scholars have made, via the use of *ijtihad* (reasoning and argumentation), compromises to allow permissible variation from absolute compliance with *shari'ah* principles (subject to passing qualitative and quantitative *shari'ah* stock screens) in order to facilitate the emergence of the *shari'ah* compliant investment industry.

The vast majority of the research to date has focused on the performance of Islamic funds that take advantage of this permissible variation and the results are mixed[2]. While many of these studies have been unable to find a significant performance difference between compliant and non-compliant portfolios — see for example Albaity and Ahmad (2008), Girard and Hassan (2008), Guyot (2011), Hassan and Girard, (2010), Kamil *et al*. (2013), Kok *et al*. (2009), and Walkshausl and Lobe (2012) — these results are not matched by other researchers who find that Islamic portfolios i) generally outperform conventional ones (Alam and Rajjaque, 2010; Ashraf and Mohammad, 2014; and Peillex and Ureche-Rangau, 2013), ii) generally underperform conventional ones (Ashraf, 2014; Fikriyah *et al*., 2007; Hayat and Kraeussl, 2011; Hoepner *et al*., 2011; and Nainggolan *et al*., 2015), iii) outperform conventional ones in down markets (Abdullah *et al*., 2007; Al-Khazali *et al*., 2014; Ashraf,

[2] See Masih *et al*. (2016) for an extensive review.

2013; Ho *et al*., 2014; and Jawadi *et al*., 2014), and iv) underperform conventional ones in down markets (Hussein, 2007; Hussein and Omran, 2005).

In those studies where Islamic portfolios are found to underperform, this underperformance is variously attributed to, *inter alia*, the lack of diversification and the lower leverage imparted by the *shari'ah* screening process and/or to the costs of applying and rebalancing these screens (Ajmi *et al*., 2014; Ashraf, 2014; Bauer *et al*., 2006; Dewandarua *et al*., 2015). What is interesting for this study is that not one article mentions costs relating to purification which, if these portfolios are indeed truly *shari'ah* compliant, should directly impact of returns versus conventional portfolios. What is evident from the albeit limited extant Islamic finance literature in this area is that, with the exception of Mulcahy (2013), there is an absence of any research on purification. This is especially surprising when, according to some *shari'ah* scholars, the entire permissibility of broad-based Islamic investment in equities hinges on purification (indeed Elgari states that 'no part of these programs is on a more solid ground from a *shari'ah* point of view, than that of purification' (2000, p.2)., 2000). That is, purification is the *proquo* to the *quid* of permissible variation.

The central problem, and the consequences of which are estimated in this paper, is that there is no agreement about how to calculate the amount that needs to be purified. For instance, although the Accounting and Auditing Organisation for Islamic Financial Institutions (AAOIFI) recommends one method to purify impure amounts in *shari'ah* Standard 21 Financial Papers (Shares and Bonds) (hereafter S21)[3], the terminology used therein is not consistent and, in certain sections, lacks specificity. Also, not all jurists adhere to AAOIFI standards such that there are several methods suggested in the extant literature and used in practice (Elfakhani *et al*., 2007). These can be broadly grouped the dividend and investment methods and which broadly differ on whether the amount to be purified is

[3] To date the AAOIFI has issued 45 *Shari'ah* Standards; Standard 21 (Financial Papers, Shares and Bonds) is the relevant standard for the funds industry.

dividends or income (and if income, whether it should be pre- or after-tax income). Of the index providers that provide *shari'ah* compliant equity benchmark indices, only MSCI perform any form of purification at source and, unsurprisingly, favour a version the least onerous dividend method (Ashraf, 2014). Separately, Mulcahy (2013) argues for a comprehensive purification methodology that also purifies the benefits to a firm from the interest expense tax shield from debt (Cooper and Nyborg, 2006, 2007; Miles and Ezzell, 1985; Modigliani and Miller, 1958, 1963) and surmises that the need to purify interest expense may have been previously considered and rejected only because perhaps, as Pomeranz (1987) observes, purification is 'more easily done with interest income than interest expense' (p.125). The result is that, even for those adhering to AAOIFI standards, differing interpretations are possible such that confusion remains and *haram* components go unestimated and unpurified. Therefore, this issue clearly needs further research.

3.0 Methodology

The primary aim of the paper is to estimate the true cost of the various purification methodologies — the dividend, investment and comprehensive, respectively, in order of rigour[4]. Ashraf (2014) argues that because trading costs, managements' stock selection and market timing skills (or lack thereof) will necessarily pervade every Islamic fund, it is inappropriate to use such funds to estimate the impact on return of any specific *shari'ah* application (be it stock screens or, in this case, also purification methods). For this reason, Schroder (2007) argues that a constructed screened portfolio from a broad index is a better tool to properly isolate the impact of a *shari'ah* application from that of trading costs, stock selection and timing issues.

[4] See Mulcahy (2013) for a detailed discussion of the three methods.

3.1 Portfolio Screening

Following Derigs and Marzban (2008), the starting universe for the analysis in this study is the constituent equities of the well-diversified and highly liquid S&P 500 index for the years 1994–2014[5]. This universe is first assessed to ensure that all firms have the required data to test the core hypothesis of this paper. Then, to help distinguish the permissible (*halal*) from the *haram* (DeLorenzo, 2002), the remaining companies are passed through a number of *shari'ah* stock screens, first to exclude those equities from firms with non-compliant business activities (qualitative screen) and then to exclude those with non-compliant financial ratios (quantitative screen). Because detailed financial statements are only available on an annual basis, the screening process occurs annually. This section describes in detail the different stages of the various assessment and screening processes.

The first step is to remove all stocks without a market capitalisation value at the start of the year. The beginning market capitalisation is necessary to calculate the market weight of each company in the portfolio in that year. This has a small impact on the total universe of stocks removing an average of eleven equities each year, and its impact is weighted toward the first half of the sample period. Non-compliant business activities are then removed using a qualitative *shari'ah* screen outlined by, *inter alia*, Derigs and Marzban (2008) and Ashraf (2014) which excludes firms whose primary business activity generates earnings from pork and alcohol, gambling, non-Islamic financial services, pornography, tobacco, and weapons (Wilson, 2004). Similar to the results from Derigs and Marzban, (2008), Renneborg *et al*., (2008b) and Galema *et al*., (2008) the application of the qualitative screen reduces the universe significantly, in this case to an average of 305 equities each year.

Quantitative screens are then applied to exclude any remaining companies tainted by *maysir*, *gharar*, and *riba*, and which are practically interpreted as disallowing excessive

[5] For the avoidance of doubt, equities are only included in the study for the years they are also constituents of the S&P 500 index.

liquidity, leverage and, ultimately, minimising interest. Four quantitative screens, using the same financial ratios as outlined in Derigs and Marzban (2008) and Ashraf (2014), are then applied. To ensure that the portfolios are implementable the results of the quantitative screening process are lagged by one year, so that if a company fails the quantitative screening process in any year then it is excluded in the following year. We believe this reflects the reality of the investment process where an investor will not know whether a company is compliant for any year until the accounts are released sometimes months after year end. These quantitative screens are:

$$s_1 = \frac{CSI_i(t)}{TA_i(t)} \leq 0.33$$

$$s_2 = \frac{AR_i(t)}{TA_i(t)} \leq 0.70$$

$$s_3 = \frac{AR_i(t) + CSI_i(t)}{TA_i(t)} \leq 0.50$$

$$s_4 = \frac{TD_i(t)}{MC_i(t)} \leq 0.33$$

where $CSI_i(t)$, $AR_i(t)$, $TA_i(t)$, $D_i(t)$ and $MC_i(t)$ are the short-term cash investments, accounts receivable, total assets, total debt, and market capitalisation, respectively, of company *i* at time *t*. These screens are applied in two stages. The first stage eliminates all equities without sufficient data for at least one of the financial screens. The second stage eliminates all equities that do not pass all tests for which there is sufficient data. At this stage we have a compliant sample, with an average size of 242, approximately half of the total number of equities in the index.

Assuming that the application of qualitative and quantitative *shari'ah* stock screens will have eliminated those firms from unacceptable industries and with unacceptable financial ratios it is likely that, any remaining impure components to be purified will consist

solely of *riba*. The final step in the process is to purify these remaining contaminated elements when earned. To accomplish this we further limit our sample to equities which have sufficient data to test the main hypothesis of this paper, that is, they should have data to calculate tax rate, pay-out ratio, interest income and interest expense. This results in a final sample with an average of 184 constituents that can be purified and is used as a benchmark against which to estimate the cost of purification according to the dividend, investment and comprehensive methods.

[Insert Figure 1 here]

Looking in Figure 1 at the variation in the numbers of compliant equities and the number that can be purified over time there is no long term trend although the number of equities with data does vary from year to year quite considerably.

Per Mulcahy (2013) the total *haram* amount to be purified (P) by investors in any company i in year t according to the three methods, respectively, can be represented in equation form as

$$P_i(t) = \{I_i(t) \,.\, [1 - \tau_i(t)] \,.\, \rho_i(t)\} \quad (1)$$

$$P_i(t) = I_i(t) \quad (2)$$

$$P_i(t) = [I_i(t) + \tau_i(t).X_i(t)] \quad (3)$$

where I is the pre-tax *haram* amounts from *riba* interest income, τ is the tax rate calculated as the ratio of tax to pre-tax income, ρ is the payout ratio, and X is the pre-tax interest expense.

3.2 Portfolio Construction

The analyses in this paper assume that investors invest in market-weighted portfolios which are rebalanced at the start of each year; rebalancing costs are excluded from the calculations. The methodology for calculating the returns for these market weighted portfolios replicates that used to create market indices and are given by the equation

$$R_{I,t} = \frac{\sum_{i=1}^{N_{I,t}} r_{i,t} MC_{i,t}}{\sum_{i=1}^{N_I} MC_{i,t}}$$

where $r_{i,t}$ is the total return of equity *i* during time period *t* and $MC_{i,t}$ is as previously defined.[6]

Specifically, three portfolios are created using this methodology for analysis in this study. The first is a replicated S&P 500 index which contains all equities in the S&P 500 with available data for market capitalisation at the start of the year and the second is a compliant portfolio which contains those equities that have passed *shari'ah* qualitative and quantitative screens and so is a free from any contamination from manager skill and market timing issues. Given the lagged construction methodology both of these portfolios are investable and directly comparable and as such can be used to isolate the performance impact of *shari'ah* screens versus the replicated S&P 500 index. The third portfolio is a market-weighted portfolio of all compliant equities with data necessary to perform purification and is interpreted as a benchmark against which to compare the impact of each of the three purification methods on returns. To do so the three different purification methods are separately used to calculate the amount of contaminated gains from *riba* to be purified for each equity in this portfolio. These amounts are then expressed as a fraction of the market capitalisation of the company at the start of the year.

[6] See for example the index methodologies used by Standard & Poors (http://www.spindices.com/documents/methodologies/methodology-index-math.pdf) and MSCI (https://www.msci.com/eqb/methodology/meth_docs/MSCI_May12_IndexCalcMethodology.pdf)

4.0 Results

4.1 Analysing Constructed Portfolios

The results from our portfolios show that, unsurprisingly, the replicated S&P index provides a close proxy for the S&P 500 index itself; the tracking error is less than 1%. The slight difference is caused by the exclusion of companies with no market capitalization data available at the start of the year. The cumulative performance of both the replicated S&P index and the compliant portfolio is seen in Figure 2 and the results are summarised in Table 1.

[Insert Table 1 Here]

[Insert Figure 2 Here]

The results show that while in any given year there may be a material difference in performance on average the two tend to produce similar performance. Specifically, on average, the replicated S&P index outperforms the compliant portfolio by 0.21% per annum but, with a standard error of 0.66%, the risk-adjusted difference is not significantly different from zero. Given that the Sharpe ratios are also not statistically different, what we can conclude is that an investor restricted to compliant equities will not be at a disadvantage relative to an investor with access to the full list of S&P 500 companies.

[Insert Table 2 Here]

In order to further understand the risk and return characteristics of the compliant portfolio relative to the replicated S&P index its excess returns are tested using two different

asset pricing models; the CAPM model and the Fama-French three factor model. In both cases the return of the replicated S&P Index is treated as the market portfolio. The results, presented in Table 2, show that the intercept is not significantly different from zero which confirms our previous results that, after adjusting for risk, an Islamic investor is not at a statistically significant disadvantage from the application of *shari'ah* stock screens alone (i.e. prior to purification). It is noteworthy that this finding is in direct opposition to the findings of Derigs and Marzban (2009) who, in a study of the constituents of the S&P 500, find that when applied at the asset level Islamic investors are disadvantaged by the application of *shar'iah* screens alone.

4.2 Estimating the Cost of Purification

While the previous section showed that a compliant Muslim investor is not at a risk-adjusted disadvantage before purification, the crux of this paper is to build on this to investigate and compare the relative cost of purification. To do so the market capitalisation weighted cost using equations (1), (2) and (3) for each the three purification methodologies previously defined is calculated and the results from these analyses are compared to the benchmark portfolio constructed from those compliant equities with data for purification.

[Insert Figure 3]

[Insert Table 3]

Figure 3 shows the cumulative impact of each purification method relative to this benchmark portfolio. Table 3 shows the annual cost of purification in percentage terms for each of the three methods. What is immediately clear is that purification matters — the average annual cost of purification is 0.06%, 0.29% and 0.95% from the dividend, investment

and comprehensive methods, respectively. All of these returns are statistically significantly different from the benchmark portfolio at the 1% level. In terms of differences in costs between the various methods it is also clear from Table 3 that the choice of purification methods matters. That is, the cost associated with the comprehensive method is 0.66% and 0.89% higher than the investment and dividend methods, respectively, and these differences are both statistically significant at the 1% level.

[Insert Figures 4 and 5]

It is evident from Figures 4 and 5 that both the total cost of purifying the gains and the cost difference between the various methods has fallen considerably over the last six years. Unsurprisingly, the majority of this variation is explained by differences in interest rates across time. Allowing for this, Figure 5 shows the costs associated with the comprehensive method is a multiple of the costs of both the dividend and investment methods and that the ratios of the costs associated with the comprehensive method versus the other methods remained relatively stable through time. That is, the comprehensive/investment cost multiple ranges from 3 to 6 times and the comprehensive/dividend multiple ranges from 10 to 20 times.

4.3 Robustness Tests

In order to test the equivalence of the risk-adjusted returns from purification for each of the three methodologies we use the same asset pricing models outlined previously with the benchmark portfolio as the market portfolio. The results are presented in Table 4.

[Insert Table 4]

The cost of purification for each method is evident from the statistically significantly negative intercept in each case. Tests of equivalence (results not reported here) show that there is no difference in betas between the methods, which is not surprising given that there is no difference in the individual assets in the portfolios.

To test the robustness of our results to alternative portfolio construction methodologies we repeat the previous analysis using two different assumptions. In the first, instead of using the market capitalisation weighted portfolio, we base our analysis on an equally weighted portfolio calculated according to the equation

$$R_{I,t} = \frac{\sum_{i=1}^{N_I} r_{i,t}}{N_{I,t}}$$

where all variables are as previously defined. In the second we assume a constant tax rate of 35% for all equities, or 0% if the actual tax rate for the company is negative.

[Insert Table 5 Here]

Table 5 shows the results of the robustness checks. The general pattern of the results is confirmed in both cases, with the comprehensive methodology being statistically significantly higher than the other purification methods. Indeed, the results are greater under these new assumptions. The equal weighted portfolio shows higher costs associated with both the investment method (0.45% compared to 0.29% previously) and the comprehensive method (1.28% compared to 0.89% previously). The constant tax rate method increases the costs associated with the comprehensive method (up to 1.12% compared to 0.89% previously) and consequently increases the cost of purification relative to both the dividend and investment methods.

5.0 Conclusion

If the Islamic funds industry is to follow through on its early promise and grow at the rates forecast, then any suspicion as to its *shari'ah* compliance needs to be assuaged. That is, insofar as permissible variation is tolerated, maximum effort must be made to purify all tainted components (El-Gamal, 2006; Maurer, 2002). What is surprising then is that while there is now an extensive collection of research relating to the application of *shari'ah* screens and its impact on the performance of Islamic funds (Alam and Rajjaque, 2010; Al-Khazali *et al*., 2014; Girard and Hassan, 2008; Ho *et al*., 2014; Hoepner *et a*l., 2011; Hussein and Omran, 2005; Kamil *et al*., 2013; Nainggolan *et al*., 2015; Walkshausl and Lobe, 2012) — the extant literature is silent about purification.

While the recommendations in AAOIFI S21 are a significant contribution in this regard, the lack of agreement about the need to purify even seemingly obvious and unequivocally prohibited elements in practice (observed most obviously in the permissibility of the pay-out ratio in the dividend method) is a concern. Going further, Mulcahy (2013) conjectures that the need to purify gains from the interest tax shield, the value of which is well understood in the corporate finance literature. While it is not surprising that those index providers who do mention purification favour a version of the dividend method (Ashraf, 2014) to winnow the amount to be purified it is puzzling that no empirical literature to date has considered the obvious *shari'ah* implications of this practice (Mulcahy, 2013).

The empirical analysis in this study fills this gap and is designed to stimulate a purification debate. To do so we construct a benchmark portfolio of compliant equities with data for purification from the S&P 500 index for the years 1994–2014 to directly estimate the cost of three purification methods (i.e. the dividend, investment and comprehensive methods). The results from these tests indicate a significant negative impact on risk adjusted portfolio returns for all methodologies. We also show that the method of purification is

important. The return differences between the three methods are all statistically significantly different and vary in magnitude from 0.23 to 0.89 percent per annum.

Prior to creating the benchmark portfolio we first construct a compliant portfolio which passed both the qualitative and quantitative *shari'ah* screens (but not necessarily the criteria to meet the data requirements for purification). In an additional analysis of the risk and return of this compliant portfolio we also show that there is no statistically significant difference between the returns from the compliant portfolio versus a replicated S&P 500 index, i.e. contrary to Derigs and Marzban (2009) this study finds that Islamic investors are not disadvantaged by the application of *shar'iah* screens alone.

The present study contributes to the need for substantive empirical research to investigate issues in Islamic finance. The results in this study show, for the first time and conclusively, that purification is not a trivial matter — comprehensive *shari'ah* compliance has significant faith and financial implications for compliant Muslim investors. In that regard, our findings significantly advance the empirical Islamic finance literature, specifically the debate about purification, as well as the broader SRI literature. We anticipate that our study, building as it does on Derigs and Marzban (2008) and Mulcahy (2013), will serve to create a broader awareness within the Islamic finance industry about the need to purify portfolio returns and the appropriate method for doing so. We believe that our findings will serve to stimulate the debate regarding the methodologies prescribed in Clauses 3/4/5/4 and 3/4/5/5 of S21 and lead to additional purification research in other jurisdictions where the prevailing attitude to and use of leverage by corporations tends to be different from the U.S.

References

AAOIFI, (2010), *Accounting, Auditing and Governance Standards (for Islamic Financial Institutions)*, English Version, Manama, Kingdom of Bahrain.

Abdelsalam, O., Fethi, M. D., Matallin, J. C., and Tortosa-Ausina, E. (2014), "On the comparative performance of socially responsible and Islamic mutual funds", *Journal of Economic Behavior and Organization*, 103 (Supplement), pp. 108–128.

Abdullah, F., Hassan, T., and Mohamad, S. (2007), "Investigation of performance of Malaysian Islamic unit trust funds", *Managerial Finance*, 33 (2), 142–153.

Adler, T. and M. Kritzman (2008), "The cost of socially responsible investing," *Journal of Portfolio Management*, 35, pp. 52–56.

Alam, N. and Rajjaque, M.S. (2010), "Shariah-compliant equities: Empirical evaluation of performance in the European market during credit crunch", *Journal of Financial Services Marketing*, 15 (3), pp. 228–240.

Albaity, M. and Ahmad, R. (2008), "Performance of Shariah and composite indices: Evidence from Bursa Malaysia," *Asian Academy of Management Journal of Accounting and Finance*, 4, pp. 23 – 43.

Al-Khazali, O., Lean, H.H. and Samet, A. (2014), "Do Islamic stock indexes outperform conventional stock indexes? A stochastic dominance approach", *Pacific-Basin Finance Journal*, 28, pp. 29–46.

Ajmi, A.N., Hammoudeh, S., Nguyen, D.K., and Sarafrazi, S. (2014), "How strong are the causal relationships between Islamic stock markets and conventional financial systems? Evidence from linear and nonlinear tests", *Journal of International Financial Markets, Institutions & Money*, 28, pp. 213–227.

Ashraf, D. (2013), "Performance evaluation of Islamic mutual funds relative to conventional funds", *International Journal of Islamic and Middle Eastern Finance and Management*, 6 (2), pp. 105–121.

Ashraf, D. (2014), "Does Shari'ah screening cause abnormal returns? Empirical evidence from Islamic equity indices", *Journal of Business Ethics*, doi: 10.1007/s10551-014-2422-2.

Ashraf, D. and Mohammad, N. (2014), "Matching perception with the reality — performance of Islamic equity investments", *Pacific-Basin Finance Journal*, 28, pp. 175–189.

Bauer, R., Koedijk, K., and Otten, R. (2005), "International evidence on ethical mutual fund performance and investment style", *Journal of Banking and Finance*, 29, pp. 1751–1767.

Bauer, R., Derwall, J., and Otten, R. (2007), "The ethical mutual fund performance debate: New evidence from Canada," *Journal of Business Ethics*, 70 (2), pp. 111–124.

Bauer, R., Otten, R., and Rad, A. T. (2006), "Ethical investing in Australia: Is there a financial penalty? *Pacific-Basin Finance Journal*, 14 (1), pp. 33–48.

Becchetti, L., Ciciretti, R., Dalò, A., and Herzel, S. (2015), "Socially responsible and conventional investment funds: Performance comparison and the global financial crisis", *Applied Economics*, 47 (25), pp. 2541–2562.

BinMahfouz, S. and Hassan, M. K., "Sustainable and socially responsible investing: does Islamic investing make a difference?" *Humanomics*, 29 (3), pp. 164–186,

Capelle-Blancard, G., and Monjon, S. (2014), "The performance of socially responsible funds: does the screening process matter?" *European Financial Management*, 20(3), pp. 494–520.

Chapra, M. U. (1984), "The nature of *riba* in Islam", Hamdard Islamicus, 7 (1), pp. 3–24.

Cooper, I. A. and Nyborg, K. G. (2006), "The value of tax shields IS equal to the present value of tax shields", *Journal of Financial Economics*, 81 (1), pp. 215–225.

Cooper, I. A. and Nyborg, K. G. (2007), "Valuing the debt tax shield", *Journal of Applied Corporate Finance*, 19 (2), pp. 50–59.

DeLorenzo, Y. T. (2002), "The religious foundations of Islamic finance", In Archer, S. and Karim, R. A. (Eds.), Islamic Finance, Innovation and Growth, Euromoney Books and AAOIFI, London, UK.

Derigs, U. and Marzban, S. (2008), "Review and analysis of current *shari'ah*-compliant equity screening practices", *International Journal of Islamic and Middle Eastern Finance and Management*, 1 (4), pp. 285–303.

Derigs, U. and Marzban, S. (2009), "New strategies and a new paradigm for *shari'ah*-compliant portfolio optimization", *Journal of Banking and Finance*, 33, pp. 1166–1176.

Derwall, J., Koedijk, K., and Ter Horst, J. (2011), "A tale of values driven and profit-seeking social investors", *Journal of Banking and Finance*, 35 (8), pp. 2137–2147.

Dewandaru, G., Bacha, O.I., Masih, M. and Masih, R. (2015), "Risk-return characteristics of Islamic equity indices: Multi-timescales analysis," *Journal of Multinational Financial Management*, 29, pp. 115–113.

Elfakhani, S., Hasan, M. K., and Sidani, Y. (2007), *Islamic mutual funds*, as Chapter 16 in M.K. Hassan and Mervyn Lewis (eds), "Handbook of Islamic Banking", Cheltenham, U.K. & Northhampton, MA: Edward Elgar.

El-Gamal, M. A. (2006), *Islamic Finance, Law, Economics and Practice*, Cambridge University Press, Cambridge, UK.

Elgari, M. A. (2000), "Purification of Islamic equity funds: methodology and *shari'ah* foundation", in Proceedings of the Fourth Harvard University Forum on Islamic Finance, Harvard University, Cambridge, MA.

Fabozzi, F. J., Ma, K. C., and Oliphant B. J. (2008), "Sin stock returns", *Journal of Portfolio Management*, 35, pp. 82–94.

Ferruz, L., Munoz, F., and Vargas, M. (2012), "Managerial abilities: evidence from religious mutual fund managers", *Journal of Business Ethics*, 105 (4), pp. 503–517

Fikriyah, A., Taufiq, H., and Shamser, M. (2007), "Investigation of performance of Malaysian Islamic unit trust funds: comparison with conventional unit trust funds," *Managerial Finance*, 33 (2), pp. 142–153.

Galema, R., Plantinga, A., Scholtens, B., (2008) "The stocks at stake: return and risk in socially responsible investment", *Journal of Banking and Finance*, 32, pp. 2646–2654.

Girard, E. and Hassan, M.K. (2008), "Is there a cost to faith-based investing? Evidence from FTSE indices", *Journal of Investing*, 17, pp. 112–121.

Hassan, M.K. and Girard, E. (2010), "Faith-based ethical investing: the case of Dow-Jones Islamic indexes," *Islamic Economic Studies*, 17(2), pp. 1–31.

Girard, E., Rahman, H., and Stone, B. (2007), "Socially responsible investments: goody-two-shoes or bad to the bone?", *Journal of Investing*, 16 (1), pp. 96–110.

Goldreyer, E.F., Ahmed, P., and Diltz, J. D. (1999), "The performance of socially responsible mutual funds: incorporating sociopolitical information in portfolio selection", *Managerial Finance*, 25 (1), pp. 23–36.

Gregory, A., and Whittaker, J. (2007), "Performance and Performance Persistence of 'Ethical' Unit Trusts in the UK", *Journal of Business Finance and Accounting*, 34(7/8), pp. 1327–1344.

Guyot, A. (2011), "Efficiency and dynamics of Islamic investment: Evidence of geopolitical effects on Dow Jones Islamic Market indexes", *Emerging Markets Finance and Trade*, 47 (6), pp. 24–45.

Hamilton, S., Jo, H. and Statman, M. (1993), "Doing well while doing good? The investment performance of socially responsible mutual funds," *Financial Analysts Journal*, 49 (6), pp. 62–66.

Hayat, R. and Kraeussl, R. (2011), "Risk and return characteristics of Islamic equity funds," *Emerging Markets Review*, 12, pp. 189–203.

Ho, C.S.F., Rahman, N.A.A., Yusuf, N.H.M. and Zamzamin, Z. (2014), "Performance of global Islamic versus conventional share indices: International evidence", *Pacific-Basin Finance Journal*, 28, pp. 110–121.

Hoepner, A. G. F., Rammal, H. G., and Rezecm M. (2011), "Islamic mutual funds' financial performance and international investment style: evidence from 20 countries", *European Journal of Finance*, 17 (9–10), pp. 828–850.

Hong, H., and Kacperczyk, M. (2009) "The price of sin: the effects of social norms on markets", *Journal of Financial Economics*, 93, 15-36.

Hussein, A.K. (2007), *"Islamic investment: Evidence from Dow Jones and FTSE indices"*. In: Iqbal, M., Ali S.S. and Muljawan, D. (Eds.), Advances in Islamic Economics and Finance, 1, Islamic Research and Training Institute, Jeddah, KSA, pp. 387 – 401.

Hussein, K., and Omran, M. (2005), "Ethical investment revisited: evidence from Dow Jones Islamic Indices", *Journal of Investing*, 14 (3), 105–124

Jawadi, F., Jawadi, N. and Louhichi, W. (2014), "Conventional and Islamic stock price performance: An empirical investigation", *International Economics*, 137, pp. 73–87.

Kamil, N.K.M., Alhabshi, S.O., Bacha, O.I. and Masih, M. (2014), "Heads we win, tails you lose: Is there equity in Islamic equity funds?", *Pacific-Basin Finance Journal*, 28, pp. 7–28.

Kok, S., Giorgioni, G., and Laws, J. (2009), "Performance of Shariah-compliant indices in London and NY stock markets and their potential for diversification", *International Journal of Monetary Economics and Finance*, 2 (3), pp. 398-408.

Kreander, N., Gray, R. H., Power, D. M., and Sinclair, C. D. (2005), "Evaluating the performance of ethical and non-ethical funds: a matched pair analysis", *Journal of Business Finance and Accounting*, 32 (7–8), pp. 1465–1493.

Kuran, T. (2005), "The logic of financial westernization in the Middle East", *Journal of Economic Behavior and Organization*, 56 (4), pp. 593–615.

Kurtz, L. (2008) "Socially responsible investment and shareholder activism", In A. Crane, A. McWilliams, D. Matten, J. Moon & D. Siegel (Eds.), The Oxford handbook of corporate social responsibility, pp. 249–280. Oxford, Oxford University Press.

Luo, H. A. and Balvers, R. J. (2015), "Social screens and systematic investor boycott risk", *Journal of Financial and Quantitative Analysis*, forthcoming.

Mallin, C.A., Saadouni, B., Briston, R.J., (1995), "The Financial Performance of Ethical Investment Funds", *Journal of Business Finance and Accounting*, 22 (4), pp. 483-496.

Maurer, B. (2002), "Anthropological and accounting knowledge in Islamic banking and finance: rethinking critical accounts", *Journal of Royal Anthropological Institute*, 8, pp. 645–667.

McMillen, M. J. (2011), "Islamic capital markets: market developments and conceptual evolution in the first thirteen years", working paper, University of Pennsylvania, Philadelphia, PA, USA, available at: http://ssrn.com/abstract=1781112 (accessed January 10, 2012).

Miles, J. and Ezzell, J. R. (1985), "Reformulating the tax shield: a note", *Journal of Finance*, 40, pp. 1485–1492.

Modigliani, F. and Miller, M. H. (1958), "The cost of capital, corporate finance and the theory of investment", *American Economic Review*, 48, pp. 261–97.

Modigliani, F. and Miller, M. H., (1963), "Corporate income taxes and the cost of capital: a correction", *American Economic Review*, 53, pp. 433–443.

Moore, P. (1997), "Islamic finance, a partnership for growth", in Archer, S. and Karim, R. A. (eds.), Islamic Finance, Innovation and Growth, Euromoney Books and AAOIFI, London, UK.

Mulcahy, M. B. (2013), "Purifying Islamic equities: the interest tax shield", *International Journal of Islamic and Middle Eastern Finance and Management*, 7 (4), pp. 473–484.

Nainggolan, Y., How, J., and Verhoeven, P. (2015), "Ethical screening and financial performance: the case of Islamic equity funds", *Journal of Business Ethics*, pp. 1–17.

Nofsinger, J., and Varma, A. (2014), "Socially responsible funds and market crises", *Journal of Banking and Finance*, 48, pp. 180–193.

Peillex, J. and Ureche-Rangau, L. (2013), "Is there a place for a Shariah-Compliant index on the Paris stock market?", *International Journal of Business*, 18 (2), pp. 131–150.

Pomeranz, F. (1997), "The Accounting and Auditing Organization for Islamic Institutions: an important regulatory debut", *Journal of International Accounting, Auditing and Taxation*, 6 (1), pp. 123–130.

Renneboog, L., Ter Horst, J., and Zhang, C. (2008a) "The price of ethics and stakeholder governance: The performance of socially responsible mutual funds", *Journal of Corporate Finance*, 4 (3), pp. 302–22.

Renneboog, L., Ter Horst, J., Zhang, C. (2008b) "Socially responsible investments: institutional aspects, performance, and investor behaviour", *Journal of Banking and Finance* 32 (9), pp. 1723–1742.

Schröder, M. (2007), "Is there a difference? The performance characteristics of SRI equity indices", *Journal of Business Finance and Accounting*, 34 (1–2), pp. 122–142.

Shank, T.M., Manullang, D.K. and Hill, R.P. (2005), "Is it better to be naughty or nice?", *Journal of Investing*, 14 (3), pp. 82–87.

Statman, M., and Glushkov, D. (2009) "The wages of social responsibility", *Financial Analysts Journal*, 65, pp. 33–46.

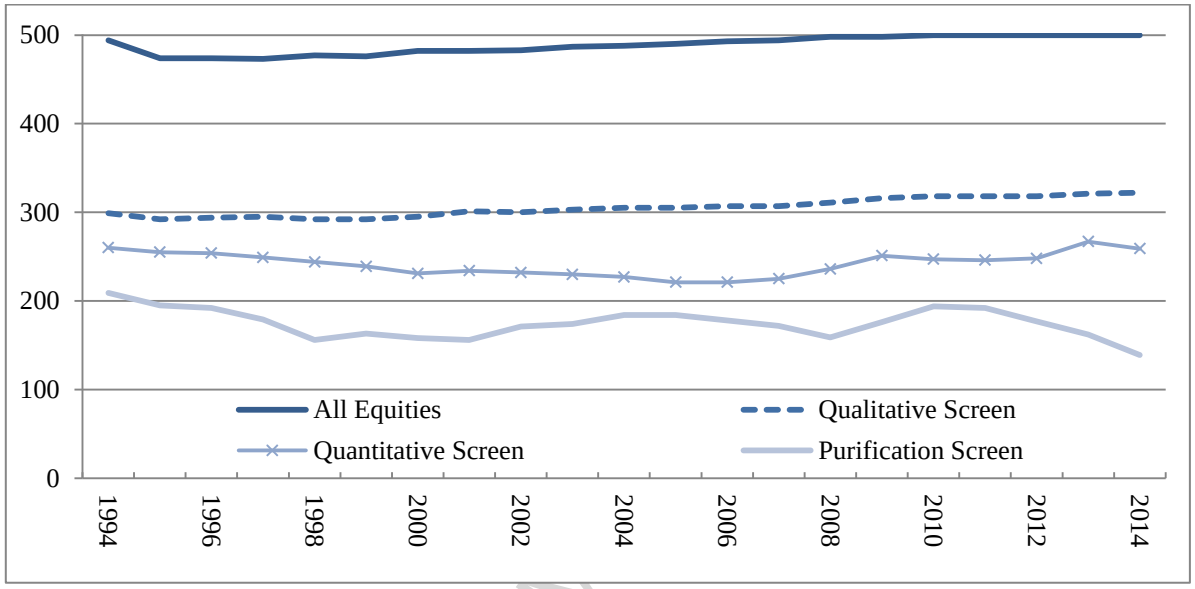
Walkshausl, C. and Lobe, S. (2012), "Islamic investing", *Review of Financial Economics*, 21, pp. 53–62.

Wilson, R., (2004) "Screening criteria for Islamic equity funds", in Islamic Asset Management: Forming the Future for *Shari'ah*-Compliant Investment Strategies, Jaffer, S. (ed.), pp. 35–45, Euromoney Books, London, UK.

Figure 1
The Effect of Screening

Panels A and B show the effect on the size of the sample following successive screens. The starting point is the universe of equities with available lagged market capitalization data in the S&P 500 index. Equities are then removed in the following order: equities failing qualitative screens, equities failing a quantitative screens, finally, equities without sufficient tax and interest data to test the cost of purification.

Panel A



Panel B

	94	95	96	97	98	99	00	01	02	03	04
All Equities	494	474	474	473	477	476	482	482	483	487	488
Qualitative Screen	299	292	294	295	292	292	295	301	300	303	305
Quantitative Screen	260	255	254	249	244	239	231	234	232	230	227
Purification Screen	209	195	192	179	156	163	158	156	171	174	184

	05	06	07	08	09	10	11	12	13	14	Avg.
All Equities	490	493	494	498	498	500	500	500	500	500	489
Qualitative Screen	305	307	307	311	316	318	318	318	321	322	305
Quantitative Screen	221	221	225	236	251	247	246	248	267	259	242
Purification Screen	184	178	172	159	176	194	192	177	162	139	184

Figure 2
Performance Comparison of a Replicated S&P 500 Index versus a Compliant Portfolio

These figures compare the performance of two portfolios for the period 1994–2014. The first is a replicated S&P 500 index. The second consists of all compliant equities, defined as those which pass qualitative and quantitative screens. Panel A shows the cumulative return of both portfolios, rebased to 31th December, 1993. Both portfolios are rebased to December 31st, 1993.

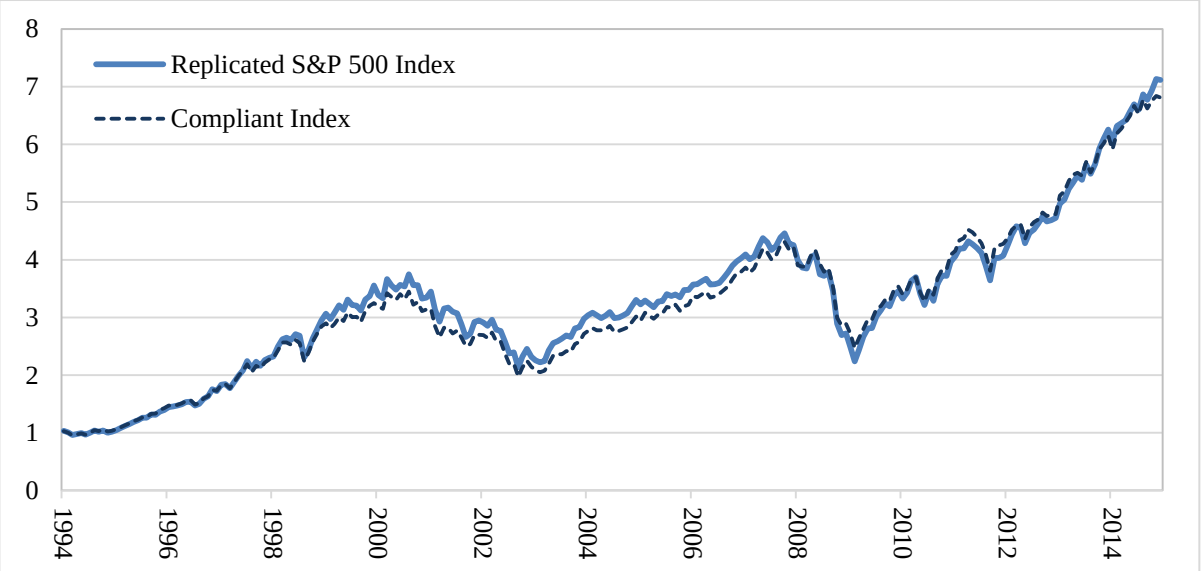


Figure 3
Cumulative Return Post Purification

This figure shows the cumulative gross and net returns of a benchmark portfolio that includes those compliant equities with data for purification from the S&P 500 Index for the period 1994–2014. The returns are shown gross (unpurified) and then net of purification costs estimated using three different methodologies — the dividend, investment and comprehensive methods. All portfolios are rebased to December 31st, 1993.

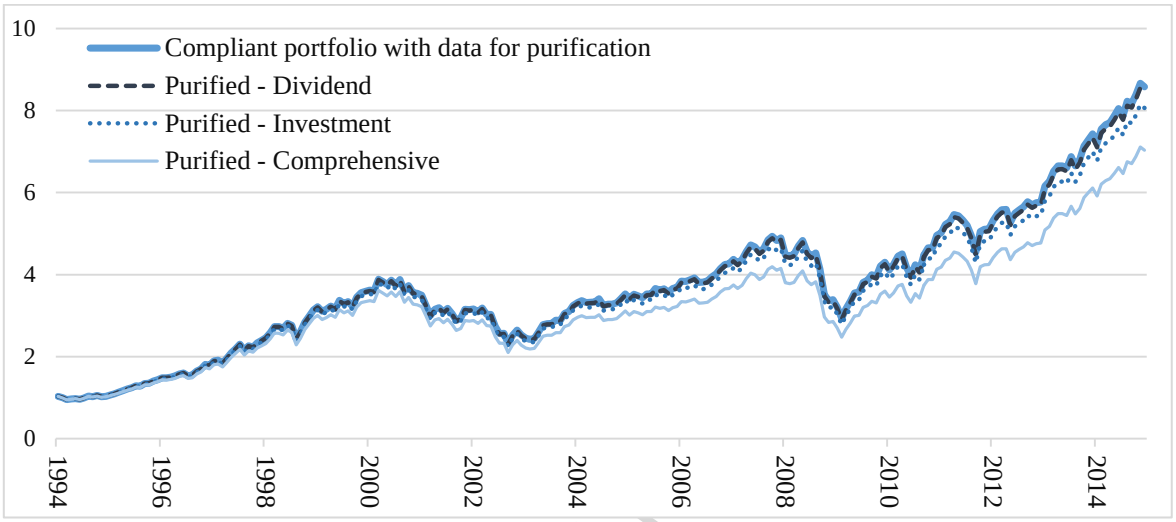


Figure 4
Cost of Purification

This figure shows the cost of purifying a benchmark portfolio that includes those compliant equities with data for purification from the S&P 500 Index for the period 1994–2014 using three different methodologies — the dividend, investment and comprehensive methods. Cost is shown as the proportion of the value of the total portfolio at the start of the year.

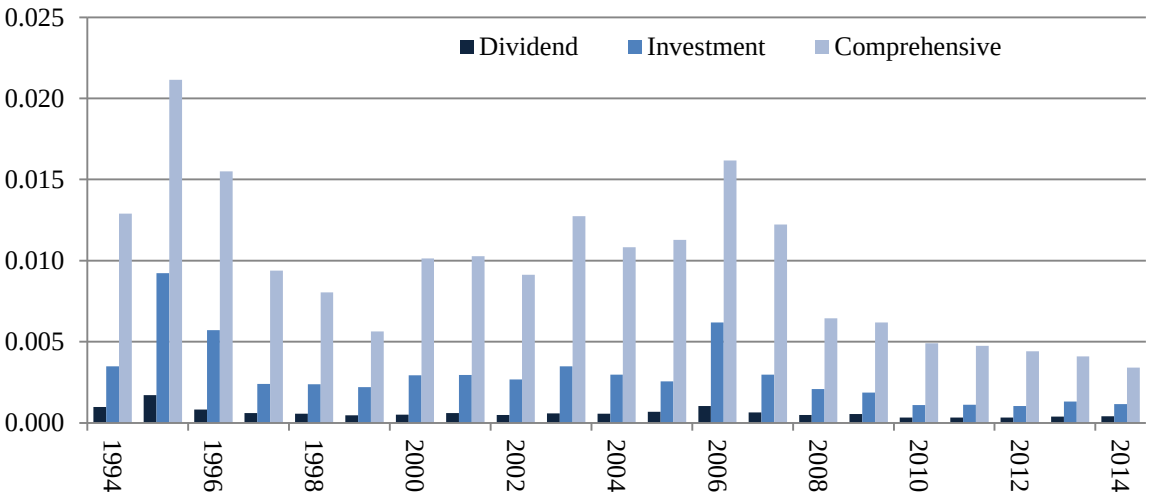


Figure 5
Relative Costs of Purification

This figure shows the relative cost of the dividend and investment methods versus the comprehensive method for the period 1994–2014. The cost of comprehensive method is shown as a multiple of the dividend and investment methods in each year.

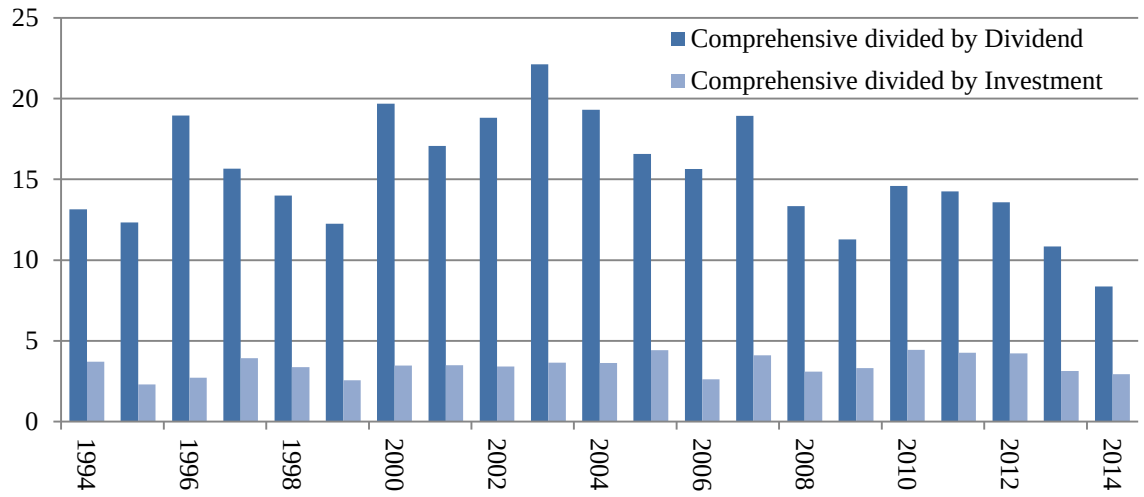


Table 1
Performance Comparison of Replicated and Compliant Portfolios

This table shows the performance of a replicated S&P 500 index and a portfolio of compliant equities for the period 1994–2014. For consistency, both are constructed from the same underlying data and methodology. The differences in return, excess return and volatility between the two are not statistically significant at the 90% level.

	Replicated S&P Index	Compliant Portfolio
Annual Return (%)	9.80	9.57
Annual Excess Return (%)	8.06	7.88
Annual Volatility (%)	14.66	13.56
Sharpe Ratio	0.55	0.58

Table 2
Compliant Portfolio Regression

The table shows the results of regressing the excess returns of the compliant portfolio first on the market portfolio and then against the market portfolio and the Fama-French size (SMB) and value (HML) factors, using the regression models $er_t^{ii} = \alpha + \beta_1 er_t^{S\&P} (+\beta_2 SMB + \beta_3 HML) + \varepsilon_t$. Coefficients that are statistically significant at the 95% level are shown in bold.

	Intercept α	Market Beta β_1	SMB β_2	HML β_3
Regression Co-efficient	0.0004	**0.8980**		
Standard Error	0.0006	0.0139		
Regression Co-efficient	0.0005	**0.8972**	-0.0326	**-0.0450**
Standard Error	0.0006	0.0139	0.0181	0.0199

Table 3
The Average Cost of Purification

This table shows the average annual cost of purification of a benchmark portfolio of compliant equities with data for purification using three different purification methodologies — the dividend, investment and comprehensive methods — from the S&P 500 for the period 1994–2014. The final three columns show the average annual difference between the methods. Standard errors are shown in in brackets. All results are statistically significant at the 1% level.

	Dividend	Investment	Comprehensive	Difference	Difference	Difference
	(1)	(2)	(3)	(2) - (1)	(3) - (1)	(3) - (2)
Average Cost (%)	0.06	0.29	0.95	0.23	0.89	0.66
	(0.01)	(0.04)	(0.10)	(0.04)	(0.09)	(0.06)

Table 4
Purified Portfolio Regression

The table shows the results of regressing the excess returns for each of the purification methodologies on the benchmark portfolio of compliant equities with data for purification and the Fama-French size (SMB) and value (HML) factors, using the regression model $er_t^{ii} = \alpha + \beta_1 er_t^{IP} + \beta_2 SMB + \beta_3 HML + \varepsilon_t$. Coefficients that are statistically significant at the 95% level are shown in bold and standard errors are shown in brackets.

	Intercept α	Market Beta β_1	SMB β_2	HML β_3
Purified — Dividend	**-0.000052**	**0.9999**	0.0000	0.0000
	(0.000002)	(0.0001)	(0.0001)	(0.0001)
Purified — Investment	**-0.000243**	**0.9995**	0.0001	-0.0003
	(0.000011)	(0.0003)	(0.0003)	(0.0004)
Purified — Comprehensive	**-0.000783**	**0.9989**	0.0001	-0.0010
	(0.000024)	(0.0006)	(0.0007)	(0.0008)

Table 5
Robustness Tests

This table show the summary results of two robustness tests. The first row reproduces the results for the market-weighted portfolio from Table 3. The next recreates the same analysis using the alternative equal weighted portfolio method. The results in the final row are based on using a constant tax rate of 35% (or zero if negative) to purify the market weighted portfolio. Standard errors are shown in brackets. All results are statistically significant at the 1% level.

	Dividend (1)	Investment (2)	Comprehensive (3)	Difference (2) - (1)	Difference (3) - (1)	Difference (3) - (2)
Market Weighted	0.06	0.29	0.95	0.23	0.89	0.66
	(0.01)	(0.04)	(0.10)	(0.04)	(0.09)	(0.06)
Equal Weighted	0.06	0.45	1.28	0.38	1.22	0.83
	(0.01)	(0.07)	(0.14)	(0.06)	(0.13)	(0.07)
Constant Tax Rate	0.06	0.29	1.12	0.23	1.06	0.83
	(0.01)	(0.04)	(0.12)	(0.04)	(0.11)	(0.08)