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Islamic religiosity and portfolio allocation: the Malaysian context

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Abstract

Purpose – This study aims to investigate the association between Muslim individuals’ portfolio allocation choice and Islamic religiosity (levels and dimensions), controlling for risk tolerance and sociodemographic factors.

Design/methodology/approach – The study uses primary data collected via survey questionnaires from a sample of 751 Muslim working individuals in Kuala Lumpur, Malaysia. Owing to the ordinal nature of the dependent variable, which reflects the levels of proportions of risky assets in portfolios, the data were analyzed using an ordered probit regression model.

Findings – The findings reveal that Islamic religiosity levels in general were insignificantly related to portfolio allocation, but that two dimensions of religiosity (virtue and obligation) significantly impact the allocations of risky assets in the portfolio. The higher the level of virtue, the lower the propensity to allocate risky assets into the portfolio. On the contrary, the higher the level of obligation, the higher the propensity to allocate risky assets in the portfolio. Meanwhile, individuals with higher risk tolerance, income and education levels show greater propensity to allocate risky assets in the portfolio.

Research limitations/implications – The sample is restricted to Muslims in Kuala Lumpur; hence, the findings are not easily generalized to Muslim investors in general. Findings may differ between Muslims across the world, so future research needs to expand from a country specific to an international analysis. In addition, future studies could include other determinants of portfolio allocation, such as financial literacy.

Practical implications – The findings of this study may assist financial planners and policymakers to better understand the drivers of portfolio allocation among their Muslim clients.

Originality/value – While other studies have tended to focus on the impact of religiosity on the holdings of specific financial assets, such as Islamic bank accounts or Takaful, the present study explores the effect of Islamic religiosity dimensions on the allocations of risky assets in the portfolio. The study also develops an ordinal measure of portfolio allocation and makes a methodological contribution by using an ordered probit regression analysis.

Keywords Islamic banking and finance, Islamic religiosity, Risk tolerance, Portfolio selection

Paper type Research paper

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1. Introduction

Portfolio allocation refers to an investor’s strategy of apportioning funds into different asset classes within his or her financial portfolio. The strategy aims to balance the investor’s risk and reward and is arrived at by measuring the percentage tradeoff between risk and return of each asset in an investment portfolio according to the investor’s risk tolerance, goals and time horizon (Yu, 2008). Funds in the portfolio may be allocated to different types of assets, such as fixed deposits, Treasury bills, bonds, stocks, unit trusts and real estate. Stock market and unit-trust investments are considered high-risk assets and are more volatile than government bonds, Treasury bills and fixed deposits – which offer lower, albeit safer, returns. However, because investors are usually risk-averse, participation in risky assets such as equity remains relatively low, despite their advantage of providing higher returns (van Rooij et al., 2011; Giannetti and Koskinen, 2010). Among the other possible reasons that people do not fully diversify their financial portfolios may be the lack of financial knowledge, lack of competence in engaging with sophisticated financial instruments (van Rooij et al., 2011; Mouna and Jarboui, 2015) and personal values that guide financial behavior (Agyemang and Ansong, 2016).

Mainstream finance theory advocates that an investor’s portfolio choices are driven by two key elements: risk and return (Markowitz, 1952). According to modern portfolio theory, the allocations of an individual’s portfolio are driven by his or her risk-taking behavior. For a certain level of expected return, investors will choose a portfolio that minimizes risk exposure, or for a certain level of risk exposure, investors will select a portfolio that gives the highest level of expected return. As such, decisions regarding savings and investments are a function of individual risk preferences. Empirically, the notion that risk-taking behavior plays an important determinant role in individuals’ financial decisions has also been widely investigated and supported by scholars in the field (Dimmock et al., 2016; Yilmazer and Lich, 2015).

From the perspective of other scholarly paradigms – such as psychology and religious studies – personality traits, including religious beliefs, have also been suggested as influential on households’ financial and economic behavior. Scholars have argued that religious beliefs give rise to the process of self-categorization that forms an individual’s identity (Benjamin et al., 2016). Self-categorization internalizes attitudes, beliefs and values, as well as the behavioral norms of the individual (Benjamin et al., 2016; Stets and Burke, 2000). Barro and McCleary (2003) opined that religions provide moral and ethical teachings for their believers, encouraging them to behave in a specific way. Religiosity shapes individuals’ values and norms, impacts their propensity to take risks and, hence, influences their actions relating to personal finance, including investment decisions (León and Pfeifer, 2013; Hess, 2012). Among the findings that have been observed in the literature are that individuals with higher levels of religiosity are more risk-averse than those who are non-religious (León and Pfeifer, 2013; Diaz, 2000); hence, they tend not to hold portfolios that expose them to high risk (Lu and Chan, 2012). Moreover, Muslims have been found to be less likely to invest in risky financial investments, such as stocks, than those of other religions (León and Pfeifer, 2013). A plausible reasoning behind Muslims’ risk-averse behavior is that, in Islam, Muslims are taught to avoid investments that involve excessive risk (gharar) or are speculative in nature (maysir). It would, therefore, be reasonable to believe that the risk aversion behavior in Muslims reflects Islamic teachings related to financial conduct.

While Muslims are taught to be risk-averse, the proliferation of Islamic finance across the globe has widened the opportunity for Muslims to invest in various risky investments that are Shariah-compliant. Malaysia’s stock market, for example, has been described as “one of the most prominent emerging markets in the region” (Mohd. Yusof and Abd. Majid, 2008), and as of November 2016, three quarters of the total securities listed on the Kuala Lumpur
Stock Exchange comprised Shariah-compliant securities. Malaysia’s financial services market is also rapidly developing, offering customers various Shariah-compliant wealth management products, such as Islamic unit trusts and Takaful. The wide range of Islamic financial products available suggests that Muslim investors in Malaysia have the option of choosing Shariah-compliant financial products of varying risk exposures to form their financial portfolios. However, despite the growth of Islamic capital markets in Malaysia, studies have suggested that participation in Islamic financial services is still low (Jamshidi et al., 2015; Thambiah et al., 2011). This suggests that there remains much that industry players and policymakers can do to increase participation in the Islamic financial market.

Based on these discussions, the main objective of this paper is to examine the impact of Islamic religiosity on the portfolio allocation of Muslim individuals in Malaysia. The two measures of religiosity used in this study are religiosity levels and religiosity dimensions. Religiosity levels relate to the degree of devoutness of a Muslim, while religiosity dimensions relate to the aspect of faith, virtue, obligation and optional practices. To test the influence of the two different measurements of religiosity, two ordered probit regression estimation models are used, with portfolio allocation as the dependent variable in both models. In addition, the role of sociodemographic factors and risk tolerance levels on portfolio allocation will also be included to ensure robustness of the analyses.

This study contributes to the literature in two ways. First, it fills a gap in the literature by bridging the paradigms of religiosity and personal finance. Specifically, it examines portfolio allocation from the perspective of the various religiosity dimensions. Second, the study makes a unique methodological contribution by using the ordered probit regression analysis in examining portfolio allocation. Past studies examining religiosity and asset choices have used other types of analysis, ranging from multivariate quantitative analysis such as stochastic dynamic programming models and ordinary least square regressions (Mouna and Jarboni, 2015) to qualitative methods such as semi-structured interviews (Jaiyeoba and Haron, 2016). In this study, the non-parametric ordered probit regression is taken as a suitable method of analysis because of the unique measurement of portfolio allocation, which is ordinal in terms of the composition of risky assets in the portfolio.

This study will shed light on whether Muslim investors in Malaysia are taking full advantage of having mixed portfolios of safe and risky assets that could maximize their wealth and achieve their financial goals. The findings from this study will allow academics and policymakers to better understand the role of religiosity in the determination of individuals’ financial portfolios, so that efforts can be taken to promote investor participation in more sophisticated Islamic financial products, such as Islamic unit trusts and equities.

The rest of this paper continues as follows. Section 2 deals with the relevant literature that underlies the study. Section 3 outlines the research methodology. Section 4 presents the findings of the study. The final section discusses and concludes the study.

2. Literature review

2.1 Portfolio allocation

Modern portfolio theory asserts that investors’ decisions on wealth allocation across different categories of assets are determined by the trade-off between expected return and the riskiness of assets in the portfolio (Markowitz, 1952). The theory suggests that, while the main criterion considered by investors in their portfolio allocation decision is the trade-off between risk and return, investors will hold a proportion of risky assets in their portfolios, and that this proportion reflects their risk tolerance levels. The theory further suggests that a range of different types of assets constituting different levels of risks and expected returns – and hence, the diversification of assets – is a key to reducing the riskiness of the portfolio. Risk-averse
individuals will choose to hold risky assets, provided that they are sufficiently compensated by appropriate returns (Eeckhoudt et al., 2005; Ismal, 2014; Gollier et al., 2013).

Empirically, the tenets of modern portfolio theory have often been challenged, although the evidence relating risk-taking attitudes and portfolio allocation is inconclusive (Ameer, 2015; Jaiyeoba and Haron, 2016; Lee and Veld-Merkoulova, 2016). Prior research shows that there are various other factors affecting risk tolerance and the portfolio allocation decision. These include demographic factors such as age, income, gender, education and religiosity (Duasa and Yusof, 2013; Aren and Aydemir, 2015; Mahmood and Shah, 2015; Pyles et al., 2016), as well as behavioral factors such as financial literacy, financial strategies, personal values and financial needs (Guiso and Jappelli, 2008; Agyemang and Ansong, 2016; Aren and Zengin, 2016). Building upon suggestions from the literature, this study focuses on exploring the role of religiosity on portfolio allocation, controlling for risk tolerance and demographic factors.

2.2 Religiosity
Religiosity is defined as belief in the presence of God and obedience of the rules defined by God (McDaniel and Burnett, 1990), and is divided into two dimensions: extrinsic and intrinsic religiosity (Allport, 1956; Allport and Ross, 1967; Vitell et al., 2006). Researchers have attempted to measure indicators of religiosity by examining individuals' commitment to religion, the strength of their religious beliefs, their participation in religious activities individually or as part of a congregation and religious practices (Lehrer, 2004; Rusu and Turliuc, 2011).

In regards to Islamic religiosity, the measurements that have been used in previous studies are varied. Taai (1985) combined recommendable (sunnah) and obligatory (wajib) practices to measure Muslims' level of religiosity. Recommendable practices are those such as seeking knowledge and performing recommendable prayers, while obligatory practices are those such as praying five times a day and fasting during the month of Ramadan (Taai, 1985). Khraim (2010) proposed four dimensions to measure Islamic religiosity, including financial service, seeking religious education, Islamic current issues and sensitive products, while Rehman and Shabbir (2010) proposed five dimensions, namely, ideological (overall beliefs associated with a religion); ritualistic (prayer, fasting and pilgrimage); intellectual (an individual's knowledge of the religion); consequential (the importance of religion) and experimental (the practicality of the religion). Likewise, El-Menouar (2014) proposed five dimensions to measure Islamic religiosity – namely, basic religiosity, central religiosity duties, religious experience, religious knowledge and orthopraxis. Besides the common constructs, such as belief and practice, religious altruism (which deals with good relations with parents and relatives) and enrichment (activities that lead to the acquisition of Islamic knowledge and spiritual experience) have been used to measure the level of Islamic religiosity among Muslims (Tiliouine and Belgoumidi, 2009).

While there is no unanimity in outlining the dimensions of religiosity, the general view of researchers is that religiosity is a multidimensional construct. Based on this standpoint, this study upholds the idea of presenting Islamic religiosity as a multidimensional construct and explores those constructs comprehensively.

2.3 Religiosity and portfolio allocation
In Islam, Muslims are taught to avoid investments that are speculative in nature. This teaching is embedded in the concept of maysir, which means hoping to gain something valuable with ease and without paying an equivalent compensation for it (Ayub, 2009). Maysir denotes the acquisition of wealth by chance, whether or not it deprives others of rights (Hameed, 2009). Islamic principles strictly forbid maysir, as this reflects taking a gamble. In the Holy Quran, Allah (SWT) said:
They ask you concerning wine and maysir. Say: In them is a great sin as well as a benefit to people, but the sin is greater than the benefit (Al-Baaarah, 2: 219).

Apart from the element of maysir, Islam prohibits investing in assets that are uncertain in nature (gharar). Owing to the nature of the uncertainty and risk caused by gharar, the majority of Muslim jurists generally agree on its prohibition. While there is no specific authority from the Quran highlighting gharar, Allah (SWT) mentions that:

Eat not your property among yourselves unjustly by falsehood and deception, except it be a trade amongst you by mutual consent (Al-Bakarah, 2:188; Al-Nisa, 4:29).

This suggests that Muslims should strictly avoid assets or investments that are uncertain in nature, and should only engage in transactions that are certain and clear with transparent guidelines. Speculative and uncertain investments should be avoided because of the inherent injustice in their mechanisms, as well as the creation of social harm in the form of inflation, unemployment, volatility, instability and environmental degradation (Paldi, 2014).

Apart from the avoidance of the gharar and maysir elements of investments, Muslims are also confined by the practice of virtue and ethics that may affect their behavior and financial conduct. In Arabic terms, this is referred to as akhlaq. The significance of ethics is emphasized in financial investments, as some investors do not only seek profits through their investments but also require the achievement of a moral duty beside the accumulation of wealth (Shakeel, 2015; Anas and Mounira, 2009).

The scholarly literature also suggests that religiosity affects people’s risk-taking behavior and portfolio allocations. This conception is grounded in social identity theory, which advocates that an individual’s identity is the outcome of a self-categorization process closely linked to his or her affiliation to a social group, reflecting the religious association of the individual (Benjamin et al., 2010). Consequently, a person’s character and actions are strongly shaped by this affiliation, as the values, attitudes and beliefs are espoused as the behavioral norms of their respective groups (Stets and Burke, 2000).

As a cultural dimension that is embedded into an individual’s identity, religion has considerable impact on individuals’ economic and financial behavior (Benjamin et al., 2016; Heinemann and Schneider, 2011; Arora and Marwaha, 2014; Yusuff and Mansor, 2016). Empirical studies support this idea and have documented evidence that religion and religiosity affect an individual’s decisions in relation to finance and investments, as well as risk-taking behavior. Generally, the literature indicates a positive relationship between religiosity and risk aversion, whereby individuals with higher religiosity levels are more likely risk averse (Chen et al., 2016; Jiang et al., 2015; León and Pfeifer, 2013; Renneboog and Spaenjers, 2012; Lu and Chan, 2012; Hryshko, 2006; Miller, 2000). As a result of being more risk averse; therefore, they are less likely to participate in risky investments (Davutyan and Öztürkkal, 2016; Tahir and Brimble, 2011; Antara et al., 2016; Yusuff and Mansor, 2016).

The findings of past studies suggest that religion and religiosity play a role in risk-taking behavior, implying also that the allocation of financial assets in a portfolio is likely to be influenced by religiosity factors. Hence, this study posits that higher levels of Islamic religiosity (levels and dimensions) will negatively influence the propensity to allocate risky assets in the portfolio.

3. Methodology
The data used in this study were collected through survey questionnaires among Muslim working individuals in Kuala Lumpur, Malaysia. The purpose of targeting working individuals is that it may be reasonable to expect that working individuals would have
various forms of financial assets, both safe and risky. The sample was collected via a non-probability convenience sampling approach.

The questionnaire instrument was developed from a pilot study to ensure that the questions and their sequence were comprehensible (Hunt et al., 1982). During this pilot study, we selected ten Muslim respondents, consisting of three finance scholars and a remaining seven who we believed held some form of financial asset. The questionnaire was first reviewed by three finance scholars with experience in financial research and Islamic studies. Next, seven working adult Muslims were invited to participate in the pilot study. We refined the questionnaire on the basis of the financial scholars’ and the working adult Muslims’ feedback. Based on the revised questionnaire, 1,000 questionnaires were distributed. Finally, 751 usable and complete responses were returned, yielding a response rate of about 75 percent, which can be considered sufficiently large for statistical reliability.

The questionnaire was worded in English and consisted of three sections. The first section focused on the demographic profiles of the respondents. The second section involved a portfolio allocation choice that was developed on the basis of studies by Hochguertel et al. (1997), Tung et al. (2014) and Van Rooij et al. (2011). The final section asked about Islamic religiosity values, and was mainly based on the studies of Wan Ahmad et al. (2008) and Tiliouine and Belgoumidi (2009). Data management and analysis was performed using SPSS v[0.20] and STATA v.10.1.

3.1 Measurement of variables
3.1.1 Dependent variable: portfolio allocation. The dependent variable examined in this study is portfolio allocation. A simple, qualitative measurement was developed to indicate the propensity to allocate risky assets in the portfolio. We asked respondents “Which combination of the financial assets below best describes your savings and investments?” The purpose of this question was to allow the respondents to give a simple approximation of the allocation to low risk and risky assets in their portfolios. The respondents were presented with five categories of options to choose from:

1. 100 per cent low risk;
2. 75 per cent low risk and 25 per cent high risk;
3. 50 per cent low risk and 50 per cent high risk;
4. 75 per cent high risk and 25 per cent low risk; and
5. 100 per cent high risk.

The choice of Option (1) or (2) would suggest a lower propensity to hold risky assets in the portfolio, while the choice of Option (3) or (4) indicates a lower propensity to hold risky assets in the portfolio.

To assist respondents in answering this question, we first provided a two-category classification of assets to clarify the types of financial assets that would be categorized as low risk and those that would be classified as risky. Low-risk financial assets included cash, bank accounts, cash value life insurance, family takaful; and Risky financial assets referred to stocks and shares, unit trusts and managed funds, investment-linked insurance, commodity futures and equities. This categorization was based on suggestions from previous research (Duasa and Yusof, 2013; Bertaut and Starr-McCluer, 2002; Hochguertel et al., 1997).

From the responses, we later re-categorized these options into three groups for simpler interpretation. The categories reflect the ordinal measurement of the propensity to hold risky assets in the portfolio:
Safe portfolio (reflecting Options 1 and 2); Balanced portfolio (reflecting Option 3); and Risky portfolio (reflecting Options 4 and 5).

### 3.1.2 Independent variables

#### 3.1.2.1 Islamic religiosity

To measure Islamic religiosity, we adapted the measurement scales used by Wan Ahmad et al. (2008) and Tiliouine and Belgoumidi (2009) to capture the various domains of religiosity, including the faith, beliefs and practices of Muslims. Using 29 items, an exploratory factory analysis (EFA) was first run to test for internal consistency and to establish the underlying latent constructs of religiosity. For the factor loadings of the EFA, we use a benchmark of 0.6, as suggested by Hair et al. (2014). As a result, nine items from 29 were discarded because of low factor loadings, and the EFA on the remaining 20 items produced a five-factor solution. However, we discarded the fifth factor, as it only included two items. Next, we conducted a reliability test using Cronbach’s alpha; the four remaining factors produced high reliability scores (Cronbach alpha between 0.706 and 0.856). The results of the EFA and the corresponding Cronbach alphas are shown in Table I.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Item</th>
<th>Factor loading</th>
<th>Cronbach’s alpha</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1 (Faith)</td>
<td>Islam is the way of life</td>
<td>0.875</td>
<td>0.856</td>
<td>3.9268</td>
</tr>
<tr>
<td>Factor 1 (Faith)</td>
<td>Quranic teachings are applicable in today’s life</td>
<td>0.864</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 1 (Faith)</td>
<td>Rasulullah’s traditions are applicable throughout all times</td>
<td>0.785</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 1 (Faith)</td>
<td>There is only one God (Allah)</td>
<td>0.745</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 1 (Faith)</td>
<td>All mankind deeds will be judged and rewarded accordingly after death</td>
<td>0.554</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 1 (Faith)</td>
<td>One will feel discomfort when missing worship time (such as prayer)</td>
<td>0.543</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 2 (Virtue)</td>
<td>I fulfill all that I promise</td>
<td>0.803</td>
<td>0.8294</td>
<td>3.2770</td>
</tr>
<tr>
<td>Factor 2 (Virtue)</td>
<td>I advise others to do good and avoid evil</td>
<td>0.759</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 2 (Virtue)</td>
<td>I care about neighbors and their wellbeing</td>
<td>0.752</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 2 (Virtue)</td>
<td>I am honest at all times</td>
<td>0.684</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 2 (Virtue)</td>
<td>I worry if I cannot pay debt on time</td>
<td>0.668</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 2 (Virtue)</td>
<td>I visit my family/friend when they are bedridden</td>
<td>0.622</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 3 (Obligation)</td>
<td>I fast the whole of Ramadan</td>
<td>0.787</td>
<td>0.7809</td>
<td>3.7353</td>
</tr>
<tr>
<td>Factor 3 (Obligation)</td>
<td>I pray five times a day</td>
<td>0.717</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 3 (Obligation)</td>
<td>I pay zakat fitrah every year</td>
<td>0.686</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 3 (Obligation)</td>
<td>I make sure the food and drink I consumed are halal</td>
<td>0.656</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 3 (Obligation)</td>
<td>I make sure that my dressing covers my aurat</td>
<td>0.647</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 4 (Optional)</td>
<td>I go to the mosque to pray salat fardh</td>
<td>0.637</td>
<td>0.706</td>
<td>3.0271</td>
</tr>
<tr>
<td>Factor 4 (Optional)</td>
<td>I read the Quran and perform zikr</td>
<td>0.620</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 4 (Optional)</td>
<td>I give charity for religious purposes</td>
<td>0.615</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 4 (Optional)</td>
<td>My earnings are from my own efforts and none from Allah’s will</td>
<td>-0.560</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 5b</td>
<td>I have taken interest (riba)</td>
<td>0.801</td>
<td>0.6552</td>
<td></td>
</tr>
<tr>
<td>Factor 5b</td>
<td>I have taken or given bribes</td>
<td>0.783</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 5b</td>
<td>I ask Allah’s pardon for wrong saying or lies</td>
<td>0.429</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:** a Items discarded because of low factor loadings of below 0.6; b Factor discarded as only two items loaded on this factor; c Mean was computed based on the items with factor loadings of at least 0.6

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**Table I.**

Exploratory factor analysis of Islamic religiosity

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3.1.2.1.1 Islamic religiosity levels. Islamic religiosity was measured using two methods. In the first method, respondents were segregated into three groups to reflect the relative strength of their levels of religiosity: Casual, Moderate and Devout, following past studies by Wan Ahmad et al. (2008) and Jamaludin (2013). To perform this categorization, we first took the mean score of the 20 items that had factor loadings above 0.6 for all respondents, producing a grand mean score for religiosity level. We then computed the standard deviation. Given that the grand mean score is 3.67, we categorized the respondents as Casual if their religiosity mean score was 0.5 standard deviations below the mean ($\mu < 3.367$). Respondents who had religiosity mean scores that fell between 3.367 and 3.643 were categorized as Moderate ($3.367 < \mu < 3.643$), while those who had religiosity mean scores of above 3.643 were categorized as Devout ($\mu \geq 3.643$). Descriptive statistics of the religiosity levels are presented later in Table III. These categories will be used to assess the impact on portfolio allocation choice (Model 1).

3.1.2.1.2 Religiosity dimensions. The second method of assessing religiosity involved using the four dimensions of Islamic religiosity produced by the factor analysis procedure from Section 3.1.3. As noted from Table I, the factor analysis produced four reliable dimensions. Following Wan Ahmad et al. (2008), we renamed the first factor “Faith” (four items), the second factor “Virtue” (six items), the third factor “Obligation” (five items) and the fourth factor “Optional” (three items). These four dimensions will be assessed in terms of their strengths in determining portfolio allocation choice (Model 2).

3.1.3 Control variables

3.1.3.1 Risk tolerance. The measurement for risk tolerance was adapted from the Survey of Consumer Finances, a comprehensive triennial survey of American household finances by the US Federal Reserve. The question was worded as follows “Which of the following statements comes closest to describing the amount of financial risk that you are willing to take when you save or make investments?” with four options available:

1. Take substantial financial risks expecting to earn substantial returns.
2. Take above-average financial risks expecting to earn above-average returns.
3. Take average financial risks expecting to earn average returns.
4. Not willing to take any financial risks.

3.1.3.2 Sociodemographic variables. Demographic profiles of respondents were also obtained for analysis. For multivariate analyses, gender, marital status, ethnicity and education were measured as dummy variables (Gender: Male = 1, Female = 0; Marital status: Married = 1, Single/Divorced/Widowed = 0; Ethnicity: Malay = 1, Non-Malay = 0; Education: Tertiary = 1, Non-tertiary = 0). The other demographic variables were measured as categorical variables. Age was categorized into five groups (Age_1: Below 25; Age_2: 25-34; Age_3: 35-44; Age_4: 45-54; Age_5: 55 and above), and monthly income was categorized as six groups (Income_1: Less than RM2,000; Income_2: RM2,000-RM3,999; Income_3: RM4,000-RM5,999; Income_4: RM6,000-RM7,999; Income_5: RM8,000-RM9,999; Income_6: RM10,000 and above).

4. Analysis and results

4.1 Descriptive analyses

The descriptive statistics are presented in Table II. From the total of 751 responses, approximately 56.7 per cent were male and most of the respondents (47.3 per cent) were in the age range of 25-34 years. Almost all respondents were Malay (97.2 per cent), which was not surprising given that the study aimed to examine the portfolio allocation choices of Muslims and the majority of Muslims in Malaysia are Malays. In regards to the level of
<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequency (n = 751)</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>426</td>
<td>56.7</td>
</tr>
<tr>
<td>Female</td>
<td>325</td>
<td>43.3</td>
</tr>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below 25</td>
<td>128</td>
<td>17.0</td>
</tr>
<tr>
<td>25-34</td>
<td>355</td>
<td>47.3</td>
</tr>
<tr>
<td>35-44</td>
<td>161</td>
<td>21.4</td>
</tr>
<tr>
<td>45-54</td>
<td>86</td>
<td>11.5</td>
</tr>
<tr>
<td>Above 55</td>
<td>21</td>
<td>2.8</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malay</td>
<td>730</td>
<td>97.2</td>
</tr>
<tr>
<td>Chinese</td>
<td>6</td>
<td>0.8</td>
</tr>
<tr>
<td>Indian</td>
<td>3</td>
<td>0.4</td>
</tr>
<tr>
<td>Bumiputera Sabah/Sarawak</td>
<td>8</td>
<td>1.1</td>
</tr>
<tr>
<td>Others</td>
<td>4</td>
<td>0.5</td>
</tr>
<tr>
<td>Level of Education</td>
<td></td>
<td></td>
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<tr>
<td>Secondary level</td>
<td>44</td>
<td>5.9</td>
</tr>
<tr>
<td>Certificate level</td>
<td>34</td>
<td>4.5</td>
</tr>
<tr>
<td>Diploma level</td>
<td>139</td>
<td>18.5</td>
</tr>
<tr>
<td>Bachelor’s degree</td>
<td>384</td>
<td>51.1</td>
</tr>
<tr>
<td>Master’s degree</td>
<td>125</td>
<td>16.6</td>
</tr>
<tr>
<td>PhD</td>
<td>25</td>
<td>3.3</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>298</td>
<td>39.7</td>
</tr>
<tr>
<td>Married</td>
<td>439</td>
<td>58.5</td>
</tr>
<tr>
<td>Divorced/Widowed</td>
<td>14</td>
<td>1.9</td>
</tr>
<tr>
<td>Monthly Ind. Income</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;RM2000</td>
<td>159</td>
<td>21.2</td>
</tr>
<tr>
<td>RM2000-RM3999</td>
<td>266</td>
<td>35.4</td>
</tr>
<tr>
<td>RM4000-RM5999</td>
<td>163</td>
<td>21.7</td>
</tr>
<tr>
<td>RM6000-RM7999</td>
<td>72</td>
<td>9.6</td>
</tr>
<tr>
<td>RM8000-RM9999</td>
<td>53</td>
<td>7.1</td>
</tr>
<tr>
<td>&gt;RM10,000 and above</td>
<td>38</td>
<td>5.1</td>
</tr>
<tr>
<td>Portfolio Allocation choice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100% low risk</td>
<td>308</td>
<td>41.0</td>
</tr>
<tr>
<td>75% low risk and 25% risky</td>
<td>285</td>
<td>37.9</td>
</tr>
<tr>
<td>50% low risk and 50% risky</td>
<td>111</td>
<td>14.8</td>
</tr>
<tr>
<td>25% low risk and 75% risky</td>
<td>43</td>
<td>5.7</td>
</tr>
<tr>
<td>100% risky</td>
<td>4</td>
<td>0.5</td>
</tr>
<tr>
<td>Portfolio Allocation choice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safe Portfolio</td>
<td>593</td>
<td>78.9</td>
</tr>
<tr>
<td>Balanced Portfolio</td>
<td>111</td>
<td>14.8</td>
</tr>
<tr>
<td>Risky Portfolio</td>
<td>47</td>
<td>6.3</td>
</tr>
</tbody>
</table>

**Religiosity levels**

Table II.
Descriptive analysis (continued)
education, about half of the respondents (51.1 per cent) had a bachelor’s degree, about 20 per cent were postgraduates and the rest either had a diploma, a certificate or high school. Almost 60 per cent of the respondents were married. In terms of monthly income, most respondents (35.4 per cent) earned RM2,000-RM3,999; 21.7 per cent earned RM4,000-RM5,999; 21.2 per cent earned below RM2,000; and the remaining earned RM6,000 or more.

In regards to portfolio allocation, 79 per cent of respondents held safe portfolios, about 15 per cent held balanced portfolios and the remaining 6 per cent held risky portfolios. From the total of 751 respondents, a rather balanced proportion fell into the three religiosity groups: 218 casual respondents (29 per cent), 270 moderate respondents (36 per cent) and 63 devout respondents (35 per cent).

In terms of risk tolerance, most respondents (34.6 per cent) were willing to take on average risks to obtain average returns. The second largest group of respondents (32.1 per cent) was not willing to take any financial risk. The third largest group of respondents (17.6 per cent) was willing to take on substantial risk to obtain substantial returns. Finally, 15.6 per cent of respondents were willing to take on above-average risk to obtain above-average returns.

4.2 Bivariate tests
Next, we investigate the association between portfolio allocation choice and religiosity levels by performing a cross-tabulation using Pearson’s chi-square tests (Table III). The results, however, yielded statistically insignificant results ($\chi^2 = 4.186, p > 0.05$).

We then ran a one-way analysis of variances (ANOVA) with portfolio allocation choice as the dependent variable and the four religiosity dimensions as the independent variables.
Table IV. ANOVA: portfolio allocation choice and dimensions of religiosity

<table>
<thead>
<tr>
<th>Dimension</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faith</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between</td>
<td>2</td>
<td>0.096</td>
<td>0.048</td>
<td>0.853</td>
<td>0.427</td>
</tr>
<tr>
<td>Within</td>
<td>748</td>
<td>42.251</td>
<td>0.056</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Akhlaq</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between</td>
<td>2</td>
<td>0.42</td>
<td>0.21</td>
<td>0.941</td>
<td>0.391</td>
</tr>
<tr>
<td>Within</td>
<td>748</td>
<td>166.86</td>
<td>0.223</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obligation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between</td>
<td>2</td>
<td>0.971</td>
<td>0.486</td>
<td>3.07</td>
<td>0.047</td>
</tr>
<tr>
<td>Within</td>
<td>748</td>
<td>118.324</td>
<td>0.158</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optional</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between</td>
<td>2</td>
<td>1.538</td>
<td>0.769</td>
<td>2.236</td>
<td>0.108</td>
</tr>
<tr>
<td>Within</td>
<td>748</td>
<td>257.356</td>
<td>0.344</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Results suggest that there are significant differences between portfolio allocation choice with the **obligation** dimension of religiosity ($F = 3.07, p < 0.05$).

**4.3 Multivariate analyses: ordered probit regression**

**4.3.1 Model specification.** To deal with the first research objective, we performed a multivariate analysis with portfolio allocation (measured as three ordered categories) as the dependent variable. Given the ordinal nature of the dependent variable, an ordered probit regression model was selected as the most appropriate analysis. The ordered probit model is suitable non-parametric technique for modeling-dependent variables with categories of some qualitative rank of order. In this case, respondents could have a portfolio consisting mostly of safe assets; a balanced portfolio consisting of both safe and risky assets; or a portfolio consisting mostly of risky assets. These categories represent an ordered form, although no fixed magnitude exists among the categories.

Using STATA version 10.1, we estimated the ordered probit model using the following specification:

$$T_i^* = \beta z_i + \varepsilon_i$$

where $T_i^*$ represents the dependent variable, which is the portfolio allocation for respondent $i$; $z_i$ is a vector of explanatory variables denoting the independent variables under consideration (risk tolerance, religiosity and demographic variables); $\beta$ is the vector of parameters for estimation; and $\varepsilon_i$ is the random error term that is assumed to be normally distributed.

The portfolio allocation with ordered categories, $T_i$, is determined from the model as follows:

$$T_i^* = \begin{cases} 
0 & \text{if } T_i^* \leq 0 \\
1 & \text{if } 0 < T_i^* \leq \mu_1 \\
2 & \text{if } \mu_1 < T_i^* \leq \mu_2
\end{cases}
$$

(portfolio of safe assets)

(balanced portfolio)

(portfolio of risky assets)

where $\mu_1$ represents the thresholds to be estimated together with the parameter vector $\beta$. 
The probabilities related with the coded responses of an ordered probit model are as follows:

\[ P_n(0) = \Pr(T_n = 0) = \Pr(T_n^* \leq \mu_1) = \Pr(\beta z_n + \varepsilon \leq \mu_1) \]
\[ = \Pr(\varepsilon \leq \mu_1 - \beta z_n) = \Phi(\mu_1 - \beta z_n) \]
\[ P_n(1) = \Pr(T_n = 1) = \Pr(\mu_1 < T_n^* \leq \mu_2) \]
\[ = \Pr(\varepsilon \leq \mu_2 - \beta z_n) - \Pr(\varepsilon \leq \mu_1 - \beta z_n) \]
\[ = \Phi(\mu_2 - \beta z_n) - \Phi(\mu_1 - \beta z_n) \]
\[ P_n(k) = \Pr(T_n = k) = \Pr(\mu_k < T_n^* \leq \mu_{k+1}) \]
\[ = \Phi(\mu_{k+1} - \beta z_n) - \Phi(\mu_k - \beta z_n) \]
\[ P_n(K) = \Pr(T_n = K) = \Pr(\mu_K < T_n^*) \]
\[ = 1 - \Phi(\mu_K - \beta z_n) \]

where \( n \) is an individual, \( k \) is the response chosen, \( P(T_n = k) \) is the probability that individual \( n \) responds in manner \( k \) and \( \Phi() \) is the standard normal cumulative distribution function. The parameters \( \beta \) to be estimated will be interpreted such that positive signs indicate a higher proportion of risky assets held in the portfolio relative to the base group (for dummy/dichotomous variables) (Greene, 2000, for more details on ordered probit models).

4.3.2 Results. Two models were evaluated in this study: Model 1 consisting of religiosity levels (casual, moderate and devout), and Model 2 consisting of four religiosity dimensions (faith, virtue, obligation and optional). The full results are displayed in Table V.

As can be seen from the results of the overall model in Table V, the likelihood ratio \( \chi^2 \) for Models 1 and 2 is 57.22 (\( p < 0.00 \)) and 66.84 (\( p < 0.00 \)), respectively. This suggests that the overall models are acceptable, as they fit significantly better than models with no predictors.

The results of the ordered probit from Model 1 demonstrate that Islamic religiosity levels do not influence the portfolio allocation choice of Muslims (\( \beta = 0.203, p < 0.05 \)). On the contrary, we find evidence from Model 2 that two religiosity dimensions significantly influence portfolio allocation choice. Virtue appeared to influence portfolio allocation with the expected negative sign of relationship (\( \beta = -0.261, p < 0.05 \)). The obligation dimension displayed an even stronger relationship with portfolio allocation (\( \beta = 0.437, p < 0.05 \)). The coefficient was, however, positive and contrary to the expected sign. Meanwhile, the two other dimensions (faith and optional) displayed insignificant relationships with portfolio allocation. These results provide partial support for our hypothesis that Islamic religiosity dimensions have a significant influence on portfolio allocation.

In both models, we observe a strong statistical influence between risk tolerance and portfolio allocation choice. As opposed to the base group (those willing to take above-average risk), respondents from the other risk tolerance groups had significantly lower propensities to allocate risky assets in the portfolio. The risk tolerance coefficient for “Not willing” was the highest and had the strongest statistical significance (Model 1: \( \beta = -0.791, p < 0.05 \); Model 2: \( \beta = -0.746, p < 0.05 \)), suggesting that those not willing to take any financial risk had significantly lower propensities to allocate risky assets in the portfolio.

Furthermore, in both models, education appeared to be a significant determinant of portfolio allocation (Model 1: \( \beta = 0.317, p < 0.05 \); Model 2: \( \beta = 0.331, p < 0.05 \)). This implies that more educated Muslims (those with tertiary education) had a higher propensity to hold risky assets in their portfolios than did those lacking tertiary education. Income was also found to be an important determinant of portfolio allocation choice. These results show that all income groups were less likely to allocate risky
assets in their portfolios than the base group (the highest income group), although with varying degrees of significance.

5. Discussion and conclusion
This section recapitulates the main findings and provides a discussion of the results. The first key finding of our study is that Islamic religiosity levels do not influence Muslims’ portfolio allocation. This implies that whether a Muslim is considered devout or otherwise, there is no effect on his or her propensity to allocate risky assets in the portfolio. Nonetheless, there is evidence that specific dimensions of religiosity impact portfolio allocation. The results of this study lend support to the literature linking

Table V. Ordered probit regression on portfolio allocation choice

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1 Coefficients</th>
<th>Model 2 Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>0.106 (0.106)</td>
<td>0.071 (0.107)</td>
</tr>
<tr>
<td>Malay</td>
<td>-0.097 (0.307)</td>
<td>-0.027 (0.308)</td>
</tr>
<tr>
<td>Education</td>
<td>0.317** (0.130)</td>
<td>0.331** (0.131)</td>
</tr>
<tr>
<td>Marital status</td>
<td>-0.048 (0.130)</td>
<td>-0.097 (0.132)</td>
</tr>
<tr>
<td>Age_1</td>
<td>0.266 (0.394)</td>
<td>0.346 (0.401)</td>
</tr>
<tr>
<td>Age_2</td>
<td>0.246 (0.373)</td>
<td>0.342 (0.381)</td>
</tr>
<tr>
<td>Age_3</td>
<td>0.024 (0.374)</td>
<td>0.113 (0.382)</td>
</tr>
<tr>
<td>Age_4</td>
<td>0.488 (0.380)</td>
<td>0.535 (0.386)</td>
</tr>
<tr>
<td>Income_1</td>
<td>-0.159 (0.247)</td>
<td>-0.173 (0.250)</td>
</tr>
<tr>
<td>Income_2</td>
<td>-0.425** (0.219)</td>
<td>-0.451** (0.220)</td>
</tr>
<tr>
<td>Income_3</td>
<td>-0.300 (0.207)</td>
<td>-0.329 (0.209)</td>
</tr>
<tr>
<td>Income_4</td>
<td>-0.705** (0.206)</td>
<td>-0.714** (0.260)</td>
</tr>
<tr>
<td>Income_6</td>
<td>-0.621** (0.312)</td>
<td>-0.596* (0.315)</td>
</tr>
</tbody>
</table>

Risk Tolerance
- Substantial risk 0.420** (0.167) -0.412** (0.167)
- Average risk -0.468** (0.145) -0.451** (0.146)
- Not willing to take risk -0.791** (0.157) -0.746** (0.158)

Religiosity Levels
- Casual -0.151 (0.138) -
- Moderate 0.112 (0.123) -

Religiosity Dimensions
- Faith 0.013 (0.229)
- Virtue -0.261** (0.124)
- Obligation 0.437** (0.170)
- Optional 0.142 (0.105)

Thresholds
- $\mu_1$ 0.402 (0.534) 1.800 (1.150)
- $\mu_2$ 1.180 (0.537) 2.590 (1.152)
- $\chi^2$ 57.22 66.84
- P > $\chi^2$ 0.000 0.000
- Pseudo $R^2$ 0.0693 0.0693

Notes: * and ** denotes 0.10 and 0.05 significance level; Standard errors are denoted in parentheses; Base groups are Age_5 (for age); Income_5 (for income); Devout (for religiosity levels); Above Average (for Risk Tolerance)
Specifically, two dimensions of Islamic religiosity were found to have some impact on Muslims’ propensity to allocate risky assets in the portfolio. The first of these is *virtue* (*akhlaq*). The results indicate that, the higher the individual’s level of virtue, the lower the propensity to allocate risky assets in the portfolio. In Islam, it is fundamental that one practice and demonstrate good *akhlaq* in all aspects of life, including financial conduct. In regards to portfolio allocation decisions, investors may not only want to seek profits through their investments but may also wish to fulfill a moral duty beside the desire to accumulate wealth (Shakeel, 2015; Anas and Mounira, 2009). The findings of this study support the idea that Muslim investors’ propensity to hold safe portfolios is influenced by their sense of virtue and morality, as taught in Islam.

The second religiosity dimension found to have an impact on portfolio allocation is *obligation*, with a counterintuitive positive sign of relationship. The results suggest that, the higher the obligation dimension, the greater the propensity to allocate risky assets in the portfolio. One possible justification for this surprising result is that the measurement of risky assets in this study may also include *Shariah*-compliant risky assets, such as Islamic unit trust funds and permissible public-listed equities. Given the proliferation of Islamic banking and finance in Malaysia, Muslims are now presented with a wider variety of saving and investment options to form their financial portfolios. Hence, although an individual may have a higher obligation dimension score, the wide availability of *Shariah*-compliant investment funds substantiates the propensity to allocate risky assets in the portfolio. Another possible reason is that the sample consisted of a high percentage of highly educated individuals, who can be presumed to have greater knowledge of financial matters and therefore to have a higher tendency to hold risky assets.

Another major conclusion of this study is that the results reveal that an individual’s portfolio allocation choice is highly associated with that individual’s risk attitudes. This finding is in line with mainstream finance theory such as the modern portfolio theory (Markowitz, 1952) and other studies (Carducci and Wong, 1998; Grable, 2000). When individuals are more risk tolerant, they are more likely to hold risky financial assets in their portfolios. Traditional finance theory suggests that the risk–return relationship is the sole determinant of portfolio choices; investors who are less risk tolerant (hence, more risk-averse) would require higher compensation as a reward for taking higher risk. The results of the present study support the classical risk–return notion of modern portfolio theory, that risk tolerance is a dominant factor influencing portfolio allocation decisions.

In regards to demographic variables, the results suggest that education plays a vital role in influencing individuals’ portfolio allocations, supporting the literature (Guise and Jappelli, 2008; Alessie et al., 2011; Wan Ahmad et al., 2008; Riley and Chow, 1992). It can be reasonably presumed that the more highly educated a person is, the better he or she is able to understand the technicalities and the risk associated with each asset class. Hence, more highly educated investors would have the ability to more effectively build portfolios that would satisfy their financial goals. In regards to income, the literature suggests that households with higher levels of net income have a higher propensity to hold risky assets, such as stocks, than lower-income households (Dohmen et al., 2011; Renneboog and Spaenjers, 2012). Similarly, our results provide evidence supporting the literature, as most of the lower income groups had lower propensities to allocate risky assets in their portfolios than did the reference group (those in the highest income group).
We discuss the implications of the results of this study for practice and research. In regards to practical implications, this study has revealed that *virtue* is negatively related to the holdings of risky assets. Meanwhile, education positively influences the allocations of risky assets in the portfolio. Hence, we suggest that the Securities Commission and Malaysia International Islamic Financial Centre (MIFC) work closely in conducting seminars to increase the public awareness on the many good *Shariah*-compliant investment opportunities that are available in the market. In addition, there is a need to educate and raise confidence in investors that these firms are also socially responsible companies with a strong sense of goodwill and high standards of morality toward society. Malaysia is one of the largest Islamic financing hubs, and one that continuously innovates ranges of various investment products for investors seeking better returns, while remaining within *Shariah* principles. Conducting public seminars for potential investors will, therefore, raise the public awareness and understanding of *Shariah*-compliant financial assets and will encourage investors to build their portfolios to include *Shariah*-compliant investment funds available on the Islamic capital market, such as PNB Shariah Aggressive, Manulife Investment Shariah Progress, Eastspring Investments Dana al-Ilham, the Bursa Malaysia Shariah index and other funds. Furthermore, the findings of this study imply that financial planners should take multiple factors into account (including religiosity, risk tolerance and sociodemographic factors) when offering advice on the allocation of risky assets in their clients’ portfolios.

In regards to the methodological approach used in this study, an ordered probit regression[2] was used to analyze portfolio allocation. The choice of this means of analysis in this study was heavily determined by the measurement of the dependent variable, *portfolio allocation*, which is ordinal in nature. Ideally, the best data to measure household financial portfolio allocations would be to extract objective financial measures such as the actual amounts of financial assets that are allocated into safe and risky assets, followed by a computation of ratios or percentages. This would lead to a perceptually more robust continuous value of the composition of risky assets held in the portfolio. This type of measurement, however, has its disadvantages. First, the computation of ratios or percentages requires respondents to report exact dollar amounts of each of their financial assets; computation of these may be challenging. Respondents may not know the actual current values of each type of asset, and extracting such information could be burdensome, tedious and time-consuming for respondents. In addition, scholars have suggested that the attempts to obtain continuous measurements could lead to erroneous reporting of financial data, spurious estimates of assets and net worth (Alessie *et al.*, 1999), and high rates of non-response (*Juster and Smith*, 1997). On account of these complexities, the present study developed a simpler measurement for portfolio allocation, measured by a qualitative, subjective measure that is ordinal in nature. We caution other researchers attempting to conduct similar investigations on household finances to evaluate the pros and cons of collecting actual financial data and to consider the advantages of nonparametric types of econometric models, such as the ordered probit model.

Finally, no research is without limitations. The first limitation of this study is that, as our sample was limited to Muslims in Kuala Lumpur, Malaysia, our findings cannot be generalized to Muslim investors in general. Findings may differ between Muslims across the world, so future research could expand from country-specific to an international analysis. The second limitation is that this study only focused on Islamic religiosity, controlling for risk tolerance and sociodemographic factors. Apart from religiosity, other factors, such as financial literacy, may also impact portfolio allocation. Future studies could thus include this variable into the estimation model.
Note

1. Ordered probit regressions have been employed in various other fields of study, including transportation (Eboli et al., 2016; Ye and Lord, 2014), economics (Pietrovito et al., 2016), public health (Tan and Yen, 2017; Avsar et al., 2017) and consumer studies (Nakamura, 2016).

References


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