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Does Faith Move Stock Markets? Evidence from Saudi Arabia

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Does Faith Move Stock Markets? Evidence from Saudi Arabia *

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Abstract

This paper investigates the effects of religious beliefs on stock prices. Our findings support the viewpoint that the religious tenets have important bearing on portfolio choices of investors. It is found that Shariah-compliant stocks have higher return and volatility than their non-Shariah compliant counterparts.

Keywords: Islamic religion, stock returns, volatility, stochastic dominance, Saudi Arabia
JEL Code: G11, C11, C22.

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1 Introduction

The role of beliefs, social norms and values has not been widely studied in financial literature. Yet, it seems intuitive that individuals operating in di erent social environments would exhibit di erent behavior. In the end, markets do not make decisions, but people do and interactions among individual choices, corporate culture and social norms are unavoidable.

whereas the non-Arab resident proportion is close to zero.

It is clear from the few highlights above that Islamic religion plays an integral part of everyday life in the country determining much of the interaction within the society. The prominent role of religion in the society together with recent developments of the Saudi stock market constitute a rare opportunity for a social scientist to observe a phenomenon in an almost lab-made experiment in which to test the e ect of religious tenets on financial markets: starting from 2001 onward, first-time local individual investors (i.e. not institutional or professional mutual fund managers) entered a "conventional" (i.e. not only Islamic finance oriented) and relatively thin stock market in large number and started trading massively.

A natural question arises at this point: Is portfolio selection of market participant0s4OG@+fiGLGan0e4 +fixHfix:3LO:HL/d

2 Background and Theoretical Motivation

Economists have long realised the importance of understanding individual portfolio choice. A rich theoretical literature demonstrates how portfolio decisions depend on factors such as risk aversion and investment opportunities. Early contributions analyse static models in which an investor selects the portfolio that maximizes expected utility function given total wealth and the risk-return patters of available assets (Tobin (1958)). More recent research has moved to a dynamic framework in which a portfolio is selected to maximize expected lifetime utility. The empirical literature on portfolio choice seeks to find observable variables that explain cross-sectional variations in portfolio behavior. Typically, covariates include resources available to the household (total wealth and income) as well as demographic characteristics (age, race, gender, marital status). The role of religion has received little attention, yet in many communities religious tenets play a role in shaping economic behavior and market outcomes, overriding at times the profit motive.

In this paper we aim at investigating if religion a ects portfolio selection. From the theoretical point of view our paper relates to the literature of ethical investments where portfolio selection is realised on the basis of ethical principle along with the traditional mean-variance relation. Following this literature we postulate that investors' religious considerations restrict the set of securities available for portfolios selection to a subset of the available stocks in the market. Testing whether religion a ects portfolio selection directly requires micro-level data on individual ownership. Ideally, one should analyse the link between the level of religiosity and risk attitude. Unfortunately, micro-level data are not available to us. Therefore, we adopt and indirect approach and analyse the return behavior in the Saudi stock market. Underneath this approach lays the

to infer that at least during the period of price run-up the most active participants were first-time local investors attracted into the stock market in large number by returns which were well above the stock fundamental values.

In behavioral finance literature individual investors are often viewed as noise-traders (see for example Black (1986) or Kyle (1985)). Several studies confirm that noise-traders (also called uninformed investors) acting on non-fundamental information a ect the level of asset prices by trading when markets are unusually bullish or bearish. Noise traders acting in concert on non-fundamental signals can introduce a systematic risk which should manifest itself as added price volatility of assets a ected by the actions of noise traders. In the literature an example of profitable destabilizing e ects of uninformed investors is given in the seminal article by De Long et al. (1990) where it is shown that in a perfectly competitive economy with risk-averse agents, retails traders bearing a larger amount of risk relative to rational investors, may earn higher than expected returns. The case of imperfectly competitive markets is considered in Palonimo (1996) were it is shown that noise traders earn higher returns than rational investors. Palonimo argues that if speculation based on irrational beliefs breeds imitation, noise traders are not driven out of the market and influence prices. The thinner the market, the larger the relative share of uninformed investors. As a result noise traders risks and the rewards stemming fromG0f4O@H cmrethiGH0m4Gxfi3G+0r4:@x:fi33:0i4V

Table1. Ranking of Shariah-compliant stocks by sector.

Sector	Stock Category		
	Halal	Mixed	Haram
Bank	11	0	89
Cement	0	100	0
Industrial	10	90	0
Services	65	35	0
Agriculture	100	0	0

Mixed Stock Descriptive Statistics

	Size	Mean	Std. Dev.	Min	Max
Bank	0	-	-	-	-
Cement	8	12.21	12.00	3	23.3
Industrial	22	8.27	12.25	0.4	53.6

where P_t and P_{t-1} are the closing prices on day t and t − 1, respectively. The Dickey-Fuller test for stationarity wa

From Table 2 it also appears that stock returns in each of the sectors are negatively skewed and leptokurtic, as the skewness and kurtosis indices are higher than zero and three, respectively. Excess kurtosis in stock returns has been well documented in many equity market studies in both developed and emerging markets.

The preliminary investigation in Table 2 suggests that the magnitude of the standard deviation of returns is a good match with Table 1, where the ranking of the sectors according to the degree of Shariah-compliance is reported. In order to further investigate this issue, below we use the stochastic dominance method to compare the returns in di erent sectors of the Saudi stock market. The theory of stochastic dominance provides a systematic framework

Linton et al. (2005) consider the Kolmogorov-Smirnov distance between functional of the empirical distribution functions of the returns and define the test statistic as

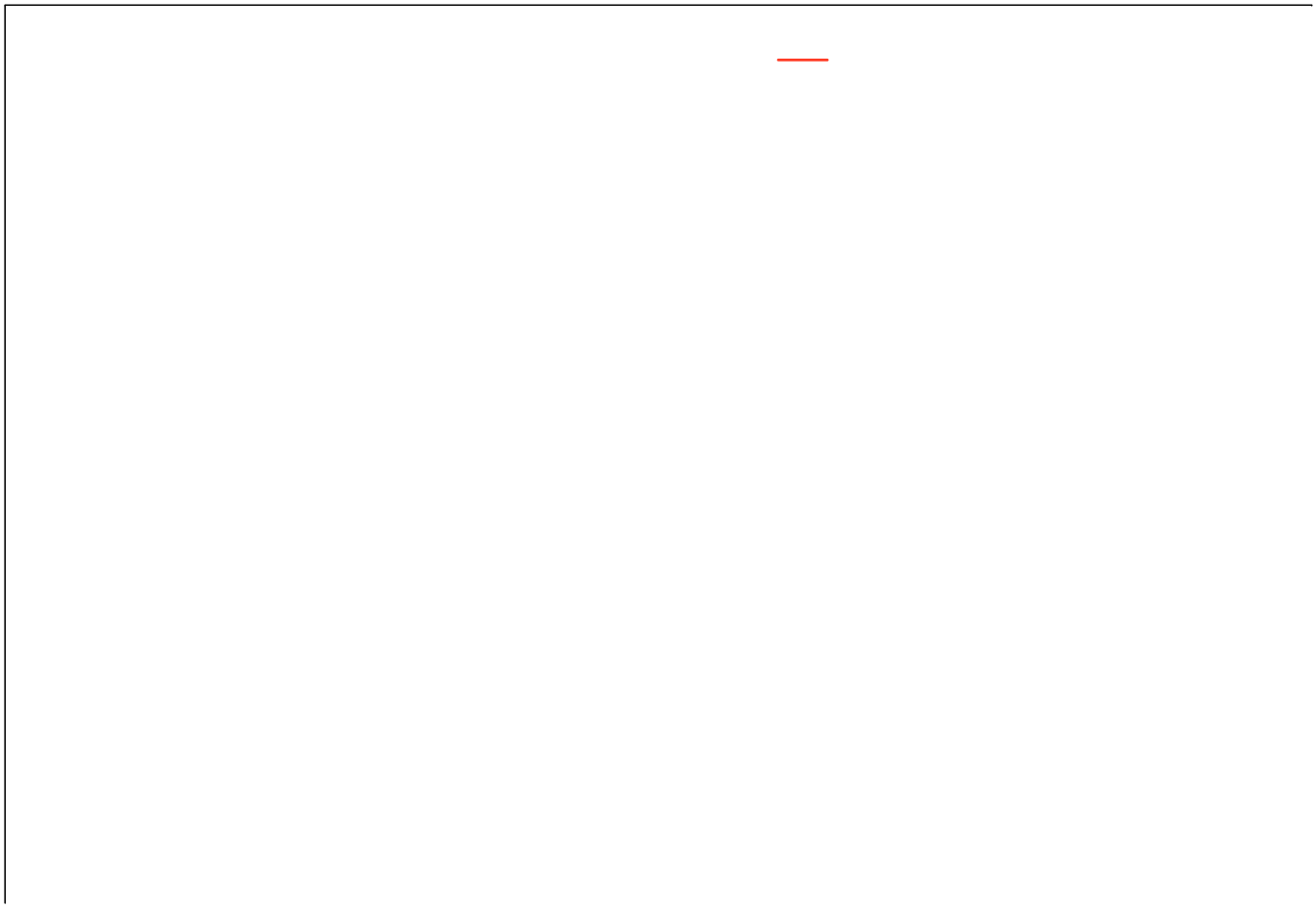
$$\hat{\Lambda} = \min \sup_{x \in \mathbb{R}} \sqrt{N} \left| \hat{D}_i^s(x; \hat{F}_i) - \hat{D}_j^s(x; \hat{F}_j) \right| . \tag{2}$$

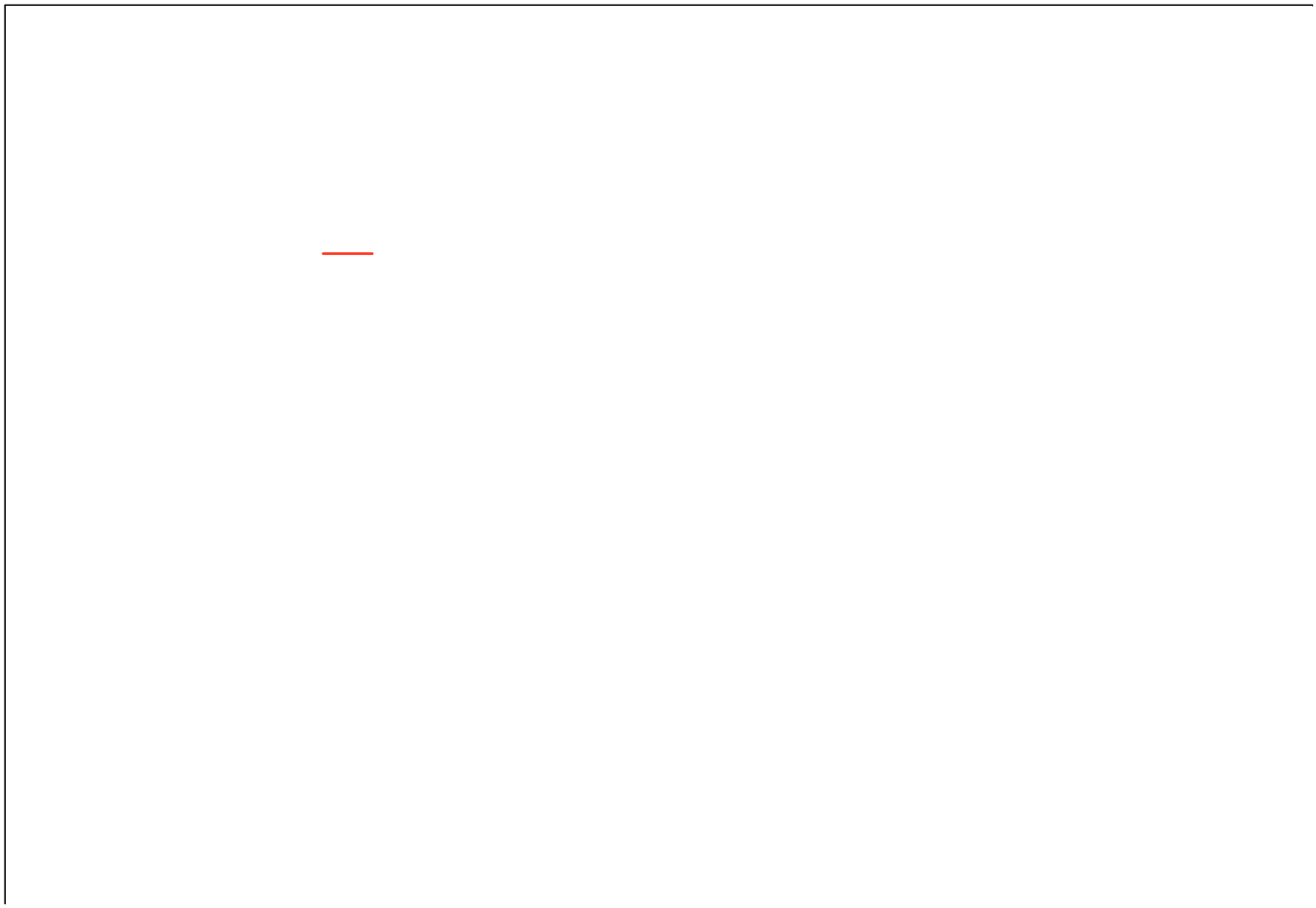
where $t = 1, ..., N$ and

$$\hat{D}_i^s(x; \hat{F}_i) = \frac{1}{N(s-1)!} \sum_{t=1}^{T} 1(X_{it} \leq x)(x - X_{it})^{s-1} \tag{3}$$

and $\hat{D}_j^s$ is similarly defined. Under suitable regularity conditions Linton et al. (2005) show that $\hat{\Lambda}$ converges to a functional of a Gaussian process. However, the asymptotic null distribution of $\hat{\Lambda}$ depends on the unknown population distributions, therefore in order to estimate the asymptotic p-values of the test we use the overlapping moving block bootstrap method. Let B be the number of bootstrap replications and b the size of the block. The bootstrap procedure involves calculating the test statistics in $\hat{\Lambda}$

In order to investigate if Shariah Law a ects stock returns we compare the distribution of returns in the Agricul-





other sectors. From the p-values in Table 3a appears that the null hypothesis that the returns in the banking sector stochastically dominate the returns in each of the other sectors is strongly rejected for both the sub-periods.

With regard to the middle panel returns in Industrial sector SSD returns in the Banking and Cement sectors in all periods under consideration, whereas the null hypotheses is rejected for the other sectors and the TASI. In the bottom panel the null hypothesis that Cement SSD Bank is not rejected. However, looking at the top panel the hypothesis that Bank stochastically dominates Cement w

Table 3a. P-values for the test for first and second order stochastic dominance (returns) by sector.

Sector	Period	SD	Bank	Industrial	Cement	Services	Agriculture	Tasi
Bank	2002-	2nd	-	0.000	0.008	0.000	0.000	0.003
	2006	1st	-	0.009	0.005	0.005	0.000	0.001
	2006	2nd	-	0.004	0.002	0.000	0.009	0.005
	2008	1st	-	0.009	0.009	0.009	0.000	0.002

Table 3b. Continue.

Sector	Period	SD	Bank	Industrial	Cement	Services	Agriculture	Tasi
Services	2002-	2nd	0.583	0.880	0.999	-	0.089	0.876
	2006	1st	0.449	0.000	0.002	-	0.000	0.999
	2006-	2nd	0.432	0.795	0.284	-	0.010	0.995
	2008	1st	0.762	0.003	0.000	-	0.056	0.271
	2002-	2nd	0.519	0.697	0.792	-	0.031	0.999
	2008	1st	0.681	0.006	0.007	-	0.004	0.638
Agriculture	2002-	2nd	0.882	0.825	0.999	0.835	-	0.999
	2006	1st	0.022	0.992	0.999	0.029	-	0.887
	2006	2nd	0.253	0.679	0.999	0.673	-	0.999
	2008	1st	0.019	0.999	0.142	0.019	-	0.526
	2002-	2nd	0.763	0.312	0.835	0.792	-	0.999
	2008	1st	0.024	0.999	0.999	0.011	-	0.762
Tasi	2002-	2nd	0.851	0.636	0.876	0.000	0.000	-
	2006	1st	0.295	0.039	0.995	0.028	0.000	-
	2006-	2nd	0.607	0.622	0.278	0.000	0.000	-
	2008	1st	0.008	0.018	0.999	0.034	0.005	-
	2002-	2nd	0.832	0.743	0.638	0.003	0.000	-
	2008	1st	0.025	0.011	0.995	0.019	0.009	-

Note: The p-values are obtained using the bootstrap algorithm described in Section 3 with $B = 1000$ replications.

Table 4a. P-values for the test for first and second order stoc

Table 4b. Continue

Sector	Period	SD	Bank	Industrial	Cement	Services	Agriculture	Tasi
Services	2002-	2nd	0.999	0.968	0.999	-	0.010	0.964
	2006	1st	0.954	0.556	0.976	-	0.010	0.763
	2006-	2nd	0.999	0.720	0.976	-	0.024	0.940
	2008	1st	0.930	0.337	0.835	-	0.020	0.738
	2002-	2nd	0.999	0.973	0.999	-	0.009	0.912
	2008	1st	0.974	0.802	0.971	-	0.015	0.613
Agriculture	2002-	2nd	0.998	0.995	0.999	0.995	-	0.999
	2006	1st	0.972	0.955	0.989	0.663	-	0.950
	2006-	2nd	0.999	0.999	0.999	0.999	-	0.999
	2008	1st	0.988	0.990	0.989	0.930	-	0.956
	2006-	2nd	0.999	0.998	0.867	0.999	-	0.974
	2008	1st	0.975	0.911	0.729	0.932	-	0.780
Tasi	2002-	2nd	0.541	0.000	0.514	0.000	0.038	-
	2005	1st	0.620	0.000	0.032	0.009	0.019	-
	2006	2nd	0.856	0.008	0.008	0.006	0.027	-
	2008	1st	0.909	0.009	0.209	0.005	0.010	-
	2002-	2nd	0.763	0.018	0.137	0.012	0.011	-
	2008	1st	0.536	0.006	0.022	0.013	0.002	-

Note: The p-values are obtained using the bootstrap algorithm described in Section 3 with $B = 1000$ replications.

To summarise our results, the stochastic dominance analysis reveals that portfolios of stocks containing Shariah-compliant assets are more volatile than stocks in other sectors. It appears that the volatility of a portfolio is closely related to the degree of Sharah-compliant element contained. Moreover, the high0i4WfiHx8GG30k4:xfiWH0S4O reliiality 8x

during the 1990s in the US and suggested that the run-up in stock price volatility was driven by sociological and psychological factors and not justified on the base of changes in the fundamentals. In Section 2 it is postulated that by increasing trade volume for Shariah-compliant stocks religious tenets a ect the volatility of returns. In order to test this hypothesis we now investigate to what extent volatility in a given sector is a ected by changes in trade volume. If religious prescriptions are binding, then investors should select Shariah-compliant stocks. As individual investors mainly place small orders, we should see that the rate of change in the trade volume should a ect volatility more in Shariah-compliant sectors. As a proxy of trade volume we use the number of shares traded in each sector in each given day. From Figure 3 it appears that trade volume is higher in the Industrial and Service sector. This is probably due to the large number of companies in these sectors (note that together stocks in the Industrial and Service sectors constitute 70% of all shares traded, a large number of shares traded in these sectors is therefore to be expected). It is interesting however, that trade volume in Agriculture is high with respect to the size of the sector. There are 8 companies in this sector and more or less the same number in the Banking sector. However, the number of shares traded in Agriculture is significantly higher than the number of shares traded in the Banking sector. Interestingly enough trade volume growth in Agriculture is in correspondence with the exponential expansion of market participation that occurred in recent years. In order to further investigate this phenomenon we look at the relation between trade volume and stock market volatility.

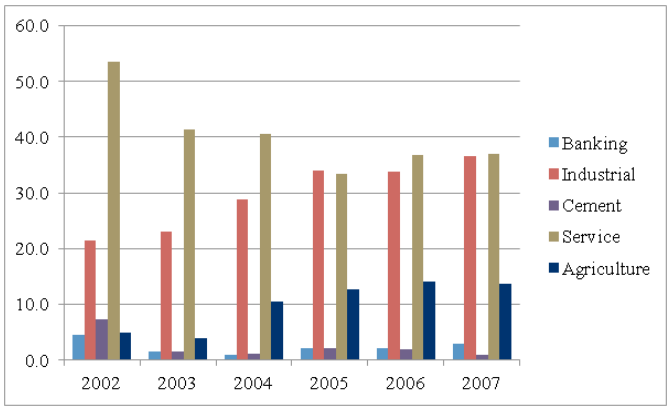


Figure 3 : Trade volume by sector as a percentage of the number of shares trated.

To model volatility we consider a generalized autoregressive conditional heteroskedastic (GARCH) type model. Since the seminal papers by Engle (1982) and Bollerslev (1986), GARCH models have been successfully used to study the behavior osle

returns as

$$R_{kt} = \delta + u_{kt} \qquad (5)$$

$$\sigma^2_{kt} = \omega +$$

index TASI.

Coming to the asymmetry tests, the results in Table 5 illustrate that for these data there is evidence against the null of symmetry from the all the test statistics considered. Therefore, the models in Table 5 are correctly specified.

Table 5. Estimated GJR(1,1) model for sectors and all share index.

	Sectors					TASI
Coe .	Bank	Industrial	Cement	Services	Agriculture	

5 Robustness Checks

5.1 Herd Behavior and the Equity Market

Table 6. Regression results of the daily cross-sectional absolute deviation (asymmetric model).

Model A: $CSDA_{kt}^{up} = \mathring{\beta} + \mathring{\gamma}_{1t}^{up} |R_{mt}^{up}| + \mathring{\gamma}_{2t}^{up} (R_{mt}^{up})^2 + \varepsilon_t$

	$\mathring{\beta}$	$\mathring{\gamma}_{1t}^{up}$	$\mathring{\gamma}_{2t}^{up}$	$\bar{R}_2$
Bank	0.003 (0.0002)	1.509 (0.084)	−9.611 (2.088)	0.66
Industrial	0.005 (0.0004)	1.544 (0.076)	−8.296 (1.114)	0.55
Cement	0.002 (0.0002)	1.495 (0.028)	−6.642 (1.0185)	0.73
Service	0.002 (0.0001)	1.083 (0.028)	−1.759 (0.478)	0.88
Agriculture	0.004 (0.0004)	1.621 (0.058)	−7.352 (0.749)	0.74
Tasi	0.001 (0.0002)	1.651 (0.109)	−8.123 (1.975)	0.66

Model B: $CSDA_{kt}^{down} = \mathring{\beta} + \mathring{\gamma}_{1t}^{down} R_{mt}^{Down} + \mathring{\gamma}_{2t}^{down} R_{mt}^{down\ 2} + \varepsilon_t$

	$\mathring{\beta}$	$\mathring{\gamma}_{1t}^{down}$	$\mathring{\gamma}_{2t}^{down}$	$\bar{R}_2$

that as the average market return becomes large in absolute term, the cross sectional return dispersion increases at decreasing rate. The result in Table 6 are consistent with the intuition that during periods of extreme market movements individuals suppress their own beliefs in favor of the market consensus and confirm the validity of our assumption that noise traders in the market act in concert.

5.2 Religion and Stock Market in the United States

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Table 7. P-values for the test for first and second order stochastic dominance (returns) for the FTSE index.

Sector	SD	Bank	Industrial	Cement	Services	Agriculture	FTSE
Bank	2nd	-	0.999	0.009	0.000	0.678	0.001
	1st	-	0.725	0.001	0.005	0.622	0.005
Industrial	2nd	0.725	-	0.013	0.004	0.999	0.002
	1st	0.544	-	0.000	0.000	0.608	0.004
Cement	2nd	0.999	0.589	-	0.556	0.995	0.648
	1st	0.588	0.019	-	0.017	0.557	0.521
Services	2nd	0.725	0.550	0.010	-	0.999	0.514
	1st	0.544	0.000	0.006	-	0.514	0.888
Agriculture	2nd	0.000	0.009	0.000	0.004	-	0.000
	1st	0.006	0.008	0.001	0.005	-	0.000
FTSE	2nd	0.999	0.999	0.000	0.999	0.514	-
	1st	0.567	0.543	0.526	0.512	0.536	-

Note: The p-values are obtained using the bootstrap algorithm described in Section 3 with $B = 1000$ replications.

To summarise our results, from the comparison between the Saudi market and the U.S. market it appears the there is no Shariah-compliant e ect in the sectors considered in the U.S. stock market. On the other side, the joint e ect of market structure and social norms appears to have an important role in Saudi Arabia. However, the Saudi stock market is quite unique among the emerging market bourses. Although significant progress has been made to boost the partecipation of foreign entities, the Saudi market is still heavily dominated by national investors. National investors are more likely to be a ected by "domestic" social norms. It would be of interest to extend this investigation to other GCC countries to see if the Shariah-compliant e ect is still relevant. Hence, an important agenda for future research is to see if the Shariah-compliant e ect is a general phenomenon or a peculiarity of the market under consideration.

6 Conclusion

In this paper we investigate the e ect of Islamic tenets on the Saudi stock market and we show that religious norms have a significant e ect on stock prices. We show that Shariah-compliant stocks have higher returns and volatility then their non-Shariah compliant counterparts. In particular, we found a close match between return volatility and the degree of compliance with religious tenets. These results have important implications for both corporations seeking to raise capital in the stock market and investors.

Looking at the relation between trade volume and volatility, our findings suggest that individual investors do act as noise traders in the market under consideration. In this sense our findings are in agreement with the model in Palonimo (1996) where it is suggested that in an economy with risk averse agents noise traders bearing a larger

amount of risk relative to informed traders earn higher expec-fi+@H-G+0a4O:8fi80e4] /:-W-H0l4

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