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Predictability of Shariah-Compliant Stock and Real Estate Investments

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The study tests the predictability of excess returns on four global asset classes that include Shariah-compliant (SC) real estate, SC stocks, conventional real estate and real estate investment trusts (REITs). Based on weekly excess returns from January 2001 to December 2010, our empirical results do not reject the hypothesis that Shariah compliance risk is significantly priced in the excess returns of a portfolio of the four global asset classes. Shariah compliance risk and real estate risk are mutually exclusive. Fund managers will only price one common Shariah compliance risk in a pure real estate portfolio that consists of SC real estate, conventional real estate and REITs.

Keywords:

Shariah-Compliance (SC) risk; Common risk premia; Global asset portfolios; Predictability of excess returns; Risk diversification

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1. Introduction

1.1 What is a Shariah Compliant (SC) Investment?

Islamic or Shariah-compliant (SC) investments are bound by the principles stipulated in the Shariah laws. The structure of SC investments needs to be approved by the Shariah Board (source: www.islamicfinance.com). The board comprises a panel of prominent Islamic legal scholars, who are responsible for interpreting Shariah laws that govern business transactions and dealings, Shariah screens, asset purification and zakats (charity taxes). Shariah precepts ban interest based transactions (riba), speculative and unethical practices in business contracts (gharar). They, however, promote equitable contracts that link finance to productivity (murabaha and ijara) and profit-loss sharing arrangements (mudarabah and musharaka).

Unethical business activities and practices are screened based on a set of sector and financial guidelines (Derigs and Marzban, 2009). The sector screens, also known as the business line screens, limit income from Haram activities, such as arms and ammunition, alcohol, tobacco, gambling (maysir) and non-halal food products (e.g. pork), to not more than 5% of the total firm revenue. The financial screens forbid business activities in conventional financial services and investments in low gearing firms, conventional fixed income instruments (such as bonds), interest-based instruments/accounts and derivatives, as well as short selling. Some thresholds on liquidity (accounts receivables, cash and short-term investments), interest income and gearing (total debt to total asset ratio) are commonly adopted in the financial ratio screens.

Shariah investment guidelines can be broadly divided into 3 categories as per Table 1.

Table 1 Shariah Guidelines on Investments

Category	Sharia Compliance
Asset allocation	Prohibits investing in companies/businesses involved in Haram activities in riba, maysir, gharar, or in industries related to alcohol, pork, life insurance, banking, and arms production
Investment and Trading Practices	Based on profit sharing principle. Debt, fixed income instruments and speculative investments are prohibited.
Income distribution	Zakat (charity tax) will be imposed

1.2 Motivations of Study

The adherence to the Islamic guidelines restricts investment opportunity sets for SC investors. Stocks and real estate are among the two most popular asset classes in the spectrum of Islamic investments. Private real estate funds, Sukuk bonds, and Islamic real estate investment trusts (Islamic REITs) are the major SC investments in the two asset classes. One question that commonly faces SC investors is whether Shariah compliance (via business line and financial screens) increases transaction costs, which adversely affects the performance of SC investments (Derigs and Marzban, 2009). The hypothesis that Shariah compliance cost is insignificant is supported by Ibrahim and Ong (2008), who have found no significant differences between the risk-adjusted returns of synthetic SC REIT portfolios *vis-à-vis* US REIT index returns. Their simulation is conducted by using the methodology proposed by Geczy, Stambaugh and Levin (2005).

This study aims to test the predictability of excess returns on SC investments by using a single latent risk factor model. Our results show that there is at most one significantly priced risk factor that predicts variations in excess returns of SC stock, SC real estate and conventional real estate investments. Our results do not reject the hypothesis that the Shariah compliance risk factor is significant in a portfolio of SC real estate, SC stocks and global real estate. However, we have found that Shariah compliance risk and real estate risk are mutually exclusive, and fund managers will only price one common risk factor in their portfolios that include SC and non-SC real estate assets.

The remainder of the paper is organized as follows: Section 2 reviews the literature on SC real estate investment. Section 3 discusses the data, descriptive statistics and empirical methodology. Section 4 analyzes the empirical results. Section 5 concludes the study.

2. Literature Review

The emergence of SC investments has attracted interest in understanding the demand for this relatively new investment option. Parsa and McIntosh (2005) have conducted a survey on 34 investors in the UK and Europe, and found that ijiara, murabahah, sukuk and musharakah are the preferred financing structures for property investments. The same preference on the SC structure for property investments have been observed by Ibrahim, Ong and Parsa (2009) when they repeated the survey on Asian investors.

The current literature focuses on the two opposing implications of Shariah-compliance requirements. First, Shariah compliance increases transaction costs, causing SC funds to underperform conventional funds. Second, Shariah screens that forbid investing in risky financial (riba) and speculative products reduce variance in SC investments.

The empirical results that compare risk and return characteristics of Islamic ethical funds vis-à-vis conventional funds are mixed. Girard and Hassan (2008) compare the performance of five Financial Times Stock Exchange (FTSE) Islamic indices and the corresponding non-Islamic indices (FTSE Global, Asia Pacific, Americas, Europe and South Africa Indexes) over the period of 1998-2006. They find no significant differences in the performance between Islamic indices and their counterparts. Hussein and Omran (2005) find significant asymmetry in the performance of the benchmark Islamic Index and 13 Islamic sub-indices published by the Dow Jones in the bear and bull markets over the period of 1996-2003. Abdullah, Hassan and Mohamad (2007) affirm the results when they used a larger sample of 65 funds, of which 14 Islamic funds were formed in Malaysia. However, the hypothesis that Islamic funds are an effective hedge against downturns in the markets is rejected by Alam and Rajjaque (2010), who find negative abnormal returns on the S&P Europe 350 Shariah Index in the bear markets after the September 11, 2001 terrorist attacks in the US.

A lack in quality time series data motivates Ibrahim and Ong (2008) to use a simulation methodology to generate returns for synthetic SC REIT portfolios; they show that SC REITs do not underperform unconstrained US REIT portfolios and real estate mutual funds, after controlling for relevant risk factors. Newell and Osmadi (2009) show that Islamic REITs in Malaysia outperformed conventional M-REITs in terms of risk-adjusted performance during the global financial crisis. The results rejected the hypothesis in that Shariah compliance increases transaction costs of SC investments.

Yusof and Majid (2007) have tested the volatility transmission between the Kuala Lumpur Composite Index (KLCI) and Rashid Hussain Berhad Islamic Index (RHBII) by using generalized autoregressive conditional heteroskedasticity (GARCH) (1, 1) and vector autoregressive (VAR) models. Over the sample periods from January 1992 to December 2000, they find that the impact of interest rate shocks is significant and positive on conditional volatility of conventional stock returns, but insignificant on conditional volatility of the Islamic stock returns. The results imply that the Shariah guidelines that forbid Riba insulate Islamic stocks against interest rate shocks.

Instead of comparing the fund-level performance between Islamic and conventional funds, Kok, Giorgioni and Laws (2009) show that the inclusion of SC funds into a portfolio that consists of mainstream funds helps to minimize portfolio variances. By evaluating various portfolio level Shariah compliance strategies, Derigs and Marzban (2009) argue that the current Shariah-compliance strategies that are applied at the asset level create suboptimal portfolios that underperform other non-SC portfolios. They propose to enforce Shariah-compliance control at the portfolio optimization stage rather than at the asset selection stage.

In the Islamic banking literature, Chazi and Syed (2010) have found that forbidding investing in mortgage backed securities insulates Islamic banks against subprime losses suffered by many banks in the Western countries. They show that Islamic banks are better capitalized in terms of gearing ratio and gross revenue ratios, which reduce the standard deviations in their earnings during the recent financial crisis periods. However, Aggarwal and Yousef (2000) show that agency problems in Islamic banks result in short-term and selective financing in favor of retail and trade financing relative to agriculture and industry. The inefficiency in Islamic financing that deviates from the principle of profit-loss sharing leads to welfare reduction when banning the debt rule.

3. Empirical Data

Two Islamic global assets (Eurekahedge Global Islamic Fund Index and S&P Global Property Shariah Index) and two conventional global assets (S&P Global Property Index and S&P Global REIT Index) are selected for our empirical tests which cover the sample periods from January 2000 to September 2010. The S&P Global Property Shariah Index has a shorter time series starting only from August 2007. Weekly time-series data for the four indices are collected from the Bloomberg. We include four forecasting variables in the asset pricing models, which are MSCI all-world stock index, yield spread measured as differences between the corporate AAA bond yield and US 10-year government FED securities yield, dividend yield of the US S&P 500 Composite Stocks and 3-month Treasury Bill Rate. The yield spread represents the term structure of interest rates. The dividend yield captures the expectations of future cash flows. The weekly 3-month Treasury Bill Rate represents the risk-free rate.

We compute the weekly returns for the four asset classes and the MSCI World stock variable by taking the first order difference of the natural logarithmic of the respective index. We then compute the excess returns by taking the difference between the log-index returns and the risk-free rate. Details on variables and data sources are summarized in Table 2. Descriptive statistics of excess returns of the sample assets and the forecasting variables and correlation matrix are reported in Table 3.

Table 2 Excess Returns, Forecasting Variables and Their Data Sources

Asset Class /Forecasting Variable	Symbol	Data	Source	Starting periods	Ending periods
a) <u>Asset classes</u>					
Excess return on Shariah-compliant global real estate	ERSCREGL	S&P Global Property Shariah Index	Bloomberg	Aug-2007	Sep-2010
Excess return on Shariah-compliant global stocks	ERSCSTGL	Eurekahedge Global Islamic Fund Index	Bloomberg	Jan-2000	Sep-2010
Excess return on global real estate stocks	ERREGL	S&P Global Property Index	Bloomberg	Jan-2000	Sep-2010
Excess return on global real estate investment trusts (REITs)	ERREITGL	S&P Global REIT index	Bloomberg	Jan-2000	Sep-2010
b) <u>Forecasting variables</u>					
Excess return on all-world stocks	ERMSCIWI	MSCI world stock Index	Bloomberg	Jan-2000	Sep-2010
Yield spread	YSPRD	US AAA Corporate Bond Yield-US 10-year FED Government Securities Yield	Datastream	Jan-2000	Sep-2010
Dividend yield	DIVYLD	US Standard and Poors' 500 Composite	Datastream	Jan-2000	Sep-2010
Treasury bill rate	TBILL3	US 3-Month Treasury Bill Rate	Datastream	Jan-2000	Sep-2010

Note: The table lists four global asset classes, which are SC global stock, SC global real estate, global real estate and REITs, and also the forecasting variables that include excess returns on all-world stocks, yield spread, dividend and Treasury bills. The sources of the data, which are mainly obtained from Bloomberg and Datastream, and the sample periods and symbols used for the respective variables are also described. Excess return as denoted by "ER" for an asset I is computed as the first order natural log-difference of returns on assets minus the Treasury bill rate, that is [$ER_{i,t} = \ln(R_{it}/R_{it-1}) - R_f$].

Table 3 Descriptive Statistics and Correlation Matrix

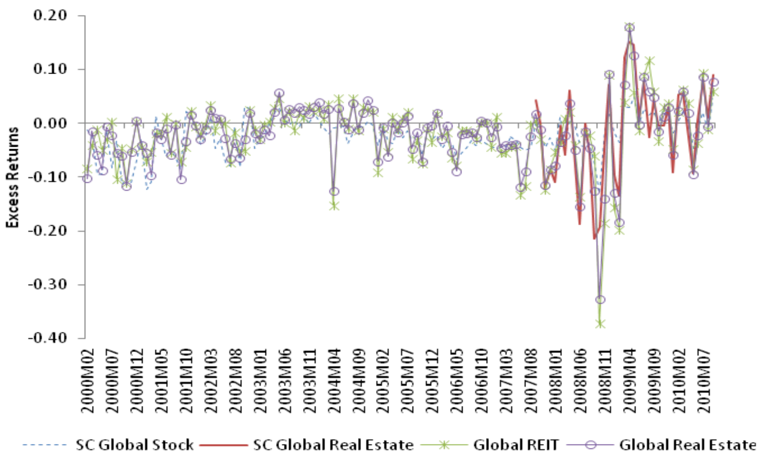
	Excess Returns on Asset Classes				Forecasting Variables			
	SC global real estate ERSCREGL	SC global stock ERSCSTGL	Global real estate ERREGL	Global REIT ERREITGL	All-world stock ERMSCIWI	Yield spread YSPRD	Dividend yield DIVYLD	Treasury bill rate TBILL3
Mean	-0.0159	-0.0090	-0.0189	-0.0200	-0.0172	0.0179	0.0234	0.0087
Median	-0.0034	-0.0037	-0.0120	-0.0131	-0.0090	0.0168	0.0211	0.0018
Maximum	0.1515	0.0490	0.1778	0.1812	0.0941	0.0280	0.0360	0.0384
Minimum	-0.2149	-0.1311	-0.3266	-0.3724	-0.1842	0.0109	0.0177	0.0001
Std. Dev.	0.0919	0.0362	0.0978	0.1026	0.0628	0.0043	0.0052	0.0113
Skewness	-0.2678	-1.0399	-0.7453	-1.1036	-0.4633	0.8318	1.0479	1.3842
Kurtosis	2.5074	4.8168	4.1464	5.2917	2.8205	3.0019	2.7603	3.7633
Jarque-Bera	0.8162	11.7575	5.4521	15.6078	1.3735	4.2662	6.8602	12.7138
Observations	37	37	37	37	37	37	37	37
Correlation Matrix:								
ERSCREGL								
ERSCSTGL	0.8574							
ERREGL	0.9070	0.8741						
ERREITGL	0.7856	0.7985	0.9679					
ERMSCIWI	0.9000	0.9056	0.9355	0.8854				
YSPRD	-0.0422	-0.1276	-0.1851	-0.2479	-0.1480			
DIVYLD	0.1109	0.0550	-0.0548	-0.1520	-0.0196	0.8362		
TBILL3	-0.2716	-0.3214	-0.2275	-0.2022	-0.2567	-0.4482	-0.4368	

Note: The table shows common sample statistics of the excess returns of the four global assets and the four forecasting variables. The pair-wise correlation matrix for the excess returns and forecasting variables is computed for the periods from September 2007 to September 2010.

As the sample periods cover the 2008 US subprime financial crisis, the mean excess returns for the four global asset classes and the all-world stocks are all negative. The two SC indices suffered smaller losses than the two conventional global asset indices over the same sample periods. The SC stock was the "*best underperformer*" among the asset classes with the lowest mean excess loss of 0.90% and the lowest standard deviation of 3.62%. The SC real estate index had a mean excess loss of 1.59% and a standard deviation of 9.19%. The global REIT index was the "*worst performer*" with the highest mean excess loss of 2.00% and the highest standard deviation of 10.26% during the sample periods. However, the global REITs experienced the largest rebound from a negative 37.24% in October 2008 to a positive 18.12% in April 2009. The results are consistent with those of Hussein and Omran (2005), which show that SC stocks outperform general stocks during a financial crisis. Both SC global stocks and SC global real estate offer positive hedges against downside risks in the crisis periods.

The correlation matrix in Table 3 shows strong pair-wise correlations of above 0.8854 between the excess returns of the four sub-asset classes (SC real estate, SC stocks, global real estate stocks, global REITs) and the excess global stock returns. The highest correlation can be observed in excess returns between SC real estate and global REITs (0.9679), followed by the correlations between SC real estate and global real estate stocks (0.9070), and SC global stocks and world stocks (0.9056). The high correlations between the four global asset classes over sample periods from 2001 to 2010 are graphically shown in Figure 1. The results imply that SC real estate has only limited diversification benefits to a portfolio that consists of conventional real estate and global REITs.

Figure 1 Excess Returns of Four Sample Global Asset Classes



Note: The graph plots the excess returns of the four asset classes over sample periods from January 2001 – September 2010, except for SC global excess returns which start only from September 2007.

4. Empirical Results

Our empirical strategies can be broadly divided into three parts. First, we test the common risk premiums in excess returns on the four global asset classes, conditional on shocks to the global stock market and the four forecasting variables. Second, we decompose the three “pure” risk factors, which are Shariah compliance, real estate and bond-like risks from the four excess asset returns, and test the significance of the risk factors in predicting excess returns on the four assets. Third, we test the common risk factors that influence industry-specific excess returns in SC stocks and SC real estate in the global and other sub-markets. The single latent risk factor model is the main empirical methodology used in the study, and technical details of the model are given in the Appendix.

4.1 Based Models

We first test the predictability of excess returns on the four global asset classes (SC real estate, SC stocks, real estate stocks and REITs) by using four forecasting variables (global stock excess return, yield spread, dividend yield of an equally weighted market portfolio, and treasury bill rate), a January dummy that controls for the seasonal effect, and a constant term. The results of the unrestricted regressions are summarized in Table 4. The excess return models for the two SC global assets have relatively high adjusted R-squares of 0.801 (SC global real estate) and 0.875 (SC global stocks), respectively. The global REIT excess return model has the lowest predictability with an adjusted R-square of 0.486.

The results in Table 4 show that global stock excess return is the most important predictor that explains significant variations in the excess returns of all the four asset classes. The global stock market betas are statistically significant and positive in all the models. The coefficients on dividend yield are also significant, but have negative signs in the global real estate and the global REIT excess return models. The risk-free rate variable predicts the SC global stocks, but the coefficient has a negative sign. The yield spread and the January effect coefficients are insignificant in all the models.

4.2 Single “Latent” Risk Factor Model

We estimate a single latent risk factor model, [K = 1], by imposing cross-equation restrictions on the regressions of the four asset classes (inclusive of K =1 reference asset), [I = 4], conditional on the four forecasting variables and the January dummy. The single latent risk factor model is estimated by using Hansen’s generalized method of moment (GMM) (1982), a methodology that adjusts for heteroskedascity and serial correlation in the error terms of the regression models. We use three reference assets to impose the [K=1] restriction on the model, but the results are invariant to the choice of reference asset (See footnote 20 in Ferson, 1990). We therefore present only one set of chi-square statistics and p-value in Table 5 for the three models. We normalize the betas of the reference assets to unity in each of the restricted models. If the null hypothesis, H_o: [K =1], is not rejected, there is only one "priced" systematic risk in the model. The estimated beta coefficients, β_{ij}, measure the risk premium multiples of the reference assets.

We compute the chi-square statistics from the J-statistics of the GMM models, and test the restriction in Equation A5 (Appendix). The results in Table 5 show that the null hypothesis is not rejected at a 5% significance level, which imply that there is at most one latent systematic risk factor that explains the variations in the excess returns of the global assets. In terms of relative risk premiums, the SC global real estate beta is 1.49 times higher than the betas of comparable non-SC global real estate (Model 1). When SC global real estate is used as the reference asset (Model 2), the relative betas are all smaller than unity, which suggest that SC global real estate has higher systematic risk premiums relative to other asset classes. When SC stock is used as the reference asset in Model 3, all of the real estate assets have higher risk premiums relative to the SC global stock. The global REITs have the lowest time-varying systematic risk premiums amongst the four global asset classes.

We plot the predictive errors of the single latent risk factor models (represented by the dashed line) alongside the unrestricted predictive errors of the excess return models (as in Table 4) (represented by the solid line) in Figure 2. The pricing errors of the two models move closely with each other, and the turning points are tracked by the models. The restricted models have larger error terms than those found in the unrestricted models. In terms of mean squared errors, the restricted model has the best predictive power for the excess returns of SC global stock (0.0002), but the poorest-fit for the excess returns of global REITs (0.0022). For SC global real estate assets, the restricted model over-estimates the excess returns of the assets during the recovery phase from September 2008 to May 2009.

The results fail to reject the hypothesis that the Shariah compliance structure risk factor predicts the excess returns of the four asset classes. SC real estate is *integrated* with the conventional real estate and REIT investments, because the same systematic risk premium is priced in the markets. The results imply that global fund managers who invest in a mix portfolio of SC and non-SC assets will not pay additional risk premiums for Shariah compliance risks. However, investors could reap some diversification benefits by pooling SC real estate with conventional real estate in the same portfolio.

Table 4 Regression of Excess Returns on Forecasting Variables

Asset class	Global Real Estate	Global REIT	SC Global Real Estate	SC Global Stock
Dependent Variable	ERREGL	ERREITGL	ERSCREGL	ERSCSTGL
Constant	0.049 **	0.072 **	-0.048	0.001
	(1.999)	(2.483)	-(1.204)	(0.110)
Work Stock Excess Return (ERMSCIWI)	0.962 ***	0.881 ***	1.304 ***	0.579 ***
	(12.119)	(9.372)	(10.541)	(21.906)
Yield Spread (YSPRD)	-0.462	-0.307	-0.967	-0.330
	-(0.587)	-(0.329)	-(0.311)	-(1.260)
Dividend Yield (DIVYLD)	-1.652 *	-2.897 ***	3.052	0.402
	-(1.853)	-(2.746)	(1.239)	(1.357)
Treasury-Bill Rate (TBILL3)	-0.238	-0.441	0.091	-0.504 ***
	-(0.900)	-(1.409)	(0.124)	-(5.721)
January Dummy (JAN)	-0.005	-0.007	-0.010	0.003
	-(0.363)	-(0.443)	-(0.393)	(0.662)
Adjusted R-squared	0.600	0.486	0.801	0.870
S.E. of Regression	0.039	0.046	0.041	0.013
F-statistic	39.052	25.029	29.929	171.286

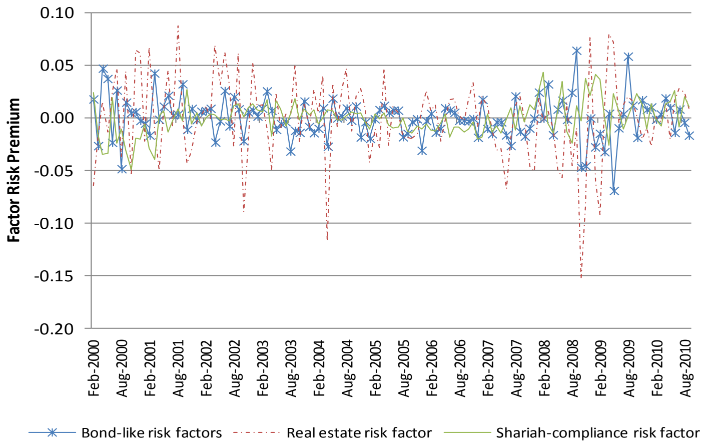
Note: The table summarizes the OLS regression results. Dependent variables are the excess returns on global real estate, global REITs, SC global real estate and SC global stocks. They are regressed against four forecasting variables which are global stock excess return, yield spread, dividend yield, Treasury bill rate, a January dummy and a constant term. The numbers in parentheses are the t-statistics. The regression is estimated by using an OLS estimator. The levels of significance of the coefficients are represented by *** 1% significance; ** 5% significance; * 10% significance

Table 5 Results of the Single Latent Risk Factor Models

	Model 1			Model 2			Model 3		
Latent variable	K=1			K=1			K=1		
Reference Asset	**Global Real Estate**			**SC Global Real Estate**			**SC Global Stock**		
Excess Return	Coefficient	t-statistics	Adj. R^2	Coefficient	t-statistics	Adj.R^2	Coefficient	t-statistics	Adj.R^2
Global REIT	0.922	(26.542) ***	0.444	0.618	(7.491) ***	0.444	1.124	(6.701) ***	0.444
Global Real Estate	1.000		0.572	0.671	(8.965) ***	0.569	1.220	(7.652) ***	0.569
SC Global Real Estate	1.491	(8.965) ***	0.748	1.000		0.756	1.819	(12.712) ***	0.748
SC Global Stock	0.820	(7.652) ***	0.808	0.550	(12.712) ***	0.808	1.000		0.810
J-statistic	0.132			0.132			0.132		
Chi-square	16.932			16.932			16.932		
Degree of Freedom	15.000			15.000			15.000		
Significance Level	0.323			0.323			0.323		

Note: The single latent risk factor models above are estimated by using Hansen's (1982) GMM estimator, and the reference asset of each of the model is indicated in row 3. The instruments used in the models include all-world stock excess returns (ERMSCIWI), yield spread (YSPRD), dividend yield (DIVYLD), Treasury bill rate (TBILL3) and a January dummy (JAN). The testing of [K=1] is based on chi-square statistics, which is computed from the J-statistics of the GMM estimator. The degree of freedom is given as [(J-K)×(L-K)], where J denotes asset classes, and L indicates the number of forecasting variables plus a constant term. The coefficients indicate the ratio of beta over the normalized beta for the reference assets, and the significance levels are denoted as *** 1%; ** 5%; * 10%.

Figure 2 Decomposed Risk Factor Premiums



Note: The graph shows the three "pure" risk factors that are derived from the residual terms of the OLS regressions. The Shariah-compliance risk is derived by regressing SC stocks excess returns on global stock excess returns; the real estate risk factor is derived by removing global stock return effects from the excess returns on SC real estate; and the bond-like returns reflect the dividend payout characteristics that resemble bond assets, by removing global real estate effects from global REIT excess returns.

4.3 Decomposition of Specific Risk Factors

The previous tests reject the [K=1] restriction, which suggests that there is at most one priced common risk factor in predicting the four asset excess returns. This section attempts to identify this single common risk factor. We first remove the global stock market risk factors by regressing the global asset excess returns of the SC global stock and global real estate on the all-world stock returns by using an ordinary least squares (OLS) regression as follows:

$$\tilde{r}_{it} = a_i + b_i\tilde{r}_{m,t} + \varepsilon_{it} \quad (1)$$

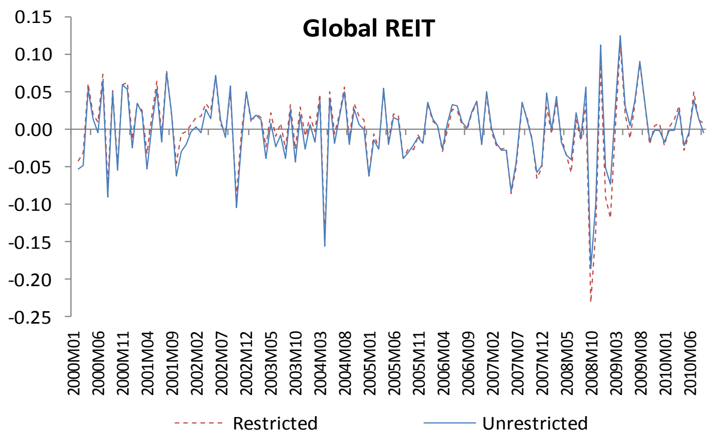
where $\tilde{r}_{it}$ is the excess returns of a global asset, in which [i = (1, 2)], such that 1 = SC global stock (ERSCSTGL), 2 = global real estate (ERREGL), and $\tilde{r}_{mt}$ is the excess return of the MSCI all-world stock portfolio. a_i and b_i are the estimated regression parameters, and ε_{it} is the residual terms that represent the "pure" risk factors which are independent of the stock market systematic risks.

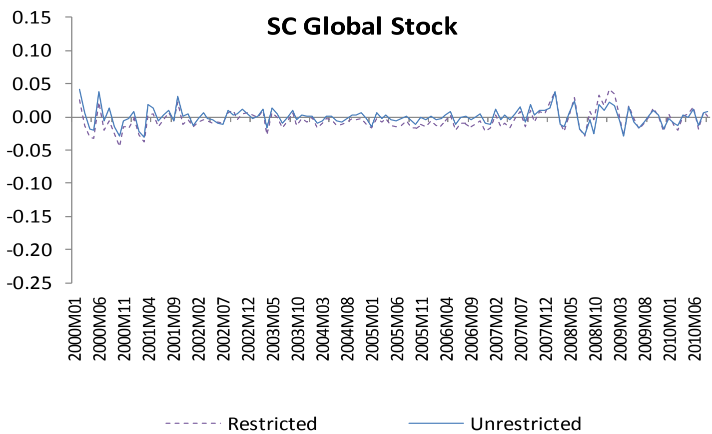
We recover two "pure" risk factors specific to Shariah compliance strategies, (ε_{1t}), and real estate, (ε_{2t}), which are denoted by FPSC and FPRE, respectively. As REIT is a securitized real estate vehicle that contains an additional bond-like feature given the mandatory requirement to distribute more than 90% of earnings as dividends, we decompose the third "pure" risk factor specific to bond-like characteristics, (ε_{3t}) (FPBOND), via the following unrestricted regression:

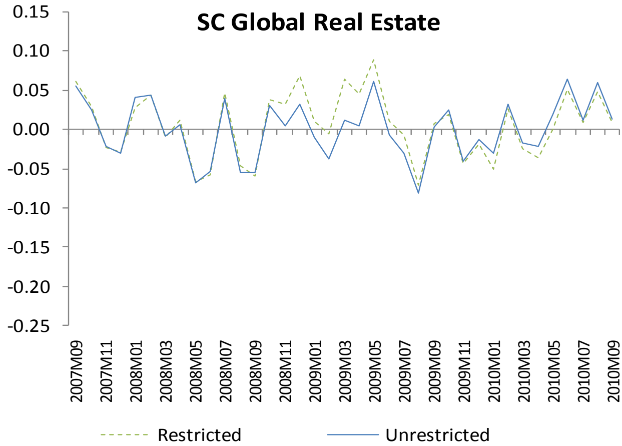
$$\tilde{r}_{REIT,t} = a_3 + b_3 \tilde{r}_{RE,t} + \varepsilon_{3t} \tag{2}$$

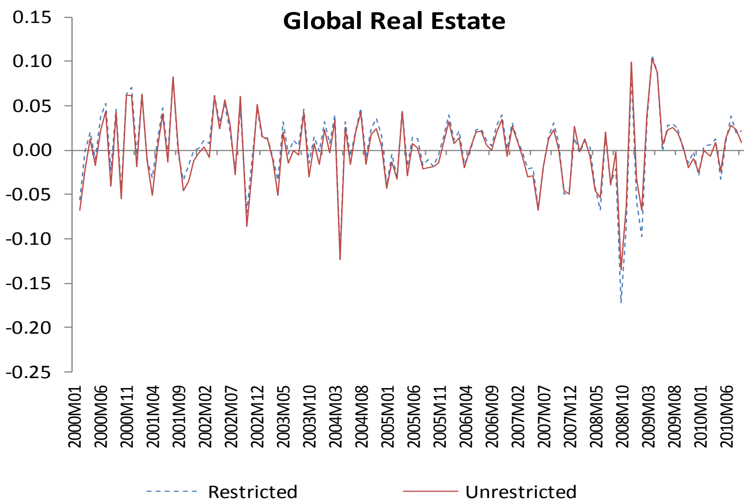
where $\tilde{r}_{REIT,t}$ and $\tilde{r}_{RE,t}$ denote excess returns on global REITs and global real estate, respectively. Figure 3 shows the time-series trends of the three "pure" risk factors. The three "pure" risk factors are orthogonal to the excess returns of the three asset classes. The real estate factor has the largest time-dependent variations in risk premiums. The correlation of the SC risk factor with the bond-like risk factor is negative at -0.213, and its correlation with the real estate risk factors is -0.133. The real estate risk factor is positively correlated with the bond-like risk factor, but the coefficient is small at 0.207.

Figure 3 Predictive Errors of Restricted and Unrestricted Models









Note: The above shows the predictive errors for the four global asset classes. The solid lines represent the forecast errors of the unrestricted models estimated from an OLS regression. The dashed lines show the corresponding error terms from the single latent risk factor models estimated by using Hansen's GMM estimator.

After deriving the "pure" risk factors, the stage-2 process involves the estimating of the single latent factor model by adding each of the "pure" risk factors as an auxiliary asset to the previous models. Conditional on the same set of forecasting variables, the restricted excess returns are estimated by using the Hansen's GMM methodology, and the rank restriction H_0: [K=1] is tested. The results are summarized in Table 6.

Table 6 Tests of Predictability of Excess Returns by Using Common Specific-Risk Factors

	Model 4			**Model 5**			**Model 6**		
Latent Risk Factor	K=1			K=1			K=1		
Reference Asset	**SC Risk Factor**			**Real Estate Risk Factor**			**Bond-like Risk Factors**		
Excess Return/Risk Factor	Coefficient	t-statistics	Adj.R^2	Coefficient	t-statistics	Adj.R^2	Coefficient	t-statistics	Adj.R^2
SC Risk Factor	1.000		-0.818						
Real Estate Risk Factor				1.000		-0.041			
Bond-like Risk Factor							1.000		-0.024
Global REIT				-109.875	-(0.106)	0.461	-17.061	-(1.765) *	0.737
Global Real Estate	0.216	(0.553)	-0.271	-117.633	-(0.106)	0.591	-18.077	-(1.868) *	0.592
SC Global Real Estate	0.181	(0.247)	-0.357	-153.590	-(0.107)	0.753	-23.603	-(1.996) **	0.737
SC Global Stock	1.898	(7.359) ***	-3.248						
J-statistic	0.190			0.090			0.200		
Chi-square	24.337			11.460			25.630		
Df	15.000			15.000			15.000		
Significance Level	0.060			0.719			0.042		

Note: The single latent risk factor models above are estimated by using Hansen's (1982) GMM estimator, and the reference assets are based on common risk factors specific to Shariah compliance, real estate and bond-like risks. The risk factors are free of global stock market risks. The instruments used in the models include all-world stock excess returns (ERMSCIWI), yield spread (YSPRD), dividend yield (DIVYLD), Treasury bill rate (TBILL3) and a January dummy (JAN). The testing of [K=1] is based on chi-square statistics, which is computed from the J-statistics of the GMM estimator. The degree of freedom is given as [(J-K)×(L-K)], where J denotes asset classes (inclusive of specific risk factors), and L indicates the number of forecasting variables plus a constant term. The coefficients indicate the ratio of beta over the normalized beta for the reference assets, and the significance levels are denoted as *** 1%; ** 5%; * 10%.

The chi-square statistics of Model 4 with reference to the Shariah compliance risk factor (FPSC) rejects the [K =1] restriction at less than a 10% significance level. There is more than one common risk factor that explains variations in the excess returns on SC global stock, SC global real estate and global real estate. The Shariah compliance risk is priced by a multiple 1.90 times the normalized risk premiums in SC global stock returns. The compliance risk factor is not significant in predicting the two real estate asset returns. Fund managers who invest in SC global stocks will incur higher transaction costs for Shariah screening.

When we test for common risk factors, the [K=1] restriction on the real estate reference risk factor is not rejected (Model 5), but the restriction on the bond-like reference risk factor is rejected (Model 6).[1] The coefficients on the three asset classes are negative but insignificant in Model 5. The coefficients are also negative, but significant at less than a 10% level in Model 6. The evidence implies that systematic risks in the three real estate markets (SC real estate, global real estate and REITs) could be priced by a common real estate specific risk factor. However, the bond-like common risk factor cannot fully capture systematic risks in the three real estate portfolios. The bond-like risk discount is the highest (-7.061) for the global REITs.

4.4 Is Shariah Compliance Risk Sector-Specific?

In the earlier tests, we reject the [K=1] hypothesis in that the Shariah compliance risk is the sole common risk factor in Model 4. However, our earlier results show a contrasting difference in the Shariah compliance risk premiums for SC global real estate (0.18) and SC global stock (1.90). We conduct robustness tests on common Shariah compliance risk by using two new sets of SC assets. The first set of assets is represented by a global SC stock index and four regional SC stock indices published by Eurekahedge (Asia Pacific, Europe, Middle East and North Africa (MENA), and North America Islamic Fund Indexes). The second set includes different SC real estate assets that are the S&P Global Property Shariah Index, S&P Developed Property Shariah, Dow Jones Islamic Market World Emerging Real Estate Index and Gulf Corporation Council (GCC) Shariah Capped Real Estate & Construction Equity Index. The SC stock indices cover the sample periods from January 2000 to September 2010, whereas the SC real estate indices have shorter sample periods from August 2007 to September 2010.

We test the [K = 1] restriction by using the reference Shariah compliance variable, (FPSC) in the SC stock portfolio (Model 7) and SC real estate portfolio (Model 8). The results are summarized in Table 7. The chi-square statistics of the two models fail to reject the hypothesis that the common

[1] The [K=2] restriction that includes both real estate specific and bond-like risk factors is not tested because of the short time-series of SC global real estate data.

Shariah compliance risk factor is the sole significant common risk factor. The results show that the coefficients on excess SC stock returns are all significant and positive in Model 7, whereas the coefficients on excess SC real estate returns are all insignificant in Model 8. The Shariah screening costs for SC stocks are higher in the North American and European markets compared to the Asia Pacific and MENA. The insignificance of Shariah compliance risk premiums in the SC real estate portfolio implies that the Shariah compliance risk is common across the sample regions.

We further test whether a common real estate risk exists in the SC real estate portfolio (Model 9), and the results reject the [K = 1] restriction. The beta coefficients on all SC real estate asset classes are insignificant. The two common risk factors could not predict variations in excess returns of global, emerging, developed, and MENA SC real estate markets. The two common risk factors, that is, Shariah compliance risk and real estate risk, are mutually exclusive in the SC real estate portfolio. Investors who hold SC real estate assets in the global and regional markets will price the time-varying risk premiums in only one of the common risk factors.

Table 7 Sector-Specific Tests of Predictability of Excess Returns and Common Risk Factors

	Model 7			
Latent Risk Factor	K=1			
Reference Asset	**Shariah Compliance Risk**			
Excess Return/Risk Factor	Coefficient	t-statistics		Adj. R^2
Shariah Compliance Risk Factor	1.000			-0.029
Real Estate Risk Factor				
Global SC Stock	21.530	(1.897)	*	0.862
Asia Pacific SC Stock	19.505	(1.902)	*	0.506
Europe SC Stock	24.018	(1.864)	*	0.802
MENA SC Stock	15.623	(1.828)	*	0.418
North America SC Stock	26.967	(1.831)	*	0.879
J-statistic	0.200			
Chi-square	25.595			
Degree of Freedom	25			
Significance Level	0.430			

(Continued…)

(Table 7 Continued)

	Model 8			Model 9		
Latent Risk Factor	K =1			K=1		
Reference Asset	**Shariah Compliance Risk**			**Real Estate Risk**		
Excess Return/Risk Factor	Coefficient	t-statistics	Adj. R^2	Coefficient	t-statistics	Adj. R^2
Shariah Compliance Risk Factor	1.000		-0.053			
Real Estate Risk Factor				1.000		-0.043
Global SC Real Estate	-59.711	-(0.713)	0.758	-30.416	-(0.762)	0.760
Developed SC Real Estate	-102.753	-(0.709)	0.496	-51.279	-(0.761)	0.495
Emerging SC Real Estate	-54.928	-(0.713)	0.753	-27.940	-(0.762)	0.755
MENA SC Real Estate	-46.014	-(0.708)	0.455	-23.471	-(0.762)	0.451
J-statistic	0.140			0.073		
Chi-square	17.892			9.373		
Degree of Freedom	20			20		
Significance Level	0.594			0.978		

Note: The single latent risk factor models above are tested on excess returns of assets in the same industry sectors which are SC stocks and SC real estate. The instruments used in the models include all-world stock excess returns (ERMSCIWI), yield spread (YSPRD), dividend yield (DIVYLD), Treasury bill rate (TBILL3) and a January dummy (JAN). The testing of [K=1] is based on chi-square statistics, which is computed from the J-statistics of the GMM estimator. The coefficients indicate the ratio of beta over the normalized beta for the reference assets, and the significance levels are denoted as *** 1%; ** 5%; * 10%.

5. Conclusion

Do Shariah compliance requirements increase transaction costs for SC investments? On one hand, Shariah precepts that encourage profit sharing and forbid riba, maysir and gharar protect SC investors against downside risks during the bearish markets. On the other hand, Shariah screens on business line limits, if not fully eliminate, exposure of SC funds to high risk investments, such as derivatives, collateralized debt obligations and mortgage backed securities. The restrictive investment opportunities mean that SC portfolios will have lower risk-adjusted returns and lower variance relative to conventional portfolios.

This paper has tested the significance of the Shariah compliance risk factor in a four-asset portfolio that consists of global real estate, global REITs, SC global real estate and SC global stocks. By using a single latent risk factor asset pricing model with four forecasting variables, including global stock excess return, yield spread, dividend yield, risk-free rate, and a January dummy and a constant term, our results fail to reject the hypothesis that there exists at most one significant common risk factor in the excess returns on the four asset classes. The same result is obtained when the restricted model is estimated by using only real estate assets. The existence of only one "priced" systematic risk implies that SC real estate is *integrated* with conventional real estate and REIT investments.

In order to identify the single "priced" risk factor, we derive three common risk factors that represent Shariah compliance, real estate and bond-like risks. We find that the common Shariah compliance risk is significant in explaining variations in excess returns of a portfolio that consists of SC real estate, SC stocks and real estate. The common bond-like risk factor is significant in the all-real estate portfolio (SC real estate, real estate and REITs). However, the common real estate risk factor fails to explain variations in the excess returns on the three real estate assets. We could not reject the significance of the common Shariah compliance risk factor in the SC global market and four SC regional markets (Asia Pacific, MENA, North America and Europe).

The findings have important implications for fund managers who are investing in SC and non-SC real estate and stock in the global market place. The Shariah compliance risk is one significant risk factor that is jointly priced in SC stock and SC real estate markets. The Shariah compliance risk and real estate risk are mutually exclusive, and only one significant risk premium will be expected by fund managers who hold portfolios with SC and non SC real estate.

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Appendix: Latent Risk Factor Asset Pricing Model

In linear OLS asset pricing models, we assume that excess returns of the asset classes are independently predicted by constant risk factors (betas). We extend the testing to common risk premia in the excess returns of the SC and non-SC global asset classes by using multifactor latent variable models. In the latent risk factor asset pricing framework as proposed by Gibbons and Ferson (1985), Campbell (1987), Ferson (1990) and Liu and Mei (1992), we specify an excess return for asset *i* as a function of *K* time-varying risk factors at time *t+1* as:

$$\tilde{r}_{i,t+1} = E_t[\tilde{r}_{i,t+1}] + \sum_{k=1}^{k} \beta_{ik}\, f_{k,t+1} + \widehat{\in}_{i,t+1} \qquad \text{(A1)}$$

where $E_t[\tilde{r}_{i,t+1}]$ is the expected excess return on asset *i* conditional on information known at time t, β_{ik} is the time invariant factor loading of *k*-th factors, and $\widehat{\in}_{i,t+1}$ is the idiosyncratic error. The zero-beta excess return, $E_t[\tilde{r}_{i,t+1}]$, has the following linear functional form:

$$E_t\left[\tilde{r}_{i,t+1}\right] = \sum_{k=1}^{k} \beta_{ik}\, \gamma_{kt} \qquad \text{(A2)}$$

where γ_{kt} is the "*market price of risk*" for the *k*-th factor at time t. Given an information set that comprises a vector of forecasting variables, X_{nt}, where [$n = 1, \ldots.., L$], we define γ_{kt} as a linear function of these variables:

$$\gamma_{kt} = \sum_{n=1}^{L} \theta_{kn} \mathrm{X}_{\mathrm{nt}} \qquad \text{(A3)}$$

By substituting Equation (3) into Equation (2), we rewrite the zero-beta excess return as:

$$E_t\left[\tilde{r}_{i,t+1}\right] = \sum_{k=1}^{k} \beta_{ik} \sum_{n=1}^{L} \theta_{kn} \mathrm{X}_{\mathrm{nt}} = \sum_{n=1}^{L} \alpha_{in} \mathrm{X}_{\mathrm{nt}} \qquad \text{(A4)}$$

where α_{in} is the risk premium for the forecasting variable, X_{nt} ,which is subject to the restriction below:

$$\alpha_{in} = \sum_{k=1}^{k} \beta_{ik}\, \theta_{kn} \qquad \text{(A5)}$$

where β_{ik} *and* θ_{kn} are free parameters.

The model is normalized by setting the factor loadings for the first k assets as follows: $\beta_{ij} = 1$, if [$j = i$]; otherwise $\beta_{ij} = 0$, if [$j \neq i$], for [$1 \leq i \leq K$]. We partition the excess return matrix into [R = (R_1, R_2)], where R_1 is a [T × K] matrix of excess returns of K-assets, and R_2 is a [T×(N-K)] matrix of excess returns for the rest of the assets:

$$R_1 = X\Theta + \mu_1 \tag{A6i}$$

$$R_2 = X\alpha + \mu_2 \tag{A6ii}$$

where X is a T × L matrix of the forecasting variables, Θ is a matrix of θ_{ij}, and α is a matrix of α_{ij}. In the case of a single latent variable, that is K=1, the excess return matrix can be written as:

$$\begin{bmatrix} \tilde{r}_{1,t+1} \\ \tilde{r}_{2,t+1} \\ \vdots \\ \tilde{r}_{J,t+1} \end{bmatrix} = \begin{bmatrix} \theta_1 & \theta_2 & \dots & \theta_L \\ \beta_2\theta_1 & \beta_2\theta_2 & \dots & \beta_2\theta_L \\ \vdots & \vdots & \vdots & \vdots \\ \beta_J\theta_1 & \beta_J\theta_2 & \dots & \beta_J\theta_L \end{bmatrix} \begin{bmatrix} x_{1t} \\ x_{2t} \\ \vdots \\ x_{Jt} \end{bmatrix} + \begin{bmatrix} \epsilon_{1,t+1} \\ \epsilon_{2,t+1} \\ \vdots \\ \epsilon_{J,t+1} \end{bmatrix} \tag{A7}$$

We test the rank restriction [H_0: $\alpha = \emptyset B$], where B is a matrix of β_{ij} elements in Equation (A5), which can be estimated in the regression system as in Equation (A6) by using Hansen's (1982) GMM estimator. The GMM estimator adjusts for conditional heteroskedacity and serial correlation in the error terms of the excess returns of different asset classes.