Dynamics between shariah (islamic) and non-shariah stock market indices: GCC market evidence based on static and dynamic panel techniques

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Dynamics between shariah (islamic) and non-shariah stock market indices: GCC market evidence based on static and dynamic panel techniques

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Abstract:

The main focus of this paper is to investigate the long run dynamic relationship between Shariah and non shariah stock indices in four GCC countries namely Oman, Qatar, Kuwait and Bahrain.. The panel techniques are used for the estimations. The traditional panel methods used are the fixed effects and the random effects models. However, these methods are restricted in that they assume away dynamics and heterogeneity of the coefficients. We augment these methods by applying pooled mean group (PMG) and mean group (MG) estimators which allow for both dynamics and heterogeneity of the coefficients. One particular interest of ours is the test of the assumption of PMG that the long-run coefficients are constant unlike the MG estimates. We provide results of all four estimators and compare their estimates which have implications for the policy makers.

Keywords: Shariah (Islamic) and non-Shariah stock indices, GCC, dynamic panel techniques

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Data and Methodology:

The dataset used in this study consist of daily observations of the Standard & Poor's (S&P) Shariah and non-Shariah Market Indexes for Oman, Qatar, Kuwait and Bahrain for the period starting from April 01, 2009. All stock markets indexes prices are in each country's local currency terms[1] and are based on the closing price of the day. The database time-series are drawn from DataStream.

PMG and MG:

PMG estimator is considered as an intermediate estimator which allows the short run coefficients, intercepts and error variances to vary across groups and only imposes homogeneity constraint on the long run coefficients. Budget or solvency constraints, arbitrage activities or common technology influencing all groups in a comparable means are some reasons that justify the assumption of homogeneity of long run coefficients across groups. (Pesaran et al, 1999)

Consider the following equation

$$SnP_{it} = \mu_i + \beta_{1i} Shi_{it} + \varepsilon_{it} \quad \ldots\ldots\ldots.(1)$$

where all coefficients are allowed to vary across cross-sectional units.

Consider now dynamic autoregressive distributed lag (ARDL (1,1,1)) model for basic equation. If the variables are I(1) and cointegrated, then the error term is I(0) for all i. A principal feature of cointegrated variables is their responsiveness to any deviation from long-run equilibrium.

[1] The collected data is in the local currency of the countries participated in this paper instead of using one specific dominator currency (eg. USD) due to limit data available on one single currency for shariah index (data available is less than one year).

This feature implies an error correction model in which the short-run dynamics of the variables in the system are influenced by the deviation from equilibrium. Thus it is common to reparameterize equation (1) into the error correction equation, by modifying equation (1) such that:

$$\theta_{0i} = \frac{\mu_i}{1-\lambda_i}$$

$$\theta_{1i} = \frac{\beta_{10i}+\beta_{11i}}{1-\lambda_i}$$

$$\theta_{2i} = \frac{\beta_{20i}+\beta_{21i}}{1-\lambda_i}$$

θ_{1i} and θ_{2i} are the long-run coefficients of Shi_{it} for the *i*th cross-sectional unit. Then, we can rewrite the equation (1) as:

$$\Delta SnP_{it} = -(1-\lambda_i)(SnP_{i,t-1} - \theta_{0i} - \theta_{1i} Shi_{it}) + \beta_{11i}\Delta Shi_{it} + \varepsilon_{it}$$

then we substitute $-(1-\lambda_i)$ with Φ_i :

$$\Delta SnP_{it} = \Phi_i (SnP_{i,t-1} - \theta_{0i} - \theta_{1i} Shi_{it}) + \beta_{11i}\Delta Shi_{it} + \varepsilon_{it} \quad \text{.....(2)}$$

Then, the mean of Mean Group estimate of error correction coefficient is:

$$\widehat{\phi} = N^{-1}\sum_{i=1}^{N}\widehat{\phi}_i$$

with the variance:

$$\widehat{\Delta}_{\widehat{\phi}} = \frac{1}{N(N-1)}\sum_{i=1}^{N}(\widehat{\phi}_i - \widehat{\phi})^2$$

The error-correction speed of adjustment parameter, $\Phi_{i,}$, and the long-run coefficient, θ_{1i} and θ_{2i} , are of primary interest. With the inclusion of θ_{0i} , a nonzero mean of the cointegrating relationship is allowed. The parameter Φ_i is the error-correcting speed of adjustment term. If

$\Phi_i = 0$, then there would be no evidence for a long-run relationship. This parameter is expected to be significantly negative under the prior assumption that the variables show a return to a long-run equilibrium. Of particular importance are the vector θ_{1i} and θ_{2i} , which contain the long-run relationships between the variables.

Results and Discussion:

While this paper shows the result of fixed effects, random effects, mean group and pooled mean group estimators, it will focus only on the last two estimators' results only.

Fixed and Random Effects results:

Variable	**Fixed Effects**	**t**	**p-value**	**Random Effects**	**t**	**p-value**	**h-test**
constant	93.35209 (11.93284)	7.82	0.000	93.67562 (52.37819)	1.79	0.074	**p-value**
Shariah index (shi)	.736497 (.138544)	5.32	0.000	.7327075 (.1377209)	5.32	0.000	0.65
R-sq	0.0007			0.0007			

Standard Errors are in parentheses in this and subsequent tables.

The results of both FE and RE are more or less similar. Hausman test result indicates that RE estimator is better. RE estimator results suggest that the shariah index coefficient is equal to 0.73 with a standard error of 0.14. The coefficient is highly significant which may reflect the strong relationship between the movement of shariah and non shariah index. (Please refer to tables (1), (2) and (3) in the appendix)

PMG and MG Results:

	PMG Estimates			**MG Estimates**			**h-test**
variable	**coef.**	**z**	**p-value**	**coef.**	**z**	**p-value**	
Shariah index (shi)	4.066171	1.27	0.204	1.239316	2.25	0.024	-0.81
ECT	-.0182033	-0.61	0.540	-.2617566	-3.32	0.001	
Shi D1.	1.123089	10.7	0.000	.9053778	5.79	0.000	

The PMG and MG results are different therefore we use Hausman test to decide which estimator is better. Hausman test result reveals that we cannot reject the null hypothesis that PMG estimator is more appropriate. (Please refer to table (6) in the appendix).

The estimated long-run coefficient of the shariah index in PMG is equal to 4.07. One possible interpretation of this figure is that the long run movement of non shariah index is four times the movement of shariah index which may reflect better performance of non shariah index. However, the test of significant shows that while the PMG long run shi coefficient is not significant, short run shi coefficient is highly significant. This contradictory result is probably due to insufficient data used.[2] The error-correcting speed of adjustment is very small (-0.018) in the PMG estimator which indicates slow adjustment (it takes 55.5 periods to return to the long run equilibrium) and therefore more chance of arbitrage activities. This figure again is not significant which indicates that the shi is exogenous. (Please refer to table (4-a) and (5) in the appendix)

PMG detailed results show that the long run coefficients are constant for all countries, but the individual short run variable is different. In fact this is one of the PMG estimator assumptions i. e. One or more of long run coefficient is constant across all groups. On the other hand the results suggest that the fastest adjustment among the participated countries occurs in the Oman's financial market and the slowest occurs in the Bahrain's financial market. Again all the results are not significant. (Please refer to table (4-b) the appendix)[3]

[2] Another problem is that the data is collected in the local currencies of the countries participate in this paper instead of using one specific dominator and this is due to limit data available on one single currency for shariah index (data available is less than one year).

[3] The order of countries is as follows: 1. Qatar 2. Oman 3. Kuwait 4. Bahrain

Conclusion:

The main focus of this paper is to investigate the long run relationship between Shariah and non shariah indices in four GCC countries namely Oman, Qatar, Kuwait and Bahrain.. Although the data is not long enough, it constitutes the whole available data for shariah index in those countries. S&P Shariah and non Shariah index are used in this study. The results are mixed. On the one hand the PMG estimator result suggests the existence of relationship between shariah and non shariah which is expected to be true. The t-test, however, shows that this relationship is not statistically significant. Furthermore, the error-correcting speed of adjustment is very small (-0.018) and also not significant. These insignificant results are probably due to insufficient data used. It is recommended that the future researchers should extend the data and try to address the limitation of this study.

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Appendix:

Table (1): Fixed Effects

```
Fixed-effects (within) regression               Number of obs      =       100
Group variable: idcode                          Number of groups   =         4

R-sq:  within  = 0.2293                         Obs per group: min =        25
       between = 0.0076                                        avg =      25.0
       overall = 0.0007                                        max =        25

                                                F(1,95)            =     28.26
corr(u_i, Xb)  = -0.2704                        Prob > F           =    0.0000
```

snp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
shi	.736497	.138544	5.32	0.000	.4614523	1.011542
_cons	93.35209	11.93284	7.82	0.000	69.6624	117.0418
sigma_u	87.81081					
sigma_e	15.756264					
rho	.96880765	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(3, 95) =   719.71             Prob > F = 0.0000
```

Table (2): Random Effects

```
Random-effects GLS regression                   Number of obs      =       100
Group variable: idcode                          Number of groups   =         4

R-sq:  within  = 0.2293                         Obs per group: min =        25
       between = 0.0076                                        avg =      25.0
       overall = 0.0007                                        max =        25

Random effects u_i ~ Gaussian                   Wald chi2(1)       =     28.30
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
```

snp	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
shi	.7327075	.1377209	5.32	0.000	.4627794	1.002636
_cons	93.67562	52.37819	1.79	0.074	-8.983738	196.335
sigma_u	102.45303					
sigma_e	15.756264					
rho	.97689506	(fraction of variance due to u_i)				

Table (3): Hausman Test

```
. hausman fixed , sigmamore

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed          .          Difference          S.E.
-------------+----------------------------------------------------------------
         shi |     .736497     .7327075        .0037895        .0084191
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(1) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =        0.20
                Prob>chi2 =      0.6526
```

Table (4-a): PMG

```
Pooled Mean Group Regression
(Estimate results saved as pmg)

Panel Variable (i): idcode                     Number of obs      =        96
Time Variable (t): Time                        Number of groups   =         4
                                               Obs per group: min =        24
                                                              avg =      24.0
                                                              max =        24

                                               Log Likelihood     = -248.2115
```

D.snp	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ECT						
shi	4.066171	3.201731	1.27	0.204	-2.209106	10.34145
SR						
ECT	-.0182033	.0296724	-0.61	0.540	-.0763601	.0399534
shi D1.	1.123089	.1049448	10.70	0.000	.9174011	1.328777
_cons	2.730195	1.89914	1.44	0.151	-.9920519	6.452441

Table (4-b): PMG Detailed Results

```
Pooled Mean Group Regression
(Estimate results saved as PMG)

Panel Variable (i): idcode                    Number of obs      =        96
Time Variable (t): Time                       Number of groups   =         4
                                              Obs per group: min =        24
                                                             avg =      24.0
                                                             max =        24

                                              Log Likelihood     = -248.2115
```

D.snp	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ECT						
shi	4.066171	3.201731	1.27	0.204	-2.209106	10.34145
idcode_1						
ECT	.0177351	.0225751	0.79	0.432	-.0265113	.0619815
shi D1.	.9274401	.060978	15.21	0.000	.8079255	1.046955
_cons	6.860326	4.371555	1.57	0.117	-1.707765	15.42842
idcode_2						
ECT	-.1055873	.0615122	-1.72	0.086	-.2261489	.0149743
shi D1.	1.407993	.3750941	3.75	0.000	.6728224	2.143164
_cons	-1.292804	25.18838	-0.05	0.959	-50.66112	48.07551
idcode_3						
ECT	.02006	.0268023	0.75	0.454	-.0324716	.0725916
shi D1.	1.144524	.0586028	19.53	0.000	1.029665	1.259383
_cons	4.916334	3.734061	1.32	0.188	-2.402291	12.23496
idcode_4						
ECT	-.0050211	.0182638	-0.27	0.783	-.0408176	.0307753
shi D1.	1.012399	.2158024	4.69	0.000	.5894336	1.435364
_cons	.4369219	2.250466	0.19	0.846	-3.97391	4.847754

Table (5): MG

```
Mean Group Estimation: Error Correction Form
(Estimate results saved as mg)
```

D.snp	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ECT						
shi	1.239316	.5506281	2.25	0.024	.1601047	2.318527
SR						
ECT	-.2617566	.0789406	-3.32	0.001	-.4164772	-.1070359
shi D1.	.9053778	.1563214	5.79	0.000	.5989935	1.211762
_cons	16.78835	9.23995	1.82	0.069	-1.321617	34.89832

Table (6): Hausman Test

	Coefficients (b) mg	(B) pmg	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
shi	1.239316	4.066171	-2.826855	.

```
                          b = consistent under Ho and Ha; obtained from xtpmg
           B = inconsistent under Ha, efficient under Ho; obtained from xtpmg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(1) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =    -0.81    chi2<0 ==> model fitted on these
                                        data fails to meet the asymptotic
                                        assumptions of the Hausman test;
                                        see suest for a generalized test
```