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COMPARATIVE PRICE FORECAST MODEL OF CONVENTIONAL AND ISLAMIC BANK STOCK LISTED IN LONDON STOCK EXCHANGE

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Abstract: *The Abstract: Islamic finance and conventional finance are two different processes. After using the data into forecasting model we got the dynamics of stock price what we present in this paper. The data has been taken from two banks' stock price from London stock exchange for a six year period staring from1st of March 2003 to 31 of December 2010. We have used Eviews software to analyze our data and found ARIMA (1,1,1) for Islamic Bank of Britain and ARIMA(2,1,2) for Barclays Bank. We present a comparative status having the fact that Islamic stock is very young in the capital market area in Europe. We hope this analysis should be further reference for direction of future research for Islamic Capital Market in relation with Conventional Capital Market and innovation of competitive capital market instruments.*

Keywords: *IBB, Barclays, Forecasting, ARIMA Model.*

1. Introduction

Islamic finance has experienced its most rapid pace of development in this decade. Total Islamic assets worldwide have increased tremendously from around $150.00 billion in the 1990s to approximately $ 1.0 trillion today, underpinned by the industry's strong financial infrastructure, institutions, and regulatory framework. Islamic finance has demonstrated its competitiveness nd resilience during the global financial crisis period. The industry is now entering into an environment that is fundamentally different in this post crisis era. Efforts are being focused on the further development of Islamic financial markets, the financial infrastructure, research and development to support innovation, and enhancing the legal, regulatory and supervisory

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framework. Given that Islamic finance has become part of the global financial system, several countries are now in the race to become Islamic financial hubs, London is one among Kualalampur, Singapore, Bahrain and Luxembourg.
Islamic banking first commenced in 1971 in Egypt and soon began to spread its wings in the Middle East, Asia and Europe. From only domestic players, international conventional banks have also entered into the scene. Well-established and reputable conventional banks now have Islamic banking units operating in countries around the world. Conventional banking is essentially based on the debtor-creditor relationship between the depositors and the bank on the one hand, and between the borrowers and the bank on the other. Interest is considered to be the price of credit, reflecting the opportunity cost of money. Islam, on the other hand, considers a loan to be given or taken, free of charge, to meet any contingency. Thus in Islamic banking, the creditor should not take advantage of the borrower [9]. However, having the functional/process difference in its operations, did the stock price data shows anything very common ? As we know the ideology or functionality of Islamic bank is quite different from that of conventional Bank. The principal well-known principles is absence of usury or interest as profit or cost of capital, certainty of contract and no-speculation. But both of the companies have their stock enlisted and daily price changes which make us interested to learn the behavior of the prices. Using the daily stock prices we make model to present whether the price data shows similar model having their different functionality, ideology and mode of finance. The data falls the crisis period (year 2008-2010) which also reveals the volatility of the stock prices in the time series graph. The next sections describe literature review (2), Data and Methodology (3), the model (ARIMA) itself, Result and Interpretation (4) with a final section of concluded remarks.

2. Literature Review

There are some scholarly works on forecasting model. Among them a few fall in Islamic Finance area. The paper of Rosylin and Shabri [7] is a good contribution who explores the extent which the conditional volatilities of both conventional and Islamic stock markets in Malaysia are related to the conditional volatility of monetary policy variables. The monetary variables, therefore, tested in the study are the money supply, interest rate, exchange rate and Industrial Production Index. They applied the GARCH (1,1) framework together with Vector Autoregressive (VAR) analysis. One relative representation is also found in the paper of Dharani and Natarajan [2] which compares the risk and return both for Shariah (Islamic) and Conventional Index in India. It explores the seasonal anomalies between two shares using the sample t-test of average return. Iqbal and Kunst [4] analyzed the volatility of return for both Islamic and conventional Commercial Banks in Pakistan. For two groups of banks they used EGARCH (p,q) model. For the predictability of Amman (Jordan) Stock Exchange General Daily Index univariate Auto-Regressive Integrated Moving Average (ARIMA) model is applied in the paper of Al-Shihab [1]. That structure of analysis part are heavily followed in this paper. For ARIMA model applied in other paper are by Marcek [6] and Nochai [5]. One application is for the Wage forecasting and the other is to model forecasting of Palm price.
Hence those studies are not dealing exactly to figure out the stock price dynamics in a comparative way for any European country. So, our purpose is to model the stock price of one

Islamic and one non-Islamic bank of London Stock Exchange to compare the behavior of the data in ARIMA model.

3. Data selection and methodology

The stock price data of London Stock Exchange has been taken from http://finance.yahoo.com. We have taken the IBB and Barclays bank data from 1st of January 2005 to 31st of December 2010; six year period. The daily 'open' stock price data has been taken into consideration for the analysis. As the geographical area is of Europe, we tried to select the similar categorical instrument such as Equity from both Banks. Here we present a very short description of those two banks. Details can be found in their websites.

3.1 Short Description of Barclays Bank

With over 300 years of history and expertise in banking, Barclays operates in over 50 countries and employs 147,500 people. Barclays moves, lends, invests and protects money for customers and clients worldwide.[1]

3.2 Short Description of Islamic Bank of Britain2

Established in September 2004 Islamic Bank of Britain (IBB in short) is the UK's first Financial Service Authority (FSA) approved Islamic Bank. It is the first stand-alone Islamic retail bank in the western world.

We present here the forecasting model as Auto-Regressive Integrated Moving Average using the six year data of London Stock Exchange. Let us discuss something about the model we are going to apply to our stock price data.

3.3 ARIMA Model

ARIMA models are, in theory, the most general class of models for forecasting a time series which can be made stationary by transformations such as differencing and logging. In fact, the easiest way to think of ARIMA models is as fine-tuned versions of random-walk and random-trend models: the fine-tuning consists of adding *lags of the differenced series* and/or *lags of the forecast errors* to the prediction equation, as needed to remove any last traces of autocorrelation from the forecast errors.

The acronym ARIMA stands for "Auto-Regressive Integrated Moving Average." Lags of the differenced series appearing in the forecasting equation are called "auto-regressive" terms, lags of the forecast errors are called "moving average" terms, and a time series which needs to be differenced to be made stationary is said to be an "integrated" version of a stationary series. Random-walk [ARIMA (0,1,0)] and random-trend model, autoregressive models [ARIMA(1,1,0)], and exponential smoothing [ARIMA (0,1,1)] models (i.e., exponential weighted moving averages) are all special cases of ARIMA models [8]. A non-seasonal ARIMA model is classified as an "ARIMA(p,d,q)" model, where:

[1] For details www.barclays.com
[2] For details www.islamic-bank.com

- **p** is the number of autoregressive terms,
- **d** is the number of differences, and
- **q** is the number of lagged forecast errors in the prediction equation.

Therefore, The ARIMA model consists of three parts: 1) The autoregressive part consist of a linear regression that establishes how past values of stock prices are related to future values, 2) The 'Integrated' part refers to how many times we have to take a difference to get a stationary series[3], and 3) The moving average part consists of how past forecast errors are related to future values of Stock prices.
An ARIMA model will be developed using the Box-Jenkin's methodology that will take into account past values and forecast errors to predict future stock prices.

$$Y_t = \alpha_0 + \alpha_1 P_{t-1} + \text{----------} + \alpha_p P_{t-p} + \beta_1 \varepsilon_{t-1} + \beta_p \varepsilon_{t-q} + \varepsilon_t \quad (1)$$

Which we say ARMA(p,q)

3.4 Box-Jenkins Methodology

We are to use the Box-Jenkins methodology to fit an Autoregressive Integrated Moving Average (ARIMA) model to six years stock data to support the forecast of future price of stock. This methodology aids in identifying a forecast model, estimating its parameters, checking the model's performance, and finally using it to forecast. All of these steps will be illustrated below:
The first part of the identification phase is to ensure that the model is stationary and if not then taking the first difference until it is (Our consideration is of the P value as close as zero). When the plot of price on time is not a stationary process so first differencing will be needed to ensure this assumption of the ARIMA model is satisfied. The number of times first differencing is used will determine the order of integration in the ARIMA model.
The first difference of Open price (stock price) turns out to be a stationary process. The Augmented Dickey Fuller test confirms that we can reject the null hypothesis that the first difference of stock prices has a unit root (non-stationary) at the 1% significance level. The next step is to choose the ARMA model that best fits this data using a correlogram.

Table 1. Correlogram and ACF/PACF Behavior

Model	ACF Behavior	PACF Behavior
AR(p)	Decays Gradually	Spikes in Lag p
MA(q)	Spikes in Lag q	Decays Gradually
ARMA(p,q)	Decays Gradually	Decays Gradually

Using Correlogram of data set, Table 1 is used to identify which kind of model we should be using: AR, MA, or mixture model ARIMA. Thus, estimate the parameters for a tentative model is selected [3]. Having identified the appropriate p,d, and q values, we need to estimate the parameters. The chosen model needs to be tested. Some those tests required are: R-squared, Adjusted R-squared, Akaike Information Criterion (AIC), Shwarz Information Criterion (SIC) and Durbin-Watson etc. The model chosen should have the lowest AIC and SIC on one hand and

[3] A stationary series is one whose statistical properties suc as mean, variance, autocorrelation, etc. Are all constant over time.

the highest R-squared and Adjusted R-squared on the other and its E-W more close to 2 (Al-Shiab 2006).

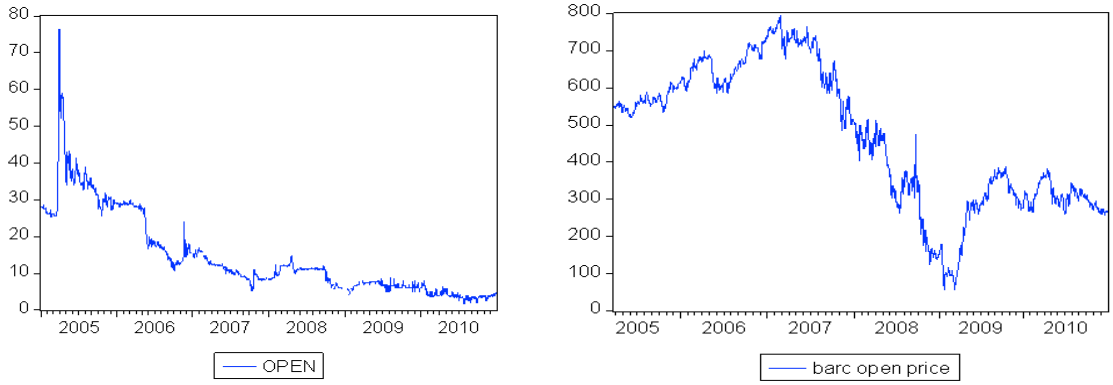
Eviews software is used for the analysis where the parameters are estimated through Least square method. Note that, the study is focused on price not with return. So, log transformation is not used because the price data set is found normal. Return can be negative, not price. Therefore, the differentiation is used to make it stationary to obtain the entire data set constant over time. As modern literature focuses on Stochastic Differential Equation, for example, Black-Sholes equation for Option pricing hence, in this study the stochastic process in discrete-time ARMA model is used to forecast Daily Stock Price.

The errors of the model appear to be a white noise process, zero mean and constant variance. The diagnostic check of the models performance validates unbiased estimates and the different criteria used to select the simple model ensures maximum efficiency. Autoregressive Conditional Heteroskedasticity ARCH LM is also adopted to verify the residuals. Note that the study focused on forecasting the price; the mean not the variance and discussion within the scope. So, forecasting parameters are also analyzed for the differentiated set of data for both Stocks.

In order to use the selected model, mathematical formulation of the ARIMA must be outlined. After the model has been constructed the parameters estimated in this model will be useful in building our forecasting model. Breaking down the lags and first differences yields the final forecasting model that will be used to forecast the stock prices of IBB or Barclays.

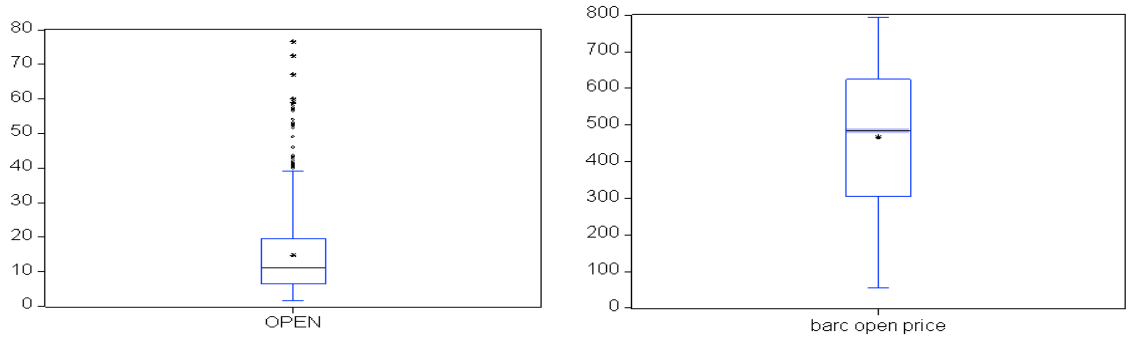
4. The Empirical Results and Discussion

We start presenting our basic time series graph both for IBB and Barclays. The first graph shows in figure 1 (in two graphs a and b) that the high starting point declines overtime. Rather in Barclays, it shows overall upward sloping except declines in the financial crisis period 2008.



Graph a) IBB Graph b) Barclays

Figure 1. Line graph of IBB Open and Barclays Open price



Graph a) IBB Graph b) Barclays

Figure 2. Box plot of IBB and Barclays Open price

Here we see the general descriptive features of two banks using Box plot in figure 2 in graphs a and b. We find the higher range of the stock price of Barclays Bank. Figure 3 shows the theoretical Q-Q plot where Barclays Stock price Index appears normal smoothing.

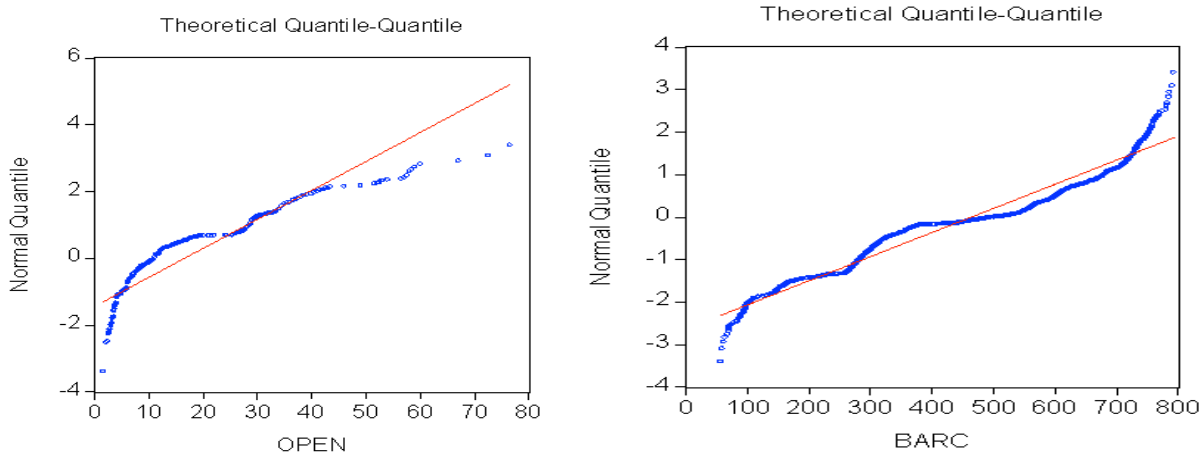


Figure 3. Q-Q plot for IBB and Barclays Bank for the daily open price of the stock

4.1 The IBB price forecasting model and result

From now on our analysis should be separately stated. We are to discuss IBB first:

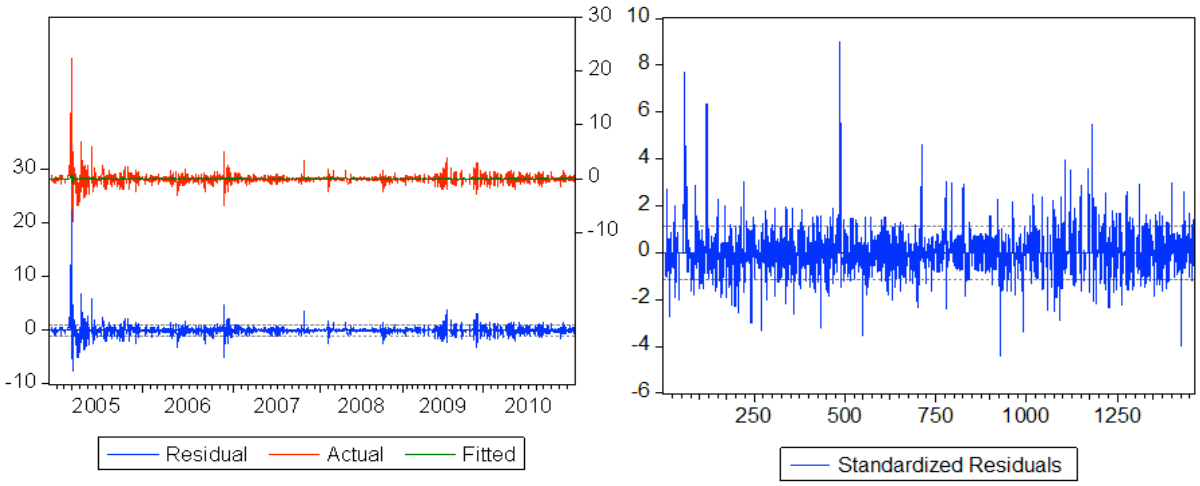


Figure 4. Fitted and residual graphs for IBB

We start our discussion showing the fitted model with residuals, separately in two graphs in figure 4.. But one find here the working process from the very beginning. To check the series being stationary we adopted the Dicky-Fuller, Augmented Dickey-Fuller and Phillip-Perron unit root tests presented in Table 2.

Table 2. IBB Stationary Test

Factors	Critical value at 1% level	Computed Value	Unit Root Test
Daily Open Price Stationary Test	-3.434618	-1.970875	Augmented Dickey-Fuller
	-2.566546	-0.915417	Dickey-Fuller GLS
	-3.434618	-1.952417	Phillips-Perron
First Difference Daily Open price Stationary test	-3.434621	-36.66058	Augmented Dickey-Fuller
	-2.566547	-36.66872	Dickey-Fuller GLS
	-3.434621	-36.65818	Phillips-Perron

For the first difference daily open price stationary test, critical value at 1% level; in absolute value, are less than the computed value for three unit root test. Therefore, we can concluded that IBB stock price are stationary one. Now, based on the correlogram using the ACF and PACF pattern, we presents different p and q ARIMA with a view to find the best one. Table 3 is one of that table[4].

[4] Appendix will show 36 lags ACF/PACF pattern and up to 35 ARIMA model (corresponding p and q) presentation.

Table 3. ARIMA(1,1,1) model Estimators

Variable	Co-efficient	Standard Error	t-statistics	Probability
Constant	0.059705	0.048737	1.225043	0.2208
AR(1)	0.040773	0.026161	1.558547	0.1193
AR(2)	-0.033103	0.026180	-0.264425	0.2063
AR(3)	0.035668	0.026187	1.362069	0.1734
MA(1)	0.043963	0.026149	1.681247	0.0929
MA(2)	-0.031936	0.026163	-1.220652	0.2224
MA(3)	0.042764	0.026152	1.635214	0.1022

Note: IBB First Difference Daily General Index is the Dependent Variables

From Table 3 we find the AR(1), MA(1) and MA(3) are highly significant.
We see the collection of ARIMA for different values of p and q. Four standards are used for determining the accurate ARIMA model (as for p=1, d=1, q=5) from the collection exercised as R-squared, Adjusted R-squared, AIC and SIC. Other parameters are showed in the following Table 4 with ARCH Test result.

Table 4. ARIMA and ARCH LM test parameters

R-squared 0.005091	Adjusted R-squared 0.004408	AIC 3.099899	
Probability 0.000000	D-W 1.998382	SIC 3.107140	
Residuals: ARCH LM			
F-Stat 17.68873	Probability 0.000028	Obs*R-Squared 17.50055	Probability 0.000029

The F-statistics is high enough to be significant to select ARIMA (1,1,1) to explains the data and most accurate forecasting. A very strict assumption, in choosing the most accurate model, is that the error terms are assumed to have white noise (i.e., zero mean and constant variance, uncorrelated and normally distributed). After the ARCH LM test for autocorrelation in error variance of the selected model is completed, it turned out that the error term are not serially correlated. Since chi-square =17.68873, its probability is higher than a 10% level of confidence (Probability 0.000028), we say the residuals does not contain ARCH effects.
For IBB our model takes the following form:

$$Y_t=0.059705+0.040773Y_{t-1}+\varepsilon_t+0.043963\varepsilon_{t-1} \quad (2)$$

4.2 Barclays Bank Price Forecasting Model and Results

The Barclays stock price forecasting model and the results are presented below:

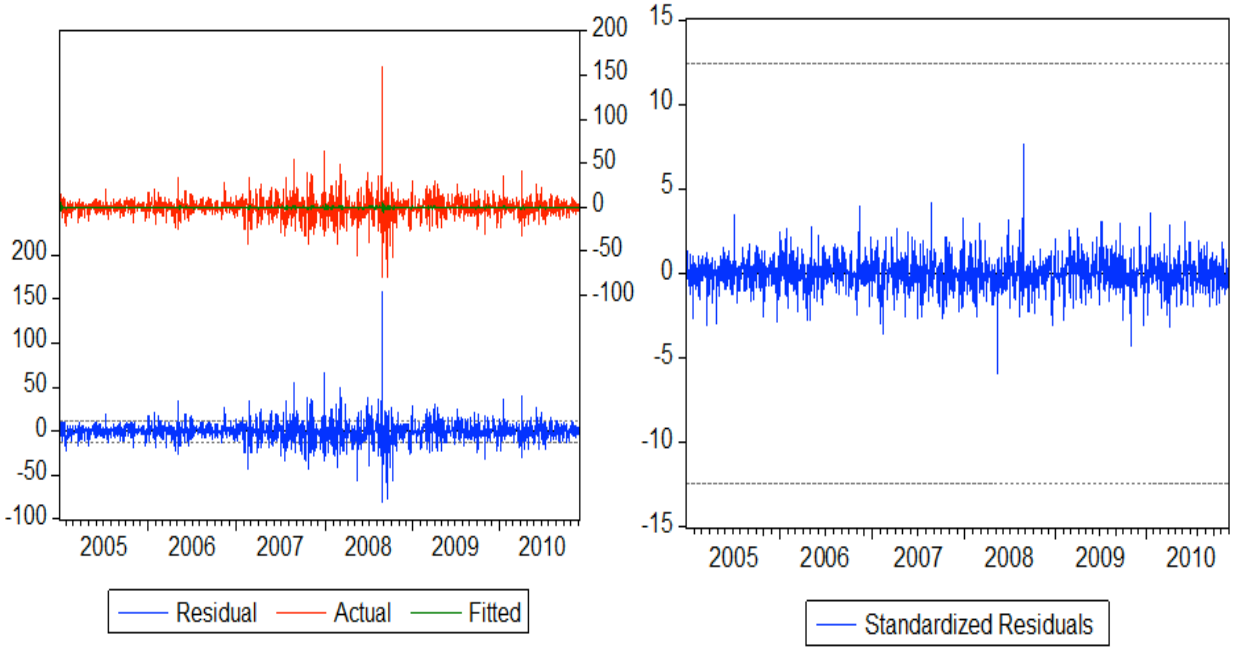


Figure 5. Fitted and Residuals graph for Barclays Bank

Also, here we start our discussion showing the fitted model with residuals, separately also in figure 5. On the other hand, Table 5 shows the stationary test for Barclays data set.

Table 5. Barclays Daily Open price Index Stationary Test

Factors	Critical value at 1% level	Computed Value	Unit Root Test
Daily Open Price Stationary Test	-3.434443	-0.956349	Augmented Dickey-Fuller
	-2.566483	-0.475970	Dickey-Fuller GLS
	-3.434440	-0.880796	Phillips-Perron
First Difference Daily Open price Stationary test	-3.434443	-44.62808	Augmented Dickey-Fuller
	-2.566495	-4.625934	Dickey-Fuller GLS
	-3.434443	-45.33620	Phillips-Perron

As well we find that the first difference Barclays daily open price series is stationary as the critical value at 1% level is much less than the computed value.

Table 6. ARIMA(2,1,2) model Estimators

Variable	Co-efficient	Standard error	t-statistics	Probability
Constant	0.525989	0.849944	0.618851	0.5361
AR(1)	-0.134287	0.025416	-5.283517	0.000
AR(2)	0.023619	0.025635	0.921359	0.3570
AR(3)	-0.006177	0.025651	-0.240817	0.8097
MA(1)	-0.131496	0.025419	-5.173125	0.000
MA(2)	0.028093	0.025632	1.096033	0.2732
MA(3)	-0.06424	0.025643	-0.250512	0.8022

Note: Barclays First Difference Daily General Index is the Dependent Variables

It is seen from the Table 6, that the co-efficient AR (2), and MA (2) are highly significant. Also, for the Barclays we see the collection of ARIMA for different values of p and q. Four standards are used for determining the accurate ARIMA (2,1,2) model (as for p=1, d=1, q=5) from the collection exercised as R-squared, Adjusted R-squared, AIC and SIC. Other parameters are presented in Table 7 with ARCH test result.

Table 7. ARIMA and ARCH LM test

R-squared 0.003023		Adjusted R-Squared 0.002367	
Probability 0.0000		SIC 7.872377	
D-W 2.258571		AIC 7.865368	
Residuals ARCH LM			
F-statistic 93.85075	Probability 0.000000	Obs*R-squared 88.49938	Probability 0.000000

The fact that R-squared and Adjusted R-squared are not high enough. The value of D-W, moreover strongly supports the view that there is no positive or negative first order serial correlation. So, the residuals does not contain ARCH effects.

For Barclays our model would take the following form:

$$Y_t=0.525989-0.134287Y_{t-1}+0.023619Y_{t-2}+\varepsilon_t-0.131496\varepsilon_{t-1}+0.028093\varepsilon_{t-2} \quad (3)$$

4.3 Limitations

The comparative focus is actually to present the status of two stock prices. The Islamic bank has still been in its initial phase. This is certain that the matured market as Barclays should react differently say, stable even for a crisis period. Therefore, the representation of this article is to focus only on the description of the observed data, not the projection of future. We all know that this modeling reflects the behavior of the investors but it is to consider that the investors does not have any alternative for Islamic capital market stock what could be diversified in a matured capital investment. Thus, our scope is limited in explanation, study as well merely to see the direction of forecasting using ARIMA model.

5 Conclusion

We are aware of the volatility (upward and downward movement) of the stock price. Also, it is known that the price shows not only the historical dynamics, the behavior of investors too. If the price is high many investors do not buy it or do the reverse. As we found IBB stock the only one equity in London Stock Exchange, not other substitute for it. On the other hand, we do consider that those are investors in the Islamic finance area, should bear in mind the profit and loss sharing phenomenon even though the share is Asset-based or Asset-backed what means less risky investment. Stock price volatility, therefore, would take a more stable dynamics. We tried to find out the status of price direction using the forecasting method where our finding is not similar for two banks share price; for the forecasting model we obtained ARIMA (1,1,1) for Islamic Bank of Britain and ARIMA (2,1,2) for Barclays Bank. What the result really mean would take time for its practical application based on the concept and ideology. 'The ethical principles on which Islamic finance is based may bring banks closer to their clients and to the true spirit which should mark every financial service' (Bloomberg). The dynamics should take different form in the near future as the economic situation changed and market became more matured. We hope this result should play a very important role for the explanation of Islamic stock market diffusion and further work on the arena of Islamic Capital Market in relation with conventional one.

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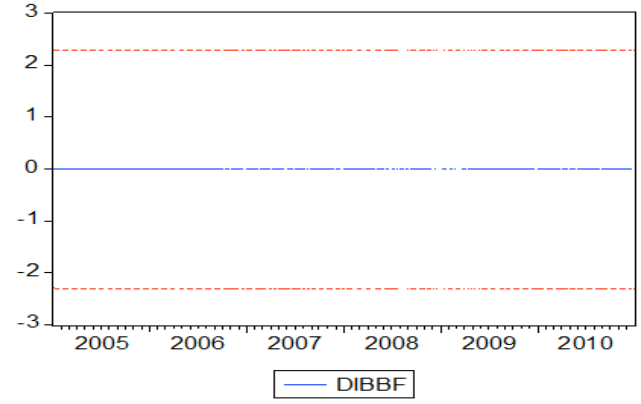
Appendices

Appendix 1: Descriptive Statistics

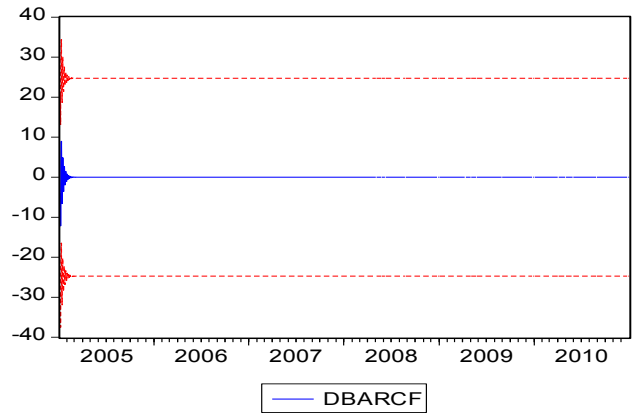
	IBB		Barclays
Mean	14.7781600547196	Mean	469.177150361131
Median	11	Median	500
Maximum	76.5	Maximum	793
Minimum	1.5	Minimum	56.3
Std. Dev.	11.4467478875409	Std. Dev.	185.866305220842
Skewness	1.39291099173577	Skewness	-0.169490749230729
Kurtosis	4.98672518745746	Kurtosis	1.85354029475095
Jarque-Bera	713.2050899805	Jarque-Bera	90.6996195527388
Probability	0	Probability	0
Sum	21605.67	Sum	714556.8
Sum Sq. Dev.	191431.962350547	Sum Sq. Dev.	52579443.3598326

Appendix 2: Forecasting Parameter of the differentiated data set



Forecast: DIBBF
Actual: DIBB
Forecast sample: 1/03/2005 12/31/2010
Adjusted sample: 1/05/2005 12/31/2010
Included observations: 1440

Root Mean Squared Error	1.148456
Mean Absolute Error	0.527986
Mean Abs. Percent Error	70.00000
Theil Inequality Coefficient	1.000000
Bias Proportion	0.000177
Variance Proportion	0.999823
Covariance Proportion	0.000000



Forecast: DBARCF
Actual: DBARC
Forecast sample: 1/03/2005 12/31/2010
Adjusted sample: 1/06/2005 12/31/2010
Included observations: 1520

Root Mean Squared Error	12.36326
Mean Absolute Error	8.089451
Mean Abs. Percent Error	97.10509
Theil Inequality Coefficient	0.962720
Bias Proportion	0.000291
Variance Proportion	0.921337
Covariance Proportion	0.078372

Appendix 3: Correlogram of IBB and Barclays

	IBB Daily Open Price index		IBB First Difference Daily Open Price index		Barclays Daily open price index		Barclays First Difference Daily Open Price index	
	AC	PAC	AC	PAC	AC	PAC	AC	PAC
1	0.994	0.994	0.041	0.041	0.997	0.997	-0.135	-0.135
2	0.987	-0.035	-0.033	-0.035	0.995	0.104	0.023	0.005
3	0.981	0.021	0.035	0.038	0.993	-0.017	-0.006	-0.003
4	0.974	-0.033	0.023	0.019	0.991	0.004	-0.079	-0.082
5	0.967	-0.019	0.040	0.041	0.989	0.065	0.013	-0.009
6	0.960	-0.039	-0.083	-0.086	0.987	0.000	-0.018	-0.016
7	0.953	0.065	-0.079	-0.072	0.985	0.011	-0.055	-0.062
8	0.947	0.059	-0.055	-0.059	0.983	0.043	-0.013	-0.036
9	0.942	0.035	0.001	0.006	0.982	0.032	0.036	0.032
10	0.937	-0.005	0.058	0.063	0.980	-0.033	-0.004	0.001
11	0.931	-0.050	0.015	0.026	0.978	-0.001	0.076	0.066
12	0.925	-0.022	-0.013	-0.009	0.976	-0.055	-0.023	-0.007
13	0.919	0.006	-0.018	-0.030	0.974	0.006	0.023	0.021
14	0.913	0.013	-0.057	-0.079	0.972	-0.014	0.006	0.010
15	0.908	0.053	-0.000	-0.011	0.970	-0.014	-0.054	-0.044
16	0.903	0.005	0.011	0.017	0.968	0.025	0.049	0.038
17	0.898	-0.014	0.007	0.029	0.966	-0.032	-0.042	-0.022
18	0.892	-0.024	-0.011	0.004	0.964	0.033	0.049	0.047
19	0.887	0.001	0.017	0.020	0.962	-0.031	0.000	0.010
20	0.882	-0.012	-0.027	-0.053	0.960	-0.009	-0.016	-0.013
21	0.877	0.033	-0.056	-0.074	0.958	-0.144	-0.018	-0.027
22	0.872	0.051	-0.071	-0.082	0.955	-0.006	0.010	0.002
23	0.868	0.059	-0.097	-0.090	0.952	-0.005	-0.002	0.003
24	0.866	0.067	-0.081	-0.064	0.949	0.010	0.000	-0.003
25	0.864	0.055	-0.051	-0.033	0.947	-0.012	0.009	0.007
26	0.862	0.027	0.052	0.064	0.944	-0.008	-0.016	-0.003
27	0.860	-0.048	0.036	0.031	0.942	0.003	0.054	0.041
28	0.858	-0.028	-0.068	-0.088	0.939	-0.029	-0.036	-0.021
29	0.856	0.061	0.050	0.018	0.936	0.007	0.051	0.038
30	0.854	-0.025	0.051	0.007	0.934	-0.034	0.017	0.032
31	0.851	-0.017	0.026	0.009	0.931	-0.036	-0.010	0.006
32	0.848	-0.025	0.058	0.070	0.928	0.020	-0.017	-0.024
33	0.844	-0.057	0.001	0.032	0.925	0.020	-0.013	-0.004
34	0.840	-0.016	-0.033	-0.033	0.922	0.019	-0.015	-0.014
35	0.837	0.029	-0.043	-0.066	0.920	0.016	-0.030	-0.034
36	0.834	0.055	0.070	0.043	0.917	0.021	0.029	0.016