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FINANCIAL LIBERALIZATION AND KUWAITI STOCK MARKET BEHAVIOUR

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Abstract

The Kuwait Stock Exchange (KSE) was established in April 1977 and is among the oldest stock exchanges in the GCC countries. Significant regulatory changes in KSE took place from 2014 to 2018 that were designed to liberate the KSE and upgrade it into an emerging market. As a result, KSE has been upgraded by several institutions' indexes (to be treated as an emerging market) such as FTSE, S&P and Dow Jones. Although the regulatory changes in the KSE aim to liberalise the stock market in Kuwait to attract foreign fund inflow, this inflow may affect the volatility of the KSE. By applying ARCH, GARCH and TGARCH models, this paper found that liberalization has reduced the volatility of the KSE. The findings of this paper indicate that the best model for estimating the volatility in the KSE is the TGARCH model.

Keywords: Kuwaiti Stock Exchange, Volatility, Financial Liberalization, ARCH, GARCH, TGARCH

INTRODUCTION

The liberalization of emerging stock markets and its impacts on market volatility have attracted growing attention from academics and policymakers during the last few decades. Liberalization has positive impacts on the emerging financial markets through integration, the sharing and diversifying of risk among international investors, increasing liquidity, decreasing costs, increasing the returns and enhancing the regulatory structure of these markets. Miles (2002) argues that such liberalization will increase the inflow of foreign capital, leading to more significant financial development and economic growth in emerging markets. On the other hand, liberalization may increase the volatility and increase the risks in the emerging stock markets and so may negatively influence the economy as a whole. For example, excess stock return volatility may increase the cost of capital to corporations, which might delay investments. Liberalization may increase the volatility during the liberalization period either in the short or long run, which may cause instability in the secondary market and send out the wrong signals about the real intrinsic value of the stocks to investors (Abul, 2003). Wang (2006) argued that market volatility will be increased if the foreign funds inflow is short-term only.

Due to the importance of this subject, numerous studies have examined the influence of liberalization on emerging stock markets, mainly focusing on the period from 1980 to 2014. However, the Kuwaiti Stock Exchange (KSE, henceforth) was established in 1977, is the oldest stock market in the GCC countries, and has passed through several developmental stages. Significant regulatory changes in the KSE took place recently, between 2014 and 2018. During this period, Kuwait started to develop and liberate its stock exchange by issuing several regulations and working hard to be upgraded to an emerging index, such as the FTSE, S&P, and Dow Jones. Although the regulatory changes in the KSE aim to liberalise the stock market in Kuwait to attract foreign fund inflows, it may be argued here that foreign fund inflows may be affected by the volatility of the KSE. Therefore, this paper aims to:

1. Investigate whether the KSE's volatility was affected by the KSE being liberated and upgraded by several institutions' indexes (to be treated as an emerging market).
2. Select the best model for estimating the volatility in the KSE.

The findings of this study will be of great interest to academics, investors and policymakers.

LITERATURE REVIEW

During the past few decades, many emerging countries, such as Latin America, Asia, Africa, the Middle East and elsewhere, have liberalized their stock markets. Most of the financial literature that examined the impacts of liberalization on volatility focuses on these countries, while little

attention was paid to Kuwait as a case study. Although all of these papers made essential contributions to the understanding of liberalization's impacts on the volatility of the emerging stock markets, they produced mixed findings. Some of them revealed that liberalization decreased volatility while others that it increased it, while a few of them found no significant relationship between these two factors. In fact, the previous research produced conflicting findings, possibly due to the different methodologies and samples used. However, quite a lot of evidence from the literature reported that liberalization increases volatility in emerging stock markets; for example, Uppal (1993) examined the effect of liberalization on the volatility of the Pakistani stock market, and concluded that both the average return and stock return's volatility increased significantly shortly after liberalization, becoming stable again after a year. In 2010, another study by Waliullah (2010) investigated the impacts of the liberalization of the Pakistani stock market on volatility for the period 1971-2005. The results of this study show that liberalization has positive impacts on volatility in the long run also.

Grabel (1995) revealed that liberalization increased volatility in selected emerging stock markets, including Chile, Colombia, Venezuela and Korea, while there was no evidence of significant impacts in Argentina or the Philippines. Brooks et al. (1997) found that the financial liberalization of the South African stock market had a positive effect on financial market volatility, while another study by Levine and Zervos (1998), that examined 16 emerging stock market factors, such as volatility, liquidity, size and international integration, found that liberalization has positive impacts on these factors and that the volatility increased during the period post-liberalization. Maghyereh (2003) examined the impacts of market liberalization on the pattern of volatility of stock prices on the Jordanian Stock Exchange, utilising the GARCH statistical technique. His results suggest that liberalization leads to increased volatility, and he concluded that the finding that price changes were integrated during the pre-liberalization period but became stationary post-liberalization implies that market liberalization improves the speed and quality of the information flow to the market. Using daily data from ten emerging markets, Wang (2006) found increased volatility in the stock markets of Thailand, Brazil, Chile, and Mexico, but unchanged volatility in South Korea, Malaysia, the Philippines, Taiwan, Turkey and Argentina. Moreover, this evidence was supported by Huang (2008), who found that liberalization increased the volatility of 35 emerging stock markets during the period from 1976 to 2002. Jaleel and Samarakoon (2009) also found that liberalization increased return volatility. They applied GARCH and TGARCH models to the Sri Lankan stock market and found that the volatility increasing during the liberalization period compared to the pre-liberalization period. Afef (2014) examined the effects of liberalization in selected countries, including Latin American countries such as Argentina, Brazil, Chile and Mexico, and Asian countries such as the

Philippines, Korea, Taiwan and Thailand, for the period from 1975 to 2005. He revealed that, in general, the effects of liberalization in the long-term are stable while, during the five years post-liberalization, the volatility was unstable. He argued that the implementation process of the liberalization (i.e. fast and thoroughly or step by step) for each country might affect the volatility cycles.

On the other hand, several researchers found evidence that liberalization decrease volatility in emerging stock markets, such as Kassimatis (2002), who found that liberalization in six emerging countries (Pakistan, India, Argentina, the Philippines, South Korea and Taiwan) decreased volatility. Beakert and Harvey (1997) revealed that liberalization decreased the volatility in emerging markets. Edwards et al. (2003) investigated the liberalization effects on selected Latin American stock markets, including Argentina, Brazil, Chile, Mexico and South Korea plus two selected Asian countries including Thailand during the 1980s and 90s. They concluded that, during the post-liberalization period, the Latin American stock markets were more stable than the Asian ones. They argued that the results regarding the Asian stock markets might be due to the financial crises of 1997. Demetriades et al. (2007) argue that structural breaks must be carefully taken when investigating liberalization's effects on market volatility. They examine the impacts of liberalization on market volatility in five countries (South Korea, Malaysia, the Philippines, Taiwan and Thailand), pre- and post-liberalization. They found that, in South Korea, Malaysia and Taiwan, the volatility increased before the liberalization date and declined thereafter. They argue that this subject needs further research since they are uncertain about the findings. James and Karoglou (2009) investigated liberalization's influence on the Indonesian stock market's volatility based on weekly data for the period from April 11, 1983, to January 23, 2006. The pre-liberalization period showed decreased volatility while the post-liberalization volatility was low and stable. Drion (2011) examined the impacts of liberalization on the volatility of 15 Latin stock markets for the period between 1970 and 2000. He reported that liberalization decreased the volatility of these markets. Ben Rejeb and Boughrara (2014) examined the impacts of liberalization on the volatility of 13 emerging stock markets for the period between 1986 and 2008 and found that liberalization had no effects on volatility, which decreased progressively with the liberalization. Imegi (2014) examined the effects of the Nigerian stock market's liberalization on volatility for the period from 1981 to 2012 and reported an insignificant negative relationship. Therefore, he argued that liberalization did not affect the volatility of the market.

However, to our knowledge, no recent studies have assessed the impacts of liberalization on the volatility of emerging markets, possibly because most of the emerging markets were liberated during the 1980s and 90s.

REVIEW OF THE KUWAITI STOCK EXCHANGE

The Kuwaiti Stock Exchange (KSE) was established in April 1977 and closed from 2 August, 1990 (the date of the Iraqi invasion) until 28 September, 1992. There is a total of 163 companies listed on the KSE and its market capitalisation was 29,105.22 million KD at the end of 2018. However, from 2010 to 2018, the KSE has witnessed significant regulatory changes, aiming to liberate and upgrade the KSE to the level of the other emerging stock markets across the world. In 2010, Kuwait started to develop its stock exchange by issuing several regulations. The most important was Law No. 7 of 2010 regarding the Establishment of the Capital Market Authority (CMA, hereafter), which was issued on February 21, 2010, and has been amended by law No.108 of 2014 and law No. 22 of 2015. As a result of these laws, the CMA issued the interior decision to organise the KSE and listed companies. As a result, traders on the KSE behaved with care towards these laws and decisions since they are unfamiliar with these new practices in the market. Therefore, CMA offered several workshops and training courses to market traders, brokers, investors and listed companies. During the period from 2010 to 2018, the KSE's volume, value and number of traded shares reached its highest level in 2013 (Figure 1). The Central Bank of Kuwait (CBK, hereafter), in their report for 2013 indicated that the sharp increase in their activity was due to several factors, such as the profits of the listed companies which rose by 22.5% in 2013 compared to 2012, and this growth was due to the compliance and disclosures requirements which were introduced by law during 2013. However, the most significant regulatory changes related to the liberalization of the KSE occurred during the period from 2014 to 2018, when the KSE made the changes required by the institutions that wished to include the Kuwait Stock Exchange in its indexes and promote it as an emerging stock exchange.

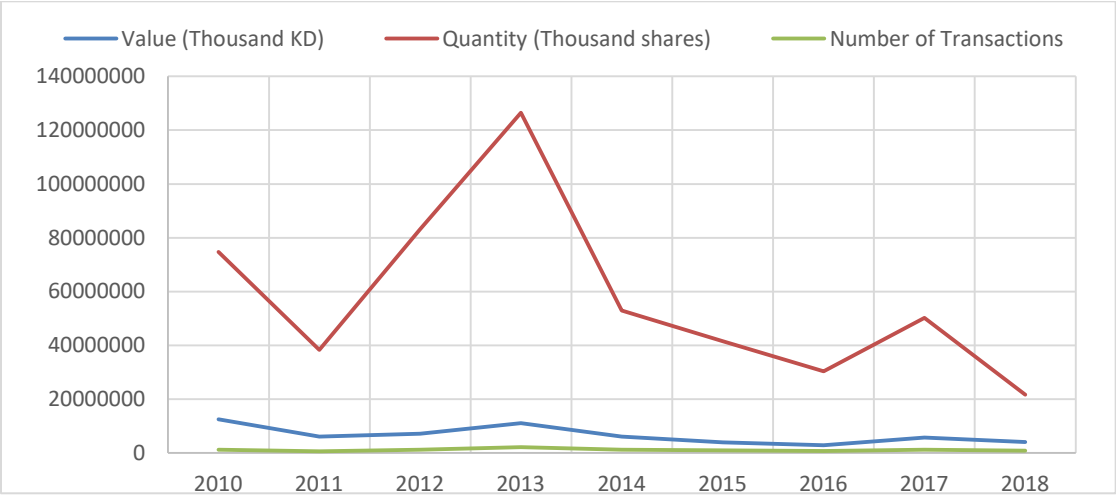

Figure 1: Kuwaiti Stock Market's Traded Activity 2010-2018

After the KSE took significant steps towards becoming accepted by emerging indexes such as Standard and Poor and the FTSE, it has already been approved by some of them and awaits approval by others for the KSE to be upgraded and treated as an emerging market. For example, the FTSE classified the KSE as an emerging market in 2017, and promoted KSE to become an emerging market in 2018; the KSE will be upgraded to an emerging market on S&P and the Dow Jones on 23 September, 2019; while MSCI noted that it would include the Kuwait Index in its main index in June 2020. These developments have had a positive impact on the KSE, and it attracted foreign inflows which reached about 950 million US dollars (from 2017 to June 2019). It is estimated to attract about 2.8 billion US dollars in June 2020 if the KSE is upgraded by MSCI to the emerging market index. (NBK Capital news report, 2019). By upgrading the KSE to become an emerging stock market, it will have some weight in the main emerging indexes, such as the FTSE, S&P, and Dow Jones, which will attract more fund inflows from foreign investors who wish to trade in the market.

Table 1 shows that the foreign investors' fund inflows into the KSE started rising from 2014, reaching 15%; however, in 2018, the value of the traded shares of foreign investors reached 27% of the total liquidity of the KSE. Another indicator that shows the growing activity of foreign investors is the fact that the number of active accounts of Kuwaiti traders declined during the same period, from 131,000 in 2014 to only 13,000 accounts in 2018 (KSE monthly report, 2019). In order to remove any structural changes from the time series, we chose 2014 as the start of the liberation period. According to table 1, it is clear that the real foreign inflows began in 2014 (the start date for liberalization); therefore, we will treat the period from 2014 to 2018 as the liberalization period. However, the period from 2009 to 2013 will be treated as the pre-liberalization period, which witnessed significant regulatory changes to the KSE.

Table 1: Value of traded shares by Nationality

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Kuwaiti	93%	92%	91%	91%	91%	85%	84%	85%	87%	73%
Non-Kuwaiti	7%	8%	9%	9%	9%	15%	16%	15%	13%	27%

Source: Kuwaiti Stock Exchange annual reports (2009-2018).

RESEARCH METHODOLOGY

Data Description

The data used in this study were taken from the Kuwaiti Stock Exchange, and the Kuwait market general index (KSEI, henceforth) has been used to calculate the stock price index returns.

The daily returns of the KSE were calculated as follows:

$$KSEIR_t = \ln\left(\frac{KSEI_t}{KSEI_{t-1}}\right) \quad (1)$$

Where;

Ln = natural logarithm, $KSEIR_t$= daily returns, $KSEI_t$is Kuwait stock index at time t, $KSEI_{t-1}$= the KSEI at time t-1.

Table 2: Descriptive Statistics

	Pre-Liberalization Period	Liberalization Period
Mean	-0.0000238	-0.0000521
Median	0.000228	0.000128
Maximum	0.032032	0.031996
Minimum	-0.037065	-0.034039
Std. Dev.	0.006906	0.006033
Skewness	-0.681787	-0.519400
Kurtosis	6.671688	8.308151
Jarque-Bera	816.8883	1495.691
Probability	0.000000	0.000000
Observations	1278	1227

Source: Authors' computation

Table 2 shows that the mean of the stock price index returns was negative for both the pre-liberalization and liberalization periods (-0.0000238 and -0.0000521). The Maximum return value was almost the same (0.03203 and 0.03199). The standard deviation statistic indicates that the pre-liberalization period was slightly more volatile than the liberalization one. Both periods were skewed negatively due to the high negative returns. The Kurtosis statistic for both periods is more than 3.

Data Analysis Approach

This study examines the volatility of the KSE for two sub-periods relating to prior to, and after, the liberalization took place and examine whether the volatility of the KSE is different between the two periods.

This will be done by applying ARCH, GARCH (1,1) and TGARCH (1,1). Unlike most previous studies, which tended to use dummy variables that take 1 for the liberalization period and zero for the pre-liberalization period, our tests were performed for each sub-period separately.

The empirical work of this study entailed the following steps:

1. The stationarity of KSEIR was tested using the unit root test.
2. The ARCH effect was tested to ensure that we can capture the volatility of the KSE by applying the ARCH model that was introduced by Engle (1982), the GARCH model which was proposed by Bollerslev (1986), and its extensions such as TGARCH, proposed by Zakoian (1994) and Glosten et al. (1993).

RESULTS AND DISCUSSIONS

Unit Root Test

The Augmented Dickey-Fuller (ADF) was tested for KSEIR stationarity. The hypotheses are as follows:

Null hypothesis H_0: the variable is not stationary (has a unit root)

Alternative Hypothesis H_1: the variable is stationary (lacks a unit root)

If the p-values are less than 0.05, this means that the data are stationary, and the null hypothesis is rejected. Moreover, if the t-statistic > the critical values, the null hypothesis is also rejected. Table 3 shows that KSEIR is stationary.

Table 3: Units Root Test for KSEIR

		t-Statistic	Prob.*
Augmented Dickey-Fuller			
test statistic		-20.02155	0.0000
Test critical values:	1% level	-3.432771	
	5% level	-2.862495	
	10% level	-2.567324	

*MacKinnon (1996) one-sided p-values.

ARCH Effects

The relationship between the Kuwaiti stock index return of today with yesterday's return for both periods can be tested by the AR (1) model using simple OLS as follows:

KSEIR = a_0 + KSEIR (-1) (2)

Table 4: Results of equation (2) for both periods

Pre-liberalization period				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.00000144	0.000189	-0.007621	0.9939
KSEIR(-1)	0.197316	0.027338	7.217663	0.0000
R-squared	0.039255	Akaike info criterion	-7.157868	
F-statistic	52.09467	Schwarz criterion	-7.149799	
Prob(F-statistic)	0.000000	Hannan-Quinn criterion	-7.154838	
		Durbin-Watson stat	2.041641	
Liberalization period				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000049	0.000170	-0.288602	0.7729
KSEIR (-1)	0.176716	0.028115	6.285491	0.0000
R-squared	0.031268	Akaike info criterion	-7.413039	
F-statistic	39.50739	Schwarz criterion	-7.404700	
Prob(F-statistic)	0.000000	Hannan-Quinn criterion	-7.409901	
		Durbin-Watson stat	2.021858	

Source: Authors' computation

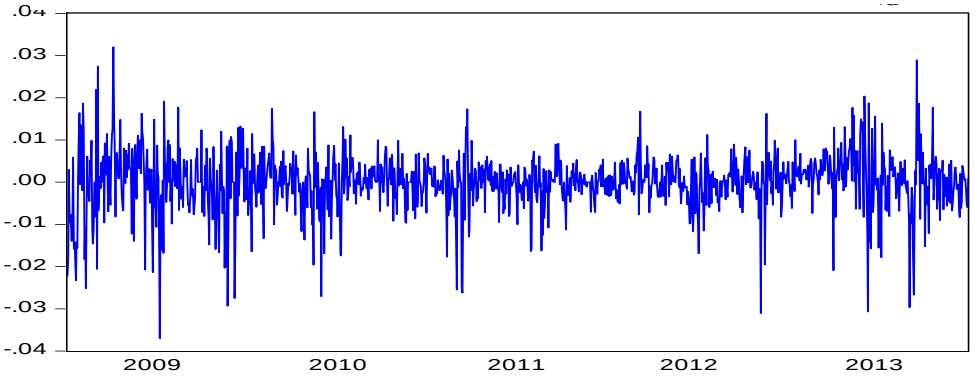

Figure 2: Volatility clustering for KSEIR during pre-liberalisation period

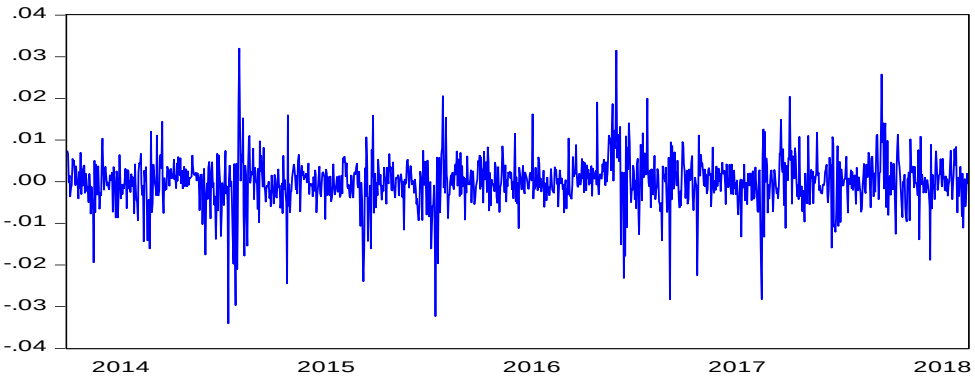

Figure 3: Volatility clustering for KSEIR during liberalisation period

Figures 2 and 3 show that the volatility clustering of daily returns of the KSE during both periods. The same figures show that the clustering of the periods of high volatility is followed by high volatility for a continued period, while the periods of low volatility are followed by low volatility. However, Figure 3 shows that the high number volatility periods in the liberalization period is less than the pre-liberalization period. Figures 2 and 3 indicate that we can be justified to run ARCH family models for our data. However, to double-check this justification, the ARCH effects were examined by testing the following hypothesis:

The null hypothesis: there is no ARCH effect.

The alternative hypothesis: there is ARCH effect.

Table 5: Heteroskedasticity Test for ARCH Effects

(Pre-liberalization period)			P-value
F-statistic	72.41705	Prob. F (1,1274)	0.0000
Obs*R-squared	68.62966	Prob. Chi-Square (1)	0.0000
(Liberalization period)			
F-statistic	65.71626	Prob. F (1,1223)	0.0000
Obs*R-squared	62.46714	Prob. Chi-Square (1)	0.0000

Source: Authors' computation

The p-value 0.000 is less than 5%, meaning that we can reject the null hypothesis and accept the alternative hypothesis. As a result, we can run the ARCH family, such as the GARCH and TGARCH models. There follows a brief explanation of each of these models.

ARCH Model

Engle (1982), in his pioneering paper, introduced the ARCH (autoregressive conditionally heteroskedastic) model that makes the variance change over time and the residuals depend on their square of error terms from previous periods. He called this heteroskedastic variance. As a result, the conditional variance is not constant. The ARCH (1) model has the mean and the variance of the series that can be written as:

The mean equation $Y_t = a + \beta' X_t + u_t$ (1)

$$u_t \mid \Omega_t \sim iid\ N(0, h_t)$$

Ω_t is the information set.

The variance equation $h_t = b_0 + b_1 u_{t-1}^2$ (2)

The ARCH model states that large/small shocks will be followed by large/small shocks in the value of u_t; therefore, the estimated coefficient of b_1 has to be positive for a positive variance. Table 6 shows the results of the ARCH model for KSEIR for two periods. According to these results, the model can be written with z-statistics between parentheses as follows:

For the pre-liberalization period;

Mean equation; $Y_t = 0.000180 + 0.2181 Y_{t-1} + u_t$ (3)

(1.055) (6.78)

$u_t \mid \Omega_t \sim iid\ N(0, h_t)$

Variance equation; h_t = 0.0000314 + 0.1613 u_{t-1}^2 (4)

(33.11) (8.84)

For the liberalization period;

Mean equation; $Y_t = 0.0000638 + 0.1661 Y_{t-1} + u_t$ (5)

(0.432) (6.22)

$u_t \mid \Omega_t \sim iid\ N(0, h_t)$

Variance equation; h_t = 0.0000222 + 0.4147 u_{t-1}^2 (6)

(28.98) (9.767)

All of the coefficients of b_0 and $b_1$are positive and highly significant at a 1% level for both periods. The results show that the big/small shocks (μ_{t-1}^2) are followed by big/small in the next variance (u_t). These results confirm that the KSEIR displays clustering behaviour during the investigation period and past returns can explain the current volatility. The Durbin-Watson statistics for both periods are around 2 and the log-likelihood values are 4636.88 and 4627 for both periods respectively.

Table 6: Results of the ARCH Model for KSEIR

Pre-liberalization				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.000180	0.000171	1.055390	0.2912
KSEIR (-1)	0.218105	0.032139	6.786313*	0.0000
Variance Equation				
b_0	0.00003214	9.49E-07	33.11277	0.0000
ARCH term b_1	0.323853	0.036633	8.840537*	0.0000
R-squared	0.038123	Akaike info criterion		-7.255895
Log-likelihood	4636.889	Schwarz criterion		-7.239756
Durbin-Watson stat	2.085329	Hannan-Quinn criterion		-7.249834

Table 6…

Liberalization Period				
C	0.00006386	0.000148	0.432690	0.6652
KSEIR (-1)	0.166142	0.026673	6.228851*	0.0000
Variance Equation				
b_0	0.0000222	0.000000767	28.98402	0.0000
ARCH term b_1	0.414773	0.042465	9.767522*	0.0000
R-squared	0.030803	Akaike info criterion		-7.541619
Log-likelihood	4627.013	Schwarz criterion		-7.524942
Durbin-Watson stat	1.998685	Hannan-Quinn criterion		-7.535344

Source: Authors' computation; *significant at 1%

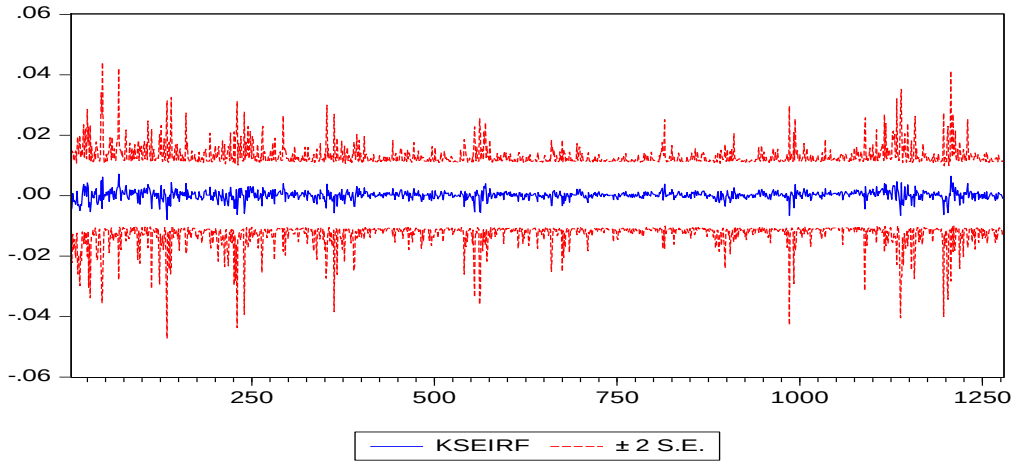

Figure 4: Static forecasting ARCH volatility for pre-liberalisation

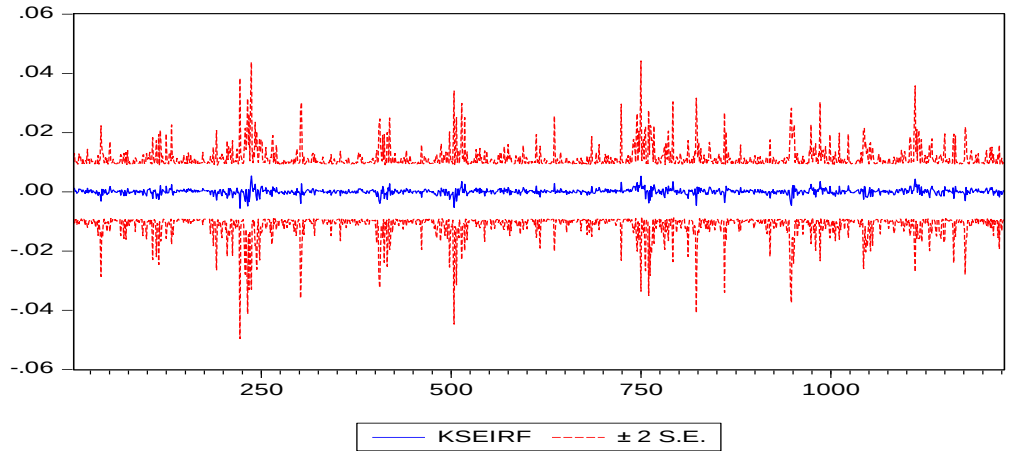

Figure 5: Static forecasting ARCH volatility for liberalisation

Figures 4 and 5 show the static forecasting ARCH volatility for the two periods. It can be observed that the KSE is less volatile during the liberalization period (middle line). However, GARCH and its extension are widely used in the field of finance to capture volatility.

GARCH (1,1) Model

Bollerslev (1986) introduced the GARCH model which states that the value of variance h_t depends on its previous lag and the squared error at lag one time. The GARCH (1, 1) model involves the combined estimation of the mean equation and conditional variance equation, which take the following forms:

Mean equation: $R_t = \mu + \epsilon_t$ (3)

Where R_t is the return of the stock index at time t.

μ is the average of returns.

ϵ is the residual returns at time t.

Conditional variance equations: $h_t = \alpha_0 + \alpha_1 \epsilon_{t-1}^2 + \beta_1 h_{t-1}$ (4)

Where h_t is the conditional variance at time t.

α_0 is the average of unconditional variance.

ϵ_{t-1}^2 is the squared error at time t-1 (ARCH term).

α_1 is the first lag ARCH parameter.

β_1 is the first lag GARCH parameter.

Where; $\alpha_0 > 0, \alpha_1 \geq 0, \beta_1 \geq 0, \alpha_1 + \beta_1 < 1 \; and \; \epsilon_t \sim N(0,1)$ distribution equation.

Table 7: Results of GARCH (1,1) Model for KSEIR

Variable	Coefficient	Std. Error	z-Statistic	Prob.
		Pre-liberalization		
C	0.000157	0.000148	1.066621	0.2861
KSEIR (-1)	0.201294	0.028983	6.945266	0.0000
		Variance Equation		
α_0	1.47E-06	2.06E-07	7.122549	0.0000
α_1	0.144186	0.014814	9.733321	0.0000
β_1	0.830231	0.014031	59.16962	0.0000
Persistence ($\alpha_1 + \beta_1$)	0.974417	-	-	-

R-squared	0.038706	Mean dependent var	-6.30E-06
Adjusted R-squared	0.037952	S.D. dependent var	0.006881
S.E. of regression	0.006749	Akaike info criterion	-7.391945
Sum squared resid.	0.058074	Schwarz criterion	-7.371772
Log-likelihood	4724.757	Hannan-Quinn criterion.	-7.384369
Durbin-Watson stat	2.049189		

Table 7…

Liberalization_period				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	6.33E-05	0.000159	0.398947	0.6899
KSEIR (-1)	0.161380	0.037012	4.360189	0.0000
Variance Equation				
α_0	4.02E-06	5.62E-07	7.157301	0.0000
α_1	0.196174	0.024634	7.963686	0.0000
β_1	0.695625	0.030887	22.52149	0.0000
Persistence ($\alpha_1 + \beta_1$)	0.891790	-	-	-
R-squared	0.030681	Akaike info criterion		-7.603898
Log-likelihood	4666.189	Schwarz criterion		-7.583051
Durbin-Watson stat	1.988560	Hannan-Quinn criterion		-7.596053

Source: Authors' computed.

Table 7 represents the results of the GARCH(1,1) model. The lag coefficients α_1 and β_1 are positive less than one for both periods and significant at the 1% level. Both of those coefficients indicate that the returns from the previous period have an impact on the current volatility. However, the α_1 coefficient for the liberalization period is higher than that for the pre-liberalization period (0.196 > 0.144) and the GARCH lag coefficient β_1, which reflects the shocks to conditional variance, is lower in the liberalization period than in the pre-liberalization period ($0.695 < 0.974$). In fact, the coefficient (α_1) measures the level to which a volatility shock today feeds through into the next period's volatility, while (α_1+β_1) measures the persistence of volatility shocks, which effect dies out over time (Campbell et al., 1997, p. 483). The (α_1+β_1) for the pre-liberalization period is higher (0.97) compared with 0.89 for the liberalization period, which indicates that, if a shock is observed in the present, then the future returns will feel its effects for a long period of time (Mittal and Goyal, 2012). However, if α_1 is relatively high and β_1 is low, the volatilities tend to be spikier (Adhikary and Saha, 2015). The high significant GARCH coefficient (β_1) for the pre-liberalization period (0.830231) compared with 0.695625 for the liberalization period) implies that the persistent volatility clustering is higher during the pre-liberalization period. In fact, in both periods, the results show that the KSE had relatively high volatility because the GARCH reaction parameter (α_1) usually ranges between 0.05 (for a market that is relatively stable) and about 0.1 (for a market that is unstable). The GARCH persistence parameter β_1 usually ranges between 0.85 and 0.98, with lower values being associated with higher (α_1). Therefore, according to the GARCH (1,1) model, the liberalization period looks less volatile than the pre-liberalization period.

The TGARCH Model

The ARCH and GARCH models assumed that good and bad news has the same influence on volatility. As a result, Zakoian (1994) and Glosten et al. (1994) argued that bad news has a high impact on volatility. Therefore, they introduced the TGARCH model which can capture the impacts of good and bad shocks. The variance equation is a multiplicative dummy variable that can be used to check whether the shocks on the volatility are due to bad news. The specification of the conditional variance equation for TGARCH (1,1) is given by:

$h_t = \alpha_0 + \alpha_1 \epsilon_{t-1}^2 + \theta \epsilon_{t-1}^2 d_{t-1} + \beta h_{t-1}$ (5)

Where;

α_0 , α_1 , θ and β are the parameters to be estimated, with d_t = 1 if $\epsilon_t < 0$, and 0 otherwise. Good news has an impact of α_1, while bad news has an impact of $\alpha_1 + \theta$. If $\theta > 0$ and significant, there is evidence of a leverage effect and we can conclude that there is asymmetry while, if $\theta = 0$, then the news impact is symmetric (Asteriou and Hall, 2011).

Table 8: Results of TARCH (1,1) Model for KSEIR

Pre-liberalization Period				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	3.55E-05	0.000156	0.228222	0.8195
KSEIR (-1)	0.209492	0.029875	7.012278*	0.0000
	Variance Equation			
α_0	1.56E-06	2.05E-07	7.635356	0.0000
α_1(ARCH effect)	0.093282	0.017183	5.428758	0.0000
θ (leverage effect)	0.091407	0.019028	4.803773	0.0000
β_1(GARCH effect)	0.829795	0.014100	58.84973	0.0000
$\alpha_1 + \beta_1 + \theta$ /2	0.92120	-	-	-
R-squared	0.039077	Mean dependent var		-6.30E-06
Adjusted R-squared	0.038323	S.D. dependent var		0.006881
S.E. of regression	0.006748	Akaike info criterion		-7.399311
Sum squared residuals	0.058052	Schwarz criterion		-7.375103
Log likelihood	4730.460	Hannan-Quinn criterion.		-7.390220
Durbin-Watson stat	2.068108			
Liberalization Period				
C	0.0297	0.000159	-0.187265	0.8515
KSEIR (-1)	0.163104	0.037150	4.390447	0.0000

Table 8…

	Variance Equation			
α_0	0.0000378	5.19E-07	7.287872	0.0000
α_1(ARCH effect)	0.122719	0.019423	6.318335	0.0000
θ (leverage effect)	0.140690	0.031410	4.479176	0.0000
β_1(GARCH effect)	0.704606	0.029473	23.90653	0.0000
$\alpha_1 + \beta_1 + \theta$ /2	0.845296	-	-	-
R-squared	0.031072	Akaike info criterion		-7.612549
Log likelihood	4672.493	Schwarz criterion		-7.587534
Durbin-Watson stat	1.992928	Hannan-Quinn criterion		-7.603136

Source: Authors' computation; *significant at 1 level.

Table 8 shows the results for the two periods. The coefficient of θ for both periods is positive and significant at the 1% level. This provides evidence that a leverage effect of negative shocks causes more volatility than positive shocks in the KSE. For the liberalization period, the θ is higher, which indicates that bad news has greater effects on the volatility of KSEI compared with good news. However, the same table shows that α_1 is high and also higher for the liberalization period compared with the pre-liberalization period, and that β_1 is relatively low and lower than in the pre-liberalization period. A large value of β_1 in the pre-liberalization period indicates that large changes in the volatility will affect future volatility for a long time. The KSEI is asymmetric regarding news, mainly bad news, which has negative impacts on the KSEI. However, the persistence in volatility in TGARCH can be calculated by this formula: $\alpha_1 + \beta_1 + \theta / 2 < 1$, which shows values of 92 for the pre-liberalization period and 84 for the liberalization period, both of which are less than 1 but, in the liberalization period, the volatility persistence is lower than in the pre-liberalization period.

However, table 9 shows that the implied unconditional volatility (IUV) for the pre-liberalization period for both GARCH (1,1) and TGARCH are higher than that for the liberalization period. Similarly, Huang and Yang (2000) found that the variances (IUV) decreased in Argentina, Chile, Malaysia and the Philippines during the liberalization period. Additionally, Jaleel and Samarakoon (2009) revealed the opposite findings for the Sri Lankan stock market, where the IUV is larger for the liberalization period, which indicates that the volatility increased during this period.

Table 9: Implied Unconditional Volatility (IUV)

	Pre-liberalization	Liberalization
GARCH (α_0 /[1 − (α_1 + β_1)	0.0000575	0.0000371
TGARCH (α_0 / [1-(α_1 + β_1 + θ/2)]	0.0000471	0.0000448

Source: Authors' computation

Table 10: Best Volatility Model for Kuwait Stock Exchange

	ARCH (1,1)		GARCH (1,1)		TGARCH (1,1)*	
Period	Pre-liber.	Liber.	Pre-liber.	Liber.	Pre-liber.	Liber.
Akaike Info Criterion	-7.25589	-7.54161	-7.39194	-7.58305	-7.399311	-7.6125
Schwarz Criterion	-7.23975	-7.52494	-7.37177	-7.59605	-7.375103	-7.5975

Source: Authors' computation; *Best model.

Table 10 indicates that the lowest value of AIC and SIC is for the TGARCH model. Therefore, the best model for measuring the volatility of the KSE in both periods is the TGARCH model. However, the results obtained from all of the models applied in this paper indicate that the volatility during the liberalization period was less than that during the pre-liberalization period. This may be explained by the fact that foreign investors' behaviour is more mature when selecting stocks. It has been noticed that most of the foreign fund flows went to Blue-Chip stocks, such as the National Bank of Kuwait, Kuwait Finance House, Gulf Bank and Zain. These stocks give high dividends every year and most of their owners keep them for long-term investment. Therefore, they are more stable than other stocks. Reinhart (2000) argued that foreign portfolios adjust their stock quantity to shocks, that reduces the volatility of the stock returns. Funds inflows to the Kuwait Stock Exchange have increased the liquidity without increasing the volatility of the returns. However, Kuwaiti traders have unique social characteristics. The trading activity of one investor carries information to another investor that can cause the latter to react, leading to several shocks. It is also possible for uninformed investors to buy a stock with very low prices, drive the price up, and then sell the stock at this higher price. This behaviour has affected the volatility during the pre-liberalization period. The new regulations in KSE have minimizes such irrational behaviour.

The findings of this paper conflict with those of similar studies performed by Uppal (1993) and Waliullah (2010), who found that the volatility in the Pakistani stock market increased significantly after the liberalization period. Our findings also conflict with those of Grabel (1995) for South American stock, Brooks et al. (1997) for South African stock, Levine and Zervos (1998) for 16 different emerging stock markets, Maghyereh (2003), Hung (2008) for

35 different stock markets, and Mnif (2013) for eight selected emerging stock markets, but agree with the findings of Kassimatis (2002), Bekaert et al. (2003), Edwards et al. (2003), Demetriades et al. (2006), James and Karoglou (2009), Drion (2011), Ben Rejeb and Boughrara (2013), and Imegi (2014), all of whom found a negative impact of liberalization on the volatility of stock markets.

Diagnostic Checks

Serial Correlations Test

A correlogram of standardized residuals squared was conducted to check whether the residuals have a serial correlation or not. The hypotheses are as follows:

1) Null hypothesis: there is no serial correlation between the residuals.
2) Alternative hypothesis: there is a serial correlation between the residuals.

The tables in appendices A.1 and A.2 shows that all of the p-values are more than 5 (p-value >5). Therefore, the null hypothesis cannot be rejected. The residuals in both periods are not the serial correlation of the TGARCH model.

ARCH Effects

The ARCH effects for the residuals of the two periods have been tested using a heteroskedasticity test. The following hypotheses has been tested:

Null hypothesis; no ARCH effects

Alternative hypothesis; there are ARCH effects.

Tables 11 and 12 indicate that, in both periods (pre-liberalization and liberalization), the p-value >5%; therefore, the null hypothesis cannot be rejected, so there are no ARCH effects on the residuals.

Table 11: Heteroskedasticity Test: ARCH effects for the pre-liberalization period

F-statistic	2.148158	Prob. F(1,1275)	0.1430
Obs*R-squared	2.147909	Prob. Chi-Square(1)	0.1428

Source: Authors' computation

Table 12: Heteroskedasticity Test: ARCH effects for liberalization period

F-statistic	0.080071	Prob. F(1,1223)	0.7772
Obs*R-squared	0.080196	Prob. Chi-Square(1)	0.7770

Source: Authors' computation

Normality Test

We tested whether the residuals are normally distributed or not. The following hypothesis was tested:

The Null hypothesis: residuals are normally distributed

The Alternative hypothesis: residuals are not normally distributed.

The tables in appendices A.3 and A.4 show that p-value = 0; therefore, we reject the null hypothesis. This indicates that the residuals are not normally distributed in our model. This is the only weakness in our model. However, since there are no serial correlations and no ARCH effects, we can argue that this model is still a good model for estimating the volatility in KSE.

CONCLUSION

This study investigates the impact of the recent regulatory changes in the Kuwaiti Stock Exchange in terms of its volatility. The study focuses on two sub-periods. The first period is from 2009 to 2013, and the second is from 2014 to 2018. As a result of these regulatory changes, the KSE has witnessed a large inflow of foreign funds into KSE during the period from 2014 to 2018. ARCH (1), GARCH (1,1) and TGARCH models have been applied to examine the volatility of the market in these two sub-periods. The results from these models show that the Kuwaiti Stock Exchange was more volatile during the pre-liberalization period compared with liberalization period. The results show also that a leverage effect of negative shocks causes more volatility than positive shocks in the KSE. According to the AIC and SIC tests, we can conclude that the best model for forecasting the volatility of the KSE is the TGARCH model.

SUGGESTIONS FOR FURTHER STUDIES

Although this paper is quite comprehensive regarding the impacts of the liberalization on the KSE volatility, it calls for more needed studies such as to test the efficiency, day-of-the week effect, and the month of the year effect on the KSE. The empirical work in this paper can be extended to assist in examining the volatility of the KSE after three years from now.

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APPENDICES

Table A.1: Correlogram of the residuals squared for the pre-liberalization period

Included observations: 1278

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	0.041	0.041	2.1539	0.142
		2	-0.040	-0.042	4.2006	0.122
		3	-0.012	-0.009	4.3960	0.222
		4	-0.024	-0.025	5.1314	0.274
		5	-0.004	-0.003	5.1572	0.397
		6	-0.009	-0.011	5.2650	0.510
		7	-0.035	-0.036	6.8828	0.441
		8	-0.034	-0.033	8.3903	0.396
		9	-0.022	-0.023	9.0424	0.433
		10	0.034	0.032	10.517	0.396
		11	0.040	0.033	12.567	0.323
		12	-0.015	-0.018	12.843	0.381
		13	0.006	0.009	12.898	0.456
		14	0.031	0.030	14.166	0.437
		15	0.015	0.013	14.470	0.490
		16	0.013	0.012	14.684	0.548
		17	-0.007	-0.004	14.745	0.614
		18	-0.036	-0.029	16.455	0.561
		19	-0.014	-0.008	16.721	0.609
		20	-0.002	-0.002	16.725	0.671
		21	-0.010	-0.012	16.866	0.719
		22	0.029	0.032	17.988	0.707
		23	-0.014	-0.015	18.251	0.744
		24	0.010	0.011	18.374	0.784
		25	-0.004	-0.011	18.397	0.825
		26	0.020	0.018	18.899	0.841
		27	0.055	0.050	22.860	0.693
		28	-0.013	-0.015	23.079	0.729
		29	0.050	0.059	26.333	0.608
		30	-0.013	-0.017	26.558	0.646
		31	-0.025	-0.015	27.355	0.654
		32	-0.029	-0.027	28.469	0.646
		33	0.018	0.023	28.872	0.673
		34	-0.022	-0.020	29.481	0.689
		35	-0.020	-0.016	30.032	0.707
		36	-0.025	-0.025	30.845	0.712

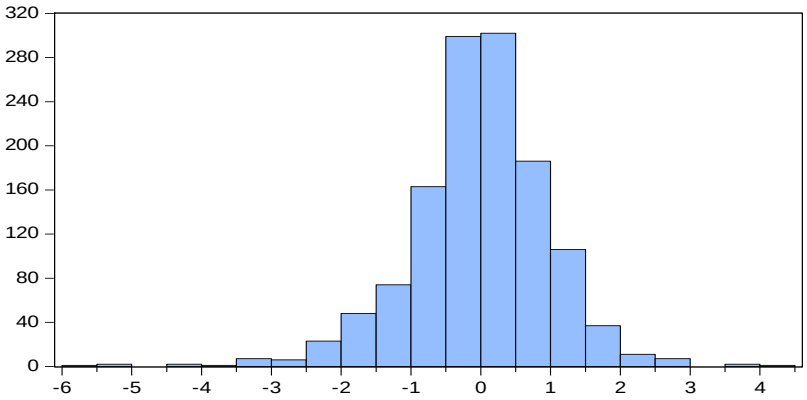
Table A.2: Correlogram of the residuals squared for the liberalization period

Included observations: 1226

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	0.008	0.008	0.0804	0.777
		2	-0.041	-0.041	2.1053	0.349
		3	-0.024	-0.024	2.8440	0.416
		4	-0.011	-0.013	3.0030	0.557
		5	0.011	0.009	3.1585	0.676
		6	0.033	0.031	4.5053	0.609
		7	-0.002	-0.003	4.5119	0.719
		8	-0.022	-0.019	5.0845	0.749
		9	-0.022	-0.021	5.7064	0.769
		10	0.035	0.035	7.2406	0.703
		11	-0.012	-0.016	7.4090	0.765
		12	0.006	0.007	7.4564	0.826
		13	-0.014	-0.014	7.7135	0.862
		14	0.003	0.006	7.7237	0.903
		15	0.022	0.021	8.3157	0.911
		16	-0.011	-0.014	8.4653	0.934
		17	0.033	0.035	9.8445	0.910
		18	-0.005	-0.005	9.8758	0.936
		19	-0.009	-0.004	9.9769	0.954
		20	0.047	0.046	12.735	0.888
		21	0.005	0.004	12.768	0.917
		22	-0.019	-0.017	13.222	0.927
		23	-0.027	-0.025	14.150	0.922
		24	-0.018	-0.018	14.556	0.933
		25	0.001	-0.003	14.556	0.951
		26	0.042	0.039	16.788	0.915
		27	-0.017	-0.022	17.146	0.927
		28	-0.026	-0.018	18.004	0.926
		29	-0.007	-0.003	18.060	0.943
		30	-0.035	-0.039	19.602	0.927
		31	0.053	0.051	23.114	0.845
		32	0.035	0.026	24.645	0.820
		33	-0.022	-0.016	25.257	0.830
		34	-0.022	-0.016	25.895	0.839
		35	0.005	0.005	25.925	0.867
		36	-0.007	-0.011	25.996	0.891

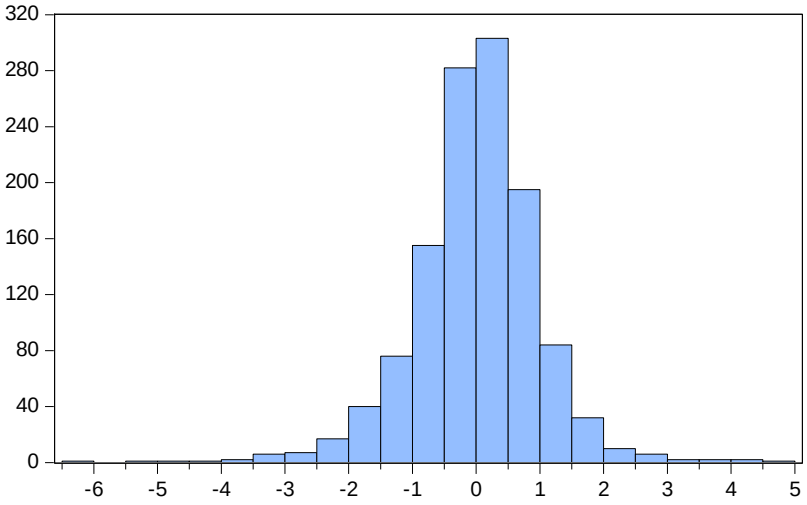
*Probabilities may not be valid for this equation specification.

Table A.3: Residuals Distribution for the pre-liberalization period



Series: Standardized Residuals	
Sample 2 1279	
Observations 1278	
Mean	-0.010903
Median	0.016513
Maximum	4.092561
Minimum	-5.993697
Std. Dev.	1.000290
Skewness	-0.657370
Kurtosis	6.079851
Jarque-Bera	597.1468
Probability	0.000000

Table A.4: Residuals Distribution for the liberalization period



Series: Standardized Residuals	
Sample 3 1228	
Observations 1226	
Mean	-0.009054
Median	0.030743
Maximum	4.971418
Minimum	-6.357665
Std. Dev.	1.000314
Skewness	-0.396944
Kurtosis	7.036388
Jarque-Bera	864.4673
Probability	0.000000