“Price-volume relation behavior around structural breaks in Kuwait Boursa”

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ARTICLE INFO	Fayez A. Abdulsalam and Amani kh. Bouresli (2019). Price-volume relation behavior around structural breaks in Kuwait Boursa. *Innovative Marketing* , *15*(2), 1-13. doi:10.21511/im.15(2).2019.01
DOI	http://dx.doi.org/10.21511/im.15(2).2019.01
RELEASED ON	Wednesday, 24 April 2019
RECEIVED ON	Monday, 25 February 2019
ACCEPTED ON	Tuesday, 16 April 2019

JOURNAL	"Innovative Marketing "
ISSN PRINT	1814-2427
ISSN ONLINE	1816-6326
PUBLISHER	LLC “Consulting Publishing Company “Business Perspectives”
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
48	1	7

BUSINESS PERSPECTIVES

LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10, Sumy, 40022, Ukraine

www.businessperspectives.org

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PRICE-VOLUME RELATION BEHAVIOR AROUND STRUCTURAL BREAKS IN KUWAIT BOURSA

Abstract

This study attempts to conduct a comprehensive investigation of the price-volume relation using daily stock prices of all publicly traded firms in Kuwait Boursa over the period 2005–2017. The aim is to provide evidence from an emerging market on the information arrival hypothesis, which is explained by the mixture of distribution and the sequential information arrival hypotheses. The investigation covered two main structural events; the 2008 financial crisis and the activation of Kuwait's New Securities Law in 2010 (CMA). The GARCH-ARCH test revealed a positive contemporaneous relation between trading volume and market return, which implies that previous information shocks affect current returns and imply that Kuwait stock market is weakly efficient. When trading volume is included in the variance equation in the GARCH model, the test revealed that new information arrival is not simultaneously available to all traders and it takes time to observe, providing support to the sequential information arrival hypothesis (SAIH). Finally, there was no change in the price-volume relation around the two events and urgent assessment of the new market reform is recommended.

Keywords price-volume relation, trading volume, market efficiency, market regulations

JEL Classification G10, G12, G14, M38, M39

Received on: 25th of February, 2019
Accepted on: 16th of April, 2019

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INTRODUCTION

Thorough analysis of the price-volume relation is a key indicator of market efficiency. Karpoff (1986) developed a theory of trading volume, which describes how information events can affect trading volume. Large volume and price changes are tied to the information flows and, hence, can be used to predict stock prices. In this research, the authors attempt to provide further evidence on the price-volume relation to enhance the understanding of the microstructure of stock markets. The interrelation between volume, return, and volatility is analyzed to examine the prediction power of trading volume in Kuwait stock market. The analysis is conducted around two structural breaks to explore whether the price-volume relation dynamics was affected. The first break is related to the establishment of Kuwait Capital Market Authority in accordance with the 2010 Securities Law No. 7, and the second break is related to the 2008 global financial crisis.

This research is motivated by the shortage in related literature on assessing the quality of market regulation and examining its impact on different dimensions of the market. Kuwait equity market has undergone profound changes in the past 10 years, beginning with the financial crisis in 2008 to the establishment of a new independent regulator in 2010, to the period of privatizing the Boursa; a series of events that

have created significant changes in the market structure, which need to be explored in the content of price-volume dynamics.

The findings should complement research in the area of getting more insight on the new securities reform's quality and its impact on stock market dynamics. The exploration of the price-volume relation around the structural breaks will add to the literature of the trading volume behavior and market efficiency in small scale developing markets. And it will provide insight on how changes in market reforms affect investors behavior as reflected by the price-volume relation. Dungey et al. (2011) argued that the behavior of securities prices between crisis and non-crisis periods differs substantially. Karanasos and Kyrtou (2011) investigate whether the 1997 financial crisis affects the dynamic interaction of the volatility-volume relation in the Korean market. They found that before the financial crisis, no causal relation between volume and stock volatility exists, however, a positive relation exists during and after the crisis. Gentile and Fioravanti (2012) examined the impact of fragmentation of the market on liquidity and on information efficiency. They documented increased market liquidity and lower efficiency and concluded that the new regulation needs to be reviewed. Mahajan and Singh (2080) argued that "price-volume relationship depends on the rates of information flow and its diffusion to the market, the extent to which markets convey information, the size of the market, the existence of short selling constraints, and the level of market efficiency". This argument supports the notion that trading volume can signal information about future price movement and stocks returns. Return and volume represent the two main pillars of stock market. As argued by Mahajan and Singh (2009), return acts as a reflection of new information and volume acts as an indicator of investor's disagreement with this information. The two main hypotheses that explain the positive relation between volume and return are: the mixture of distribution hypothesis (MDH) and the sequential information arrival hypothesis (SIAH). The MDH argues that only a contemporaneous relation exists between price volatility and trading volume, and accordingly there is no information content in past volatility data that can be used to predict volume (Clark, 1973; T. Epps & M. Epps, 1976; Andersen, 1996). The second competing hypothesis SIAH posits that information dissemination occurred on a gradual basis, and hence, transitional equilibria exits before the final equilibria (Smirlock & Starks, 1985; Morse, 1980; Copeland, 1976). Consequently, traders receive information sequentially and informed traders can trade before uninformed ones. Under SIAH, lagged values of volatility can sometimes predict current trading volume. The evidence is mixed between the two competing hypotheses; some support the MDH of a contemptuous and positive relation between volatility and volume, while others support the SIAH hypothesis. In the next section, the new market reform passed in 2010 and Kuwait Boursa are discussed.

The new market reform

Kuwait Boursa is considered a small developing market striving to be considered as one of the emerging markets in the region. As of December 31, 2017, Kuwait Boursa was considered the fifth largest in the MENA region with a total number of 175 listed firms with market capitalization of KD 28.6 billion down from a total number of 224 listed firms with market capitalization of around KD 100 billion in 2010. A major event occurred in Kuwait when the government and parliament passed a new reform to establish a new regulatory body to organize the securities market in an effort to enhance performance. The aim was to complement the governmental efforts to attract foreign investors and enhance market transparency and investors' confidence. The legislation, effective in 2010, established the capital market authority (CMA), which replaced the market committee – the principal regulator before 2010. The call to establish a new reform was initiated after the 2008 financial crisis, when several cases of financial abuse were exposed. This paper attempts to revisit the price-volume relation in light of the two events to provide further evidence on the effect of the new market reform on the stock exchange. The investigation will cover the full period from 2005 until the end of 2017. And the structural break analysis will cover two subsamples during the major period (2005–2009 pre CMA, and 2011–2017 post CMA). Al-Ajmi (2017) examined the effect of daily trading volume on Kuwait Stock Exchange on the persistence

http://dx.doi.org/10.21511/im.15(2).2019.01

of time-varying conditional volatility. He used daily index values and trading volume of KSE's listed firms from 7 sectoral indices and a sample of 20 largest companies as of 2008. The analysis aims to examine whether the volume-return relation is explained by the MDH or the SAIH. He examined the impact of including trading volume on the persistence of return volatility of firms listed in Kuwait Stock Exchange. The results on individual stocks support the implications of the conditional variance equation, which indicate reduction in volatility persistence on returns. For some indices, the results provide strong support for the MDH, as the inclusion of the lagged trading volume in the conditional variance equation exhibits no effect on the persistence of volatility. Accordingly, he concluded that sequentially correlated information arrival process is a source of GARCH impact on Kuwait Stock Exchange. Al-Saad and Moosa (2008) examined for asymmetry in the price-volume relation on 36 listed firms in Kuwait Stock Exchange. By applying an asymmetric autoregressive model distributed lag (AMDL), they documented a robust asymmetric price-volume relation. The trading volume was higher in rising market than in falling market.

The Kuwaiti market and the financial crisis

Kuwait's economy entered in a financial crisis after few months from the global event. The country's economy, which is highly dependent on the oil sector revenue, was indirectly affected by the global trauma. Among the factors that contributed to the not immediate or lower reaction to the financial crisis in the Gulf states there were: 1) limited exposure of the Gulf states to the sub-prime assets, 2) bigger focus on traditional lending, 3) lower integration with the global financial system, 4) faster reaction by the government with forceful policy action. However, in spite of the factors described above, there are other factors that contributed to the low impact on the country's economy. One of the main consequences of the international financial crisis is lower demand for GCC main export products, crude oil and petrochemicals (Woertz, 2008). The GCCs' budgets are balanced mainly on the revenue of crude oil and natural gas. Therefore, as demand decreased on crude oil by importers, GCC economy was triggered, and hence lower government spending was allocated to mega projects. Most of the companies and banks listed on Kuwait Boursa were hit in 2008 as a result of the lower government spending. As a result, we expect negative impact on return's and trading volume and different price-volume relation. In this research, we attempt to explore the price-volume relation around the 2008 financial crisis, by dividing the sample into two subsamples pre and post financial crisis of 2008. Following Dungey (2009) and Celik (2013), we assume that July 17, 2007 is the starting point of the global financial crisis, however, we predict that the Gulf states were affected at a later stage by the crisis. Accordingly, we assumed that year 2018 is the structural break year when the financial crisis occurred.

1. LITERATURE REVIEW

The relation between trading volume and price is the focus of market efficiency research and remains inconclusive. Stock prices and return predictability is a big concern for portfolio managers. However, there is evidence of some predictable component in stock returns. For example, lagged volume is able to predict stock return or lagged return is able to predict trading volume. Christiana et al. (2016) documented positive unidirectional causality from stock return to trading volume indicating that stock return can predict trading volume.

Several reasons were discussed in the literature about the relation between price and trading volume. According to Karpoff (1987), price-volume relation provides insight of the financial market structure and information dissemination. Ying (1966) used Standard and Poor's 500 composite index as a measure of price and NYSE's outstanding shares traded to examine the price-volume relation. He documented that smaller volume is associated with a fall in price, and larger volume is associated with a rise in the price. Furthermore, he documented that large increase in the trading volume is associated with large increase in price or large fall in price. The same relation of a pos-

itive correlation between daily price changes and trading volume was also documented by Crouch (1970). In addition, the price-volume relation was documented by Westerfield (1977), Clark (1973), Morgan (1976), Tauchen and Pitts (1983), T. Epps and M. Epps (1976). Karpoff (1987) raised several issues that need to be further explored in the price-volume relation. Among the issues there are:

1. Does the size of the market affect the price-volume relation?

2. Is the price-volume relation is asymmetric?

3. Are the properties of the price-volume relation are affected by the properties of the rate of information flow?

Saatcioglu and Starks (1998) addressed the second question and found that the trading volume causes stock returns, however, stock return does not cause trading volume.

Mahajan and Singh (2080) examined market structure in light of the two competing hypotheses MDH and SIAH. They documented supporting evidence with the mixture of distribution hypothesis. A positive contemporaneous relation between volume and volatility exists. Further they documented supportive evidence with the sequentially arrival of information hypothesis, indicating that new information is not concurrently available for all investors and takes time to absorb implying market inefficiency. Internationally, Belhaj and Abaoub (2015) examined the two competing hypotheses, MDH and SIAH, in the Tunisian stock market. They found strong positive relation between trading volume and returns conditional volatility and the evidence is inconsistent with the implications of the SIAH.

The positive contemporaneous return-volume significant relation in the bull market was documented in Jakarta market (Christiana et al., 2016). The positive relation is well documented in the literature between trading volume and stock return. Chen (2012) investigated whether the return-volume relation differs across multi phases of market cycles (bull-bear). He found that return is positively and significantly related to volume in bear markets and negatively related in bull markets. An indication of that stock return can predict volume. Al-Deehani (2007) examined asymmetry in the price-volume relation in nine stock market indices in eight different countries. The results show a strong asymmetric effect that is higher trading volume is associated with price increases. His results are consistent with the evidence presented by Granger and Morgenstern (1963) who documented large trading volume to be associated with stock price increases.

A contemporaneous positive correlation between stock return and trading volume is documented (Richardson et al., 1987; Karpoff, 1987; Harris & Gurel, 1986). More newer studies started to focus on examining the dynamic correlation between trading volume and stock return. For example, these studies are addressing the following questions: "does trading volume predict stock return?" or "do traders trade more when prices increase?". Statman et al. (2006) used NYSE/AMEX monthly data and find that trading activity is positively related to lagged returns. However, Lee and Rui (2002) documented that trading volume does not Granger-cause stock return by using daily stock return of New York, Tokyo and London. Chuang et al. (2009) documented heterogenous causal effects of volume on return and more stable casual effects of return on volume. In the emerging markets, Habib (2011) examined the dynamics of stock returns and trading volume in Egypt Securities Exchange on the period 1998–2005. He explored whether the trading volume has the power to predict future return volatility and autocorrelation. His evidence is not consistent with efficient market hypothesis, which indicates that the trading volume has no prediction power of return. He concluded that the lagged stock trading volume has a small role in forecasting the future return volatility. Jiranyakul (2016), in Thai stock market, provides supporting evidence that trading volume plays a dominant role in the relationship between return, volume and volatility.

2. THEORETICAL FRAMEWORK

Trading volume in the literature is used as a proxy for arrival of information flow. Accordingly, trading volume, whether measured by the number of trades or value or number of shares traded, is a powerful indicator to predict the market (Mestel,

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2003; Darrat et al., 2003; Huson et al., 2005). Furthermore, Herbert (1995) documented that lagged trading volume has predictive power for price volatility. A predictive power of lagged trading volume indicates evidence inconsistent with the mixture of distribution hypothesis (MDH) and consistent with the sequential information arrival hypothesis (SIAH).

In the controversial relation between price-volume-volatility, Habib (2011) argued that there are three hypotheses that provide theoretical explanation as follows:

1. Significant positive contemporaneous relation between volatility and trading volume: There are two competing main hypotheses that explain the information arrival process to the market, namely MDH and the SIAH. The MDH posits that both price and volume should be positively correlated as a sequence of their dependence on an interaction variable that affects trading volume, contemporaneous volatility, and information flow. The second hypothesis, SIAH implies that new information flows into the market and is disseminated to traders sequentially.

2. Lagged relation between volatility and trading volume: The "dispersion of beliefs" theory explains this relation and posits that current trading volume should dictate the concentration of future return volatility. The theory relates high and irregular volatility in trading volume to differences in trader's beliefs. The extreme volatile trading can be attributed to differences in traders' interpretation of information or due to having private information.

3. Current trading volume should dictate the direction and concentration of the correlation of future return: the literature documented that past trading volume correlates strongly with past return to forecast future stock returns. However, there is a dispute on whether the relation is positive or negative between return autocorrelation and trading volume.

The focus of the research analysis will be on the arrival of information theory, specifically the MDH and the SIAH.

Research main tests

This research aims to address the following three relations in terms of the dynamics of the price-volume relation:

1. Examining the overall correlation between stock return and trading volume measures by using daily return of the market index during the period 2005–2017, and around the two structural breaks; the 2008 financial crisis, and the passage of the Securities Law in 2010 (CMA).

2. Testing the contemporaneous relation between trading volume and volatility by examining the two information arrival hypotheses (MDH and SIAH), around the two structural breaks: the 2010 CMA reform and the 2008 financial crisis period.

3. Examining whether the relationship between trading volume and return autocorrelation is positive or negative to explore the power of trading volume to predict future stock prices.

3. DATA AND METHODOLOGY

To study the dynamics of the price-volume relation, the authors gathered data from Kuwait Stock Exchange official website (Kuwait Boursa) of all publicly listed firms for the period 2005–2017. The data are compiled for all listed firms (225) for the period from January 1, 2005 until end of December 2017. The main variables collected are trading volume, trading value, number of trades, stock closing prices. The following criteria are applied for the purpose of the analysis:

- during the 13-year full research period, 45 firms with missing data were excluded, since some firms were delisted, and others were newly listed;

- the log of the trading volume measure is used to normalize the data and to mitigate the effect outliers;

- for the pre and post CMA periods, the sub-samples used are as follows: pre CMA from January 1, 2005 until December 31,

2009; post CMA from January 1, 2011 until December 31, 2017. Year 2010 was excluded, since it was the year when the CMA law was effective, and the new regulatory body began operation;

- for the pre- and post-crisis periods, the sub-samples are as follows: pre-crisis from January 1, 2005 until December 31, 2007, post-crisis from January 1, 2009 until December 31, 2013.

The final total number of firms included in our analysis after the filtering process reached 186 with 531,882 observations. Return, return volatility, and the log of trading volume for the three proxy measures are calculated from the compiled data. The percentage of market return is defined as follows: $r_t = \left(\ln MC_t - \ln MC_{t-1}\right) \cdot 100$, where r_t is the natural log of daily percentage return at time t and MC_t is the market capitalization at time t. Table 1 provides data description of the full sample.

3.1. The model design

To examine the dynamic relation between market returns and trading volume, the authors used the generalized autoregressive conditional heteroskedasticity GARCH model of Bollerslev (1986). The GARCH model that encompasses heteroskedasticity is suitable for the analysis, because the error distribution of returns might not exhibit a constant variance. GARCH model allows current conditional variance to be a function of previous conditional variance, hence, allowing the shocks of volatility to persist over time (Huson et al., 2005). Following Mahajan and Singh (2009), GARCH (1,1) model is used to examine the impact of trading volume, as a proxy for information arrival, on market return. Specifically, it explains the contemporaneous relation between market return and trading volume. The model is shown below in equations (1) and (2):

$$r_t = \beta_0 + \beta_1 r_{t-1} + \beta_2 \ln V_t + \beta_3 r_t^2 + \varepsilon_t \qquad (1)$$

$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 h_{t-1}, \qquad (2)$$

where r_t is the market return at day t, r_{t-1} is the market return of the previous day, $\ln V_t$ is the natural log of the trading volume proxied by the trading value of the market index at day t, r_t^2 represents the market return volatility. In the variance equation (2), h_t is the conditional variance in period t, α_1 represents the information arrival coefficient and α_2 is a persistence coefficient.

Stock prices often exhibit the volatility clustering phenomena. Therefore, two tests are conducted to confirm the existence of the main requirements of the ARCH/GARCH model. First, the presence of clustering volatility in the residuals is examined as shown in Figure (1) and then the ARCH effect existence is examined as well. Table 2 confirms an ARCH effect existence in the time series of returns in our data with Prob Chi2 of 0.000. Accordingly, Figure 1 confirms the presence of clustering volatility in the residuals.

GARCH methodology is used to test the mixture of distribution hypothesis (MDH). MDH assumes that the volume-return relationship depends on the information arrival flow into the stock market causing an immediate equilibrium (Foster, 1995; Harris, 1987). The hypothesis was tested in developed markets with supportive evidence (Anderson, 1996; Gallo & Pacini, 2000; Brailsford, 1996). The inclusion of trading volume in the variance equation in GARCH model will lead to reduction of the estimated persistence. The decreased estimated persistence is interpreted as supportive evidence of the mixture of distribution hypothesis (MDH). Accordingly, and to explore if the trading volume measure interprets GARCH effects of return, the following model is estimated with inclusion of trading volume in the variance equation:

$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 h_{t-1} + \alpha_3 \ln V_t, \qquad (3)$$

where h_t is the conditional variance in period t, α_1 represents the information arrival coefficient, α_2 is a persistence coefficient and $\ln V_t$ is the natural log and trading volume proxy for the whole market at day t.

4. RESULTS AND ANALYSIS

Table 1 shows the mean and median for the main variables for the market index which includes all listed companies. Market return for the study peri-

http://dx.doi.org/10.21511/im.15(2).2019.01

Table 1. Summary statistics of the data

Measurement	Return	Volatility	Trading value (million KD)	Trading volume (million)	No. of trades
Mean	–0.027	1.189	51.66	229.3	5,025
Lower quartile	–0.415	0.040	18.13	116.6	3,077
Median	0.000	0.189	34.21	177.9	4,465
Upper quartile	0.456	0.770	70.83	283.1	6,385
St. deviation	1.090	4.482	55.47	176.7	2,764
Skewness	–1.208	16.44	10.90	2.4	1.54
Kurtosis	15.105	435.29	316.38	11.7	7.00

od has a mean value of –0.027% and median value of 0.000%. The distribution of the market return series has negative skewness, which indicates that the series is asymmetric and non-normal. Further, the market return is negatively skewed with excess kurtosis, which indicates that the market returns are not normally distributed. All measures of trading volume are positively skewed with excess kurtosis. For the trading volume three proxies were used, however, in the analysis, the trading value measure was utilized in the model. For return volatility, positive skewness is observed, which indicates volatility persistence of Kuwaiti market.

Figure 1 shows the existence of clustering volatility in the return data, which is one of the requirements for ARCH/GARCH. Table 2 shows the results of the LM test that rejects the null hypothesis of no ARCH effect in the residuals.

Table 2. LM test for autoregressive conditional heteroskedasticity (ARCH) effect

Variable	Coefficient	*t*-statistic	*p*-value
Constant	–0.02707	–1.31	0.191
Return L1	0.1110	5.95	0.000***
LM test for ARCH	Df	Chi^2 statistic	p-value
	1	21.47	0.000***

4.1. Results of the GARCH model

Table 3 shows the results of the contemporaneous relation between market return, trading volume and volatility for the full sample over the 13-year period. GARCH (1,1) model with trading volume and return volatility in the mean equation shows that the coefficient of trading volume (0.080) is

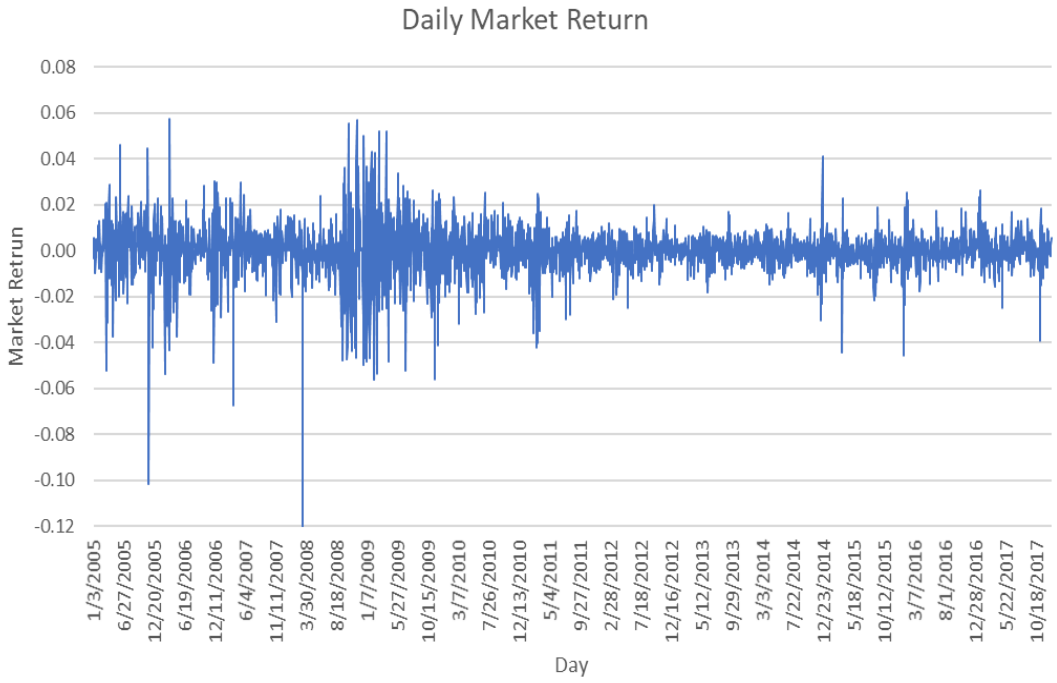

Figure 1. Daily market return for the period from January 2005 to the end of 2017

positive and significant at the 1% level (*p*-value is 0.00). This indicates a positive contemporaneous relation between trading volume and market return. In addition, the results show highly significant ARCH and GARCH coefficients (0.380 and 0.620), indicating that conditional variance is largely affected by the lagged variance. The above result is consistent with prior literature, which implies that previous information shocks significantly affect current returns, and hence imply that Kuwait stock market is weakly efficient. Table 3 results further show that there is volatility clustering, which supports the asymmetry in the market.

Table 3. GARCH (1,1) of volume, return, volatility relationship

Variable	Coefficient	*z*-statistic	*p*-value
Constant	–1.3248	–4.21	0.000***
Return L1	0.0034	0.29	0.771
ln (volume)	0.0799	4.45	0.000***
Return^2	–0.0990	–47.82	0.000***
Variance equation			
Constant	–0.0104	–0.40	0.686
ARCH L1	0.3791	13.71	0.000***
GARCH L1	0.6204	14.31	0.000***
Residuals tests			
Portmanteau Q (Chi^2)	–	36.15	0.644
Shapiro-Wilk W (Z)	–	10.51	0.000***

Table 4 presents the results of GARCH methodology used to test the mixture of distribution hypothesis (MDH). The trading volume is included in the variance equation in GARCH model to test the decreased estimated persistence and to investigate if the volume explains GARCH effects for returns. The results show that both coefficients of ARCH and GARCH are positive and highly significant (0.342, 0.218). In addition, the trading volume variable coefficient is highly significant, which indicates positive effect on volatility. However, the coefficients of GARCH were lower in Table 4 than in Table 3, indicating weak support for the mixture of distribution hypothesis (MDH). The above results imply that new information arrival is not simultaneously available to all traders and it takes time to observe. This result provides more support to the sequential information arrival hypothesis (SAIH).

Table 4. GARCH (1,1) of volume, return, volatility relationship with volume included in the variance

Variable	Coefficient	*z*-statistic	*p*-value
Constant	–1.4310	–4.17	0.000***
Return L1	0.0019	0.15	0.879
ln (volume)	0.0868	4.28	0.000***
Return^2	–0.0990	–38.99	0.000***
Variance equation			
Constant	–14.8033	–21.18	0.000***
ARCH L1	0.3423	14.23	0.000***
GARCH L1	0.2183	8.52	0.000***
ln (volume)	0.7790	19.91	0.000***
Residuals tests			
Portmanteau Q (Chi^2)	–	37.78	0.571
Shapiro-Wilk W (Z)	–	10.54	0.000***

4.2. Pre-post CMA law GARCH model results

As discussed above, the capital market authority was incorporated, and the new market reform (Law No. 7) was imposed in 2010, for the purpose of enhancing market efficiency. The new reforms introduced new provisions to guarantee fair disclosure and to enhance transparency in the market. We expect that investors' behavior to change after the law's activation. Card and Freeman (2004) discussed the role of sound economic reforms in enhancing market growth in the United Kingdom. They presented evidence of significant improvement in the UK international competitiveness Fraser Institute Index (FII) for economic freedom over the period from 1980 to 2000. Whether the new reform and changing policies can ensure better market efficiency is an ongoing debate and concern for regulators and policy makers. And more research should be devoted to address this debate in developing markets. This paper aims to present new evidence on the effect of new reforms on market efficiency in small scale emerging markets. Specifically, the authors link the change in the price-volume relation and inves-

http://dx.doi.org/10.21511/im.15(2).2019.01

tors behavior before and after the CMA law activation to market efficiency deterioration or improvement. If the CMA law was effective, then higher market efficiency should be observed through more support for the mixture of distribution hypothesis (MDH) in the period after the CMA law. Table 5 presents the results of GARCH (1,1) model for the two subsamples, pre CMA and post CMA law. In both periods, the contemporaneous relation is positive and highly significant, indicating no or minor change in market efficiency between the two sub-samples. The trading volumes' ARCH and GARCH coefficients were positive and highly significant in both periods implying that previous information shocks affect present market return. The results imply the weak efficiency or inefficiency of Kuwait stock market. Furthermore, surprisingly the GARCH coefficient is higher in the post CMA period (1.960), compared with the pre CMA period (0.6628), indicating lower market efficiency after the enactment of the CMA law. However, all *p*-values in both periods were of equal significance, indicating no change in the predication power of trading volume of return, which supports the sequential information arrival hypothesis SIAH. That is, new information arrival is not simultaneously available to all traders and it takes time to observe.

The findings are consistent with previous work of Jiranykal (2016) who finds that trading volume plays a major role in determining stock return and return volatility in the Thai Stock Exchange. Also, the results are consistent with the evidence documented by Mahajan and Singh (2080) who found positive effect of trading volume on stock return and return volatility, and, hence, some inefficiency in the market. Alam et al. (2011) explored the impact of new policy reforms adopted by Dhaka Stock Exchange (DSE) following several cases of market abuse in 1996 in an attempt to assess their impact on market efficiency. They found that reformed policies for DSE failed to enhance market efficiency. The study's results highly imply the need for further research on the topic of new reforms impact on market development and efficiency.

The GARCH model test is repeated with trading volume variable included in the variance equation. According to the results shown in Table 6, the contemporaneous relationship exists between trading volume and market return. The highly significant parameters of ARCH and GARCH at the 1% level in the pre CMA signify the predictability power of the information arrival variable to forecast market return.

Table 5. GARCH (1,1) of volume, return, volatility relationship pre and post CMA law

Variable	Coefficient	*z*-statistic	*p*-value
Panel A. Pre CMA			
Constant	–2.7998	–2.62	0.009**
Return L1	0.0047	0.21	0.834
ln (volume)	0.1592	2.71	0.007**
Return^2	–0.0892	–23.47	0.000***
Variance equation			
Constant	–0.1130	–1.27	0.204
ARCH L1	0.3969	7.13	0.000***
GARCH L1	0.6628	8.33	0.000***
Residuals tests			
Portmanteau Q (Chi^2)	–	41.06	0.424
Shapiro-Wilk W (Z)	–	10.40	0.000***
Panel B. Post CMA			
Constant	–1.2461	–2.80	0.005**
Return L1	0.0151	0.81	0.419
ln (volume)	0.0777	2.94	0.003**
Return^2	–0.2061	–24.70	0.000***
Variance equation			
Constant	–0.3797	–3.58	0.000***
ARCH L1	0.9834	4.73	0.000***
GARCH L1	1.9599	6.31	0.000***
Residuals tests			
Portmanteau Q (Chi^2)	–	54.91	0.058
Shapiro-Wilk W (Z)	–	15.28	0.000***

In the post CMA period, the relation is positive and highly significant (ARCH coefficient of 0.217 is significant at the 1% level, and GARCH coefficient of 0.000 is significant at the 5% level). The minor decrease in significance level may indicate small evidence of some change in the predictability level of trading volume to transmit information to investors, and hence gradual improvement in market efficiency. However, the highly significant Portmanteau Q (Chi^2) (heteroskedasticity) is an indication of lower reliability of the model. Therefore, no conclusion can be made of efficiency's improvement in Kuwaiti market in the post CMA law period.

Table 6. GARCH (1,1) of volume, return relation in pre-post CMA law, volume included in variance equation

Variable	Coefficient	*z*-statistic	*p*-value
Panel A. Pre CMA			
Constant	–4.531	–3.36	0.0008***
Return L1	0.137	3.35	0.0008***
ln (volume)	0.075	5.50	0.0000***
Variance equation			
Constant	–58.072	–7.52	0.0000***
ARCH L1	0.463	7.95	0.0000***
GARCH L1	0.491	13.61	0.0000***
ln (volume)	3.039	7.54	0.0000***
Residuals tests			
Portmanteau Q (Chi^2)	–	145.98	0.0000***
Shapiro-Wilk W (Z)	–	12.53	0.0000***
Panel B. Post CMA			
Constant	–0.567	–1.10	0.2728
Return L1	–0.041	–1.65	0.0998
ln (volume)	0.032	1.04	0.2986
Variance equation			
Constant	–10.419	–8.81	0.0000***
ARCH L1	0.217	8.64	0.0000***
GARCH L1	0.121	2.52	0.0119*
ln (volume)	0.540	7.83	0.0000***
Residuals tests			
Portmanteau Q (Chi^2)	–	61.45	0.0162*
Shapiro-Wilk W (Z)	–	12.75	0.0000***

4.3. Pre-post financial crisis GARCH model results

In this section, an analysis of the price-volume relation around the financial crisis period is conducted by using the two sub-samples: the period from January 2005 to the end of 2007, designated as the pre-crisis period, and the period from January 2009 to the end of 2013, designated as post-crisis period. The authors predicted that investors' behavior around the financial crisis period can be affected and, hence, the volume, return, and return volatility dynamics are changed. Table 7 presents the results of GARCH (1,1) model for the two sub-samples: pre-crisis and post-crisis. In both periods, the contemporaneous relation is positive and highly significant, indicating no or minor change in market efficiency between the two sub-samples. The trading volumes' ARCH and GARCH coefficients were positive and highly significant in both periods. A minor higher volume's coefficient is noted in the post-crisis period, but both were highly significant. The results imply that previous information shocks affect present market return. The results are not consistent with the findings of Dungey et al. (2011) who documented substantial change in the behavior of securities prices between crisis and non-crisis periods. The results imply that both the structural events that affected Kuwaiti market did not change the contemporaneous relation. That is, the CMA law was not effective in improving market efficiency as expected and the financial crisis did not lead to changes in investors attitude or behavior.

Table 7. GARCH (1,1) of volume, return and volatility relationship in pre-post financial crisis

Variable	Coefficient	*z*-statistic	*p*-value
Panel A. Pre-crisis			
Constant	–3.382	–2.91	0.004**
Return L1	0.025	0.85	0.396
ln (volume)	0.194	3.06	0.002**
Return^2	–0.116	–28.19	0.000***
Variance equation			
Constant	–0.045	–0.22	0.825
ARCH L1	0.373	4.18	0.000***
GARCH L1	0.681	2.44	0.015*
Residuals tests			
Portmanteau Q (Chi^2)	–	45.18	0.265
Shapiro-Wilk W (Z)	–	10.86	0.000***
Panel B. Post-crisis			
Constant	–2.867	–4.27	0.000***
Return L1	–0.022	–1.14	0.254
ln (volume)	0.169	4.40	0.000***
Return^2	–0.112	–27.94	0.000***
Variance equation			
Constant	–0.078	–1.05	0.292
ARCH L1	0.325	7.01	0.000***
GARCH L1	0.745	6.96	0.000***
Residuals tests			
Portmanteau Q (Chi^2)	–	46.43	0.224
Shapiro-Wilk W (Z)	–	10.62	0.000***

http://dx.doi.org/10.21511/im.15(2).2019.01

CONCLUDING REMARKS

In this paper, the authors seek to examine how major information events can affect the relation dynamics between trading volume, return, and volatility. In the theory of market efficiency, stock prices are the reflection of the arrival of new information and trading volume acts as the direction of prices movement. Daily stock return of all listed firms on Kuwait Boursa are used for the period from January 2005 to the end of December of 2017 to examine the price-volume relationship. The main focus of the research is to address whether trading volume is useful in predicting stock return and return volatility. In addition, the research aims to examine the price-volume relation dynamics around two main structural events: the introduction of the CMA 2010 law and the 2008 financial crisis. Within the content of the analysis, the information arrival hypotheses are examined by using GARCH (1,1) model.

The introduction of a New Securities Law in 2010 in Kuwait (CMA) had led to a sequence of major changes in the market structure. The objective of introducing the CMA law was to enhance market efficiency, restore investors' confidence, and achieve higher transparency in the market place. Therefore, the authors explored whether the price-volume relation is affected by the introduction of the new structural changes in Kuwaiti market.

The results of the full sample revealed a positive and highly significant relation between the trading volume and return volatility over the 13-year period. The positive impact of volume on return and return volatility indicates that the trading by traders with inside information reveals information to the market and hence impacts stock prices (Suominen, 2001). The finding is consistent with the notion that there is information content in trading volume. Pathirawasam (2011) argued that when the trading volume has predictive power of returns and traders can use the information carried in the trading volume to make profits, this implies that the market has weak form efficiency. The result is consistent with prior literature that previous information shocks significantly impact current returns. In addition, when trading volume is included in the variance equation in the GARCH model, the coefficients were highly significant indicating positive effect on volatility. The results indicate weak support for the mixture of distribution hypothesis (MDH) and imply that new information arrival is not simultaneously available to all traders and it takes time to observe. This result provides more support to the sequential information arrival hypothesis (SAIH).

In the analysis of the price-volume relation for the pre-post CMA law periods, a positive and highly significant contemporaneous relation is documented in both periods. This result implies no or minor change in market efficiency between the two periods, and hence an implication of no change of the weak market efficiency. The finding is consistent with Alam et al. (2011) who concluded that reformed policies for Dhaka Stock Exchange (DSE) failed to enhance market efficiency.

Finally, the 2008 financial crisis analysis revealed the same pattern of no significant difference between the two sub-samples. The results confirmed that previous information shocks significantly affect current returns, which implies supporting evidence for the SIAH. The overall results of no change in the price-volume relation between subsamples and the implication of weak market efficiency call for more assessment by policy makers on the quality of market regulations.

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