INTEREST RATES AND INVESTORS BEHAVIOUR: COINTEGRATION AND GRANGER CAUSALITY

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Received: 23 March 2018
Revised: 28 April 2018
Accepted: 03 May 2018

Abstract

***Research Problem**: The review of literature revealed that though the economy of Jordan fluctuated considerably, there is no research evaluated the impact of the volatility in the rates of interest in the perception of Jordanian investors.*

***Research Objectives**: Therefore, the study aimed at exploring the causal correlation between the weighted average time deposit interest rates and the saving deposit interest rates along with the liquidity of Amman stock exchange as main proxies for investors' behaviour.*

***Research Methodology**: To achieve the aim of this research, the study employed empirical techniques like the ADF, Johansen co-integration test, VAR model and the short-run granger causality test to analyze a time series data covering the period Q1/2000-Q4/2016.*

***Findings**: Consequently, the study found that the tested variables became stationary only after converting them into the first difference. However, results from the Johansen test proved that the examined variables are not integrated on the long-run. Similarly, findings from the VAR analysis and the granger causality tests revealed that there is no short-run causality running from the volatility in interest rates towards the market's liquidity as captured by the value traded and the turnover ratio.*

***Implications**: Moreover, the study concludes that investors of Jordan can be classified as risk averse investors, since they are preferring to deposit their funds into the banks, though the level of interest rates is low. Eventually, the study recommends investors to rely on these rates to improve the quality of their investment decisions.*

***Keywords**: Weighted Average Time Deposit Interest Rates; Weighted Average Saving Interest Rates; Amman Stock Exchange Liquidity; Turnover Ratio, Traded Value.*

Introduction

The statistics revealed that the economy of Jordan is highly relied on the stock market development. For instance, in 1999, the Amman stock exchange "ASE" contributes in the country GDP by 75%, compared with 150% and 289% by the end of 2009 and 2007, consecutively (Ali, 2016). However, due to the impacts of deregulation, political instability and the set of global financial turbulences in the economy of Jordan; the last periods showed that the economy of Jordan witnessed structure fluctuations pre and post-financial crisis and factors such as interest rates lie at the heart of these fluctuations. Therefore, that is resulted in decreasing the time deposit interest rates from 6.55% in 2000 to 2.88% in 2002, before increased to 6.49% in 2006, and ultimately it declined to 4.11% and 2.0 by the end of 2014 and 2016 respectively. Likewise, the interest rates on the saving deposit fell down from 3.8 in 2000 to 1.8 in 2002, after that it declined to 1.0 in 2006 and eventually plunged to 0.6 by the end of 2016 (CBJ, 2018). Though researchers including (Thang, 2009; Ali, 2016) praised the role of interest rates in affecting the performance of stock markets, however, there is no previous study answered the impacts of the movements in both the time deposit interest rates and saving interest rates in the liquidity of ASE during the period Q1/2000-Q4/2016. Therefore, to fill this gap in literature; the current research is mainly aimed at answering the impacts of the volatility in the weighted average time deposit interest rates "WATDIR" and the weighted average saving deposit interest rates "WASDIR" in the behaviour of Jordanian investors. This main aim will be achieved through investigating the causal relationship between the WATDIR and WASDIR along with the liquidity of ASE as measured by the turnover ratio "TOR" and the value traded "VT", over the period Q1/2000-Q4/2016.

Following the introductory, the next section focuses on reviewing the available literature regarding the influential factors of the stock market liquidity as well as the development of the Amman stock exchange. Thereafter, the study proceeds to explain the methodology, which was employed to accomplish the core aim of this research. Eventually, the study presented the main findings as well as the conclusion of this research.

Literature Review

The current research attempts to explore the effect of the volatility in the WATDIR and WASDIR in the behaviour of Jordanian investors as measured by the liquidity of ASE. To cover the theoretical and empirical foundation of this research; I have presented a critical appraisal for the most recent studies concerning the potential determinants of the markets' liquidity. In this regard, researchers including Wong and Fung (2002) found that the liquidity of the Hong Kong stock market as gauged by the turnover ratio and the trading volume is significantly related to the interest rate, price volatility, and the global liquidity. Alternatively, Kemboi and Tarus (2012) showed that the development of stock markets is significantly affected by the level of income, the development of the banking sector as measured by M2/ GDP as well as stock market's liquidity as captured by the turnover ratio and the value traded. On the other hand; the results resealed a non-significant correlation between the real interest rate and the inflation rates along with the market capitalization/GDP. Lee and Wong (2009) showed a positive relationship between the financial liberalization of china and the liquidity of Shanghai stock market as measured by stock prices, trading volume, number of outstanding shares and bid-ask spread.

Ali (2016) revealed that there is no long or short-run causality running from the volatility in M/BV ratio towards the market liquidity as measured by the value traded and the turnover ratio. In addition, the study confirmed that there are no causalities running from the market's liquidity to the M/BV ratio. The study concludes that financial factors like M/BV ratio do not impact the behaviour of Jordanian investors. However, through analyzing a time series data covers the 1995-2011 period; (Sukruoglu and Nalin, 2014) proved that the development of European stock markets is positively impacted by the turnover ratio, traded value/ GDP, saving rate and GDP per capita. Nevertheless, variables including inflation rate, as well as the monetization are negatively affecting the market's development as measured by capitalization/ GDP. A study by Chordia, Sarkar and Subrahmanyam (2001) revealed a strong relationship between the lagged market returns, lagged spread, lagged volume, lagged interest rate along with the spread of bid-ask and trading volume. Studies including Zafar (2013) showed a positive relationship between the foreign direct investment and the value traded, along with the performance of Karachi stock market as gauged by the market capitalization/GDP. Nevertheless, the real interest rate is found to be negatively associated with the market's performance. However, regarding the influential factors of investors' behaviour, (Al-Zu'bi, 2000) revealed that market fundamentals like the interest rate, exchange rate, growth in money supply and the GNP growth rate are positively influencing the stock index in the ASE. On the other hand, Shaban and Al-Zubi (2014) revealed that financial indicators like M/BV ratio and P/E ratio are significantly influencing the decisions of Jordanian investors. In addition, the study showed that factors like the cash flow/sales ratio, cash flow/assets ratio, assets turnover ratio, debt/assets ratio, ROA and ROE ratios play a significant role in determining the decisions of ASE's investors. However, Ali (2016) proved that on the long-run, the decisions of Jordanian investors as measured by the market's liquidity is significantly impacted by the rate of inflation, while the fluctuations in the time deposit interest rate doesn't impact the decisions of Jordanian investors. Beyond that, in order to cover the theoretical and empirical foundation of this research, the study presented a quick review regarding the development of Amman stock exchange as well as the influential factors of Amman stock exchange's investors.

The Development of Amman Stock Exchange

The Amman Stock Exchange is considered as the extension of the Amman financial market that was established in 1976. Thus, the development of the ASE has passed several stages before reaching its current position. More specifically, during the period 1930-1960, the economy of Jordan witnessed the establishment of a limited number of Jordanian public shareholding companies, while, only in 1974, these companies started to issue corporate bonds through an unorganised market. However, to ensure the safety of trading securities as well as protecting the class of small savers, under the temporary securities law number 31/1976, what was known as Amman Financial Market "AFM" was consequently established. However, due to the incredible improvement in the performance of the AFM, the securities law of 11/Mar/1999 aimed at replacing the Amman financial market by three main institutions, namely Amman stock exchange, Jordan Securities Commission and Securities Depository Centre (ASE, 2018).

However, since the performance of stock markets is highly relied on investors' behaviour, there are intensive studies conducted to identify the influential factors, which are affecting the behaviour of stock markets' investors. For instance, literature including AL-Radaideh, et al. (2013) argued that variables including the trading volume, news and financial reports are significantly

impacting the decisions of Amman stock exchange's investors. However, Siam and Al-Thaher (2015) confirmed that information from the financial statements play a leading role in rationalising the decisions of Jordanian investors. Al-Khatib and Al-Shara's (1994 cited in Abbad, 2012) mentioned that the market prices and stock's returns in the ASE are significantly related to the movements in deposit interest rates, exchange rates and money supply. Additionally, a recent study by Ali (2018) confirmed that the behaviour of Amman stock exchange's investors as captured by the market performance is significantly impacted by the movements of interest rate on the long-run. According to Hourani (2004) factors such as deposit and lending interest rates, economic growth, political situations as well as the stability of banks and shareholding companies, play a leading role in making the year of 2004 as a special period. In this period, the performance indicators in the ASE broke the records. For example, compared with the previous year, the price of the stock index rose by 62%, the traded value increased by several folds reaching up to JOD 3.8 billion, and the number of traded shares exceeded 1.3 billion. The number of executed contracts recorded 1.2 million; the market capitalisation went up by 68% amounting JOD 13 billion, the net of foreign investment increased to JOD150.9 million compared with JOD 81.9 million in the last year.

Furthermore, to create a fair and efficient market, at the end of 2004, the ASE developed its website in order to strengthen the policies of disclosure and transparency. This new website was considered as one of the greatest resources for researchers, investors and the other interested parties. Subsequently, the website had around 40 million visitors per month. In 2005 this official site was classified as one of the best financial websites in Jordan. Continuously, to provide investors with the needed information regarding investment decisions, on Sunday June 5th/2005, the ASE started to publish the opening and closing prices of the traded securities within its daily bulletins (Ali, 2016). Moreover, the above discussion revealed that there are a set of market fundamentals, which are influencing the decisions of ASE's investors. However, since the available statistics showed that variables such as the WATDIR and WASDIR fluctuated considerably, the current research is concerned of assessing the impact of the time and saving deposit interest rates in the decisions of Jordanian investors as captured by the liquidity of ASE. However, the available statistics showed that in 2004, the decline of deposit interest rate in Jordan was resulted in increasing the turnover ratio and the value traded in the Amman stock exchange. Thus, to investigate whether this relationship is really existed; the current research aimed at exploring the causal relationship between the rates of interest along with the turnover ratio and the value traded as main proxies to capture the decisions of ASE's investors.

Methodology and Data Collection

The current research aimed at examining the causal relationship of the volatility in the WATDIR and WASDIR along with the liquidity of ASE. For this purpose, the study employed a time series data covers the period Q1/2000-Q4/2016. These data were mainly obtained from the official site of the Amman stock exchange and the Central bank of Jordan (CBJ, 2017; ASE, 2018). To analyze obtained data set; the study implemented two main methodologies those are primarily relied on two econometric softwares. More specifically, through using the E-views-8 software; the study used the method of linear match-last to convert the annual data of market liquidity to quarterly data. However, via using the STATA software; the study applied the descriptive analysis test to describe the data's mean, variance, standard deviation, kurtosis and skewness. The Augmented Dickey Fuller test is also applied to check for data stationarty. The Johansen co-integration test

was used to find-out whether there is a long-run co-integration between the variables of interest, the VAR model and the granger causality test were applied to check the short-run correlation between the WATDIR and WASDIR along with the liquidity of Amman stock exchange. In this research the indicator of market's liquidity was captured by utilizing trading activity measures like the TOR and the VT in the ASE.

Variables Discussion and Hypotheses

To accomplish the core purpose of this research; the following dependent and independent variables are used:

I. Independent variable (s)

- **Time Deposit Interest Rate**

This variable refers to the interest rates, which are paid by Jordanian commercial banks for customers' time deposits. However, to avoid the phenomenon of getting heteroscedasticity, the variable of the weighted average time deposit interest rates is employed to attain the prime aim of this research. In addition, to define the impact of the fluctuations in the TDIR in investors' decisions, the study used the standard deviation of the WATDIR. In order to calculate the weighted average time deposit interest rate for the three month fixed account, the study employed the following formula which is used by Ali (2016) for the same purpose:

$$\mathbf{WASDIR} = \frac{\sum \mathbf{WATDIR^{JB}}}{\mathbf{13}}$$

The $\sum \mathrm{WATDIR}^{\mathrm{JB}}$ relates to the summation of the weighted average time deposit interest rates of the Jordanian commercial banks, divided by the total number of the Jordanian commercial licensed banks, which are 13 Jordanian commercial banks. Moreover, the current research postulated a negative correlation between the WATDIR and the liquidity of ASE. Where, the decrease in these rates is assumed to encourage investors of Jordan to deposit their surplus of funds in banks, instead of diverting them to the stock market.

- **Saving Deposit Interest Rate**

This variable refers to the interest rates, which are paid by Jordanian commercial banks for customers' saving deposit accounts. However, to avoid the phenomenon of getting heteroscedasticity, the variable of the weighted average saving deposit interest rates is employed to achieve the study aims and objectives. The following formula is used to calculate the weighted average saving deposit interest rates (CBJ, 2017):

$$\mathbf{WASDIR} = \frac{\sum \mathbf{WASDIR^{JB}}}{\mathbf{13}}$$

The $\sum \text{WASDIR}^{JB}$ relates to the summation of the weighted average saving deposit interest rates of Jordanian commercial banks, divided by the total number of the Jordanian commercial licensed banks. Moreover, the study assumed a negative correlation between the WASDIR along with the liquidity of the ASE. Where, the decrease in these rates is supposed to encourage investors to deposit their funds in banks instead of diverting them to the stock market.

II. Dependent Variables

This research utilizes the trading activity measures to capture the liquidity of ASE. These measures are described below:

a. Turnover Ratio

This ratio is considered as a typical measure to gauge the stock market's liquidity. This ratio was used by Amador, et al. (2013) to investigate the impact of monetary policy on the stock markets' liquidity. Levine and Zervos (1998) used this ratio to predict the role of stock market's liquidity in enhancing economic growth. Moreover, since the above studies appraised the ability of this ratio to measure the stock markets' liquidity; this ratio is used as a proxy to measure the liquidity of Amman stock exchange. This ratio is calculated by Ali (2016) as addressed below:

$$\mathbf{TOR} = \frac{\textbf{Total No. of Specific period's Traded Stocks}}{\textbf{No. of Initial Offered Stocks in the Same Period}}$$

b. Value Traded

This ratio is considered as a typical indicator to gauge the stock market's liquidity. The available literature showed that studies like Amador, et al. (2013); Alabed and Al-Khouri (2008); Kemboi and Tarus (2012) have used this factor to measure the stock markets' liquidity. Similarly, the current study employs this measure to capture the liquidity of Amman stock exchange. Ali (2016) calculates this value by applying the following formula:

$$\mathbf{TV} = \sum \mathbf{TSt} * \boldsymbol{\mu}\mathbf{MPt}$$

Where the TS, refers to the total number of shares which are traded in the Amman stock exchange in time t, multiplied by the average market price in the same period.

Model Specification

The primary model of this research shows the linear function for the relationship of the volatility in interest rates along with the market's liquidity. This model is addressed below:

- ✓ $\mathbf{Ln\ (ML) = \beta 0 \pm \beta 1(\sigma\ WATDIR\%) \pm \beta 2\ (\sigma\ WASDIR\%) + \varepsilon t}$ $\ldots\ldots\ldots\ldots\ldots (1)$

The Ln (ML) refers to the logarithm of the market's liquidity as measured by the turnover ratio and the value traded. β_0 represents the constant, β_1:β_2 refers to the regression coefficient, WATDIR relates to the weighted average time deposit interest rates, and the WASDIR is the weighted

average saving deposit interest rates. The σ symbol represents the standard deviation that is employed to investigate the impact of the volatility in the WATDIR and WASDIR in the market's liquidity. The epsilon symbol "ε" is the error term and the "t" is the quarterly time series data.

The above model was modified and presented in its simple form as addressed below:

- ✓ $\mathbf{Ln\ (TOR) = \beta 0 \pm \beta 1(\sigma\ WATDIR\%) \pm \beta 2\ \sigma\ (WASDIR\%) + \varepsilon t} \dots\dots\dots\dots\dots (\mathbf{2})$

TR= is the logarithm of the ASE's turnover ratio.

- ✓ $\mathbf{Ln\ (VT) = \beta 0 \pm \beta 1(\sigma\ WATDIR\%) \pm \beta 2\ (\sigma\ WASDIR\%) + \varepsilon t} \dots\dots\dots\dots\dots (\mathbf{3})$

Ln (VT) =is the logarithm of the ASE's value traded.

However, since the results of the ADF test confirmed that the used series data became stationary only after adding the first difference, the single equation of the VAR test have been tested in order to accomplish the core aim of this research:

$$\mathbf{Ln\ (ML_t) = \alpha \pm \sum \beta_{ik}\ (ML_{t-1}) \pm \sum \beta_{ik}\ (\sigma\ WATDIR\%_{t-i}) \pm \sum \beta_{ik}\ (\sigma\ WASDIR\%_{t-i}) + \varepsilon_t} \dots\dots\dots\dots\dots (\mathbf{4})$$

Where, the ML is a (K*1) vector of variable. This variable relates to the markets' liquidity. However, since more than one variable is used to measure the market's liquidity, each variable is found not to be co-integrated on the long-run, it will be measured in a separate VAR model. α is the vector of intercept's terms (K*1), β_i are the metrics of coefficients to be estimated in the model (K*K). The k_i refers to the lag length (i.e. i= 1…..k). ε_t is the white noise error term for the time t. In this model the market liquidity is measured by using both the value traded and the turnover ratio. This model is considered to be a valid model to achieve the core aim of this research, as it was previously established as well as tested by (Ali, 2016) for the same purpose.

The study Findings

The current research aims at exploring the causal correlation between the rates of interest along with the behaviour of Jordanian investors, as captured by the turnover ratio and the traded value. For this purpose, the study employed a set of advanced empirical techniques like the descriptive test, the augmented dickey fuller, the Johansen cointegration, the vector autoregressive model and the granger causality Wald tests. Consequently, the results are explained as shown in the following tables 1-8:

Table 1: Variables Descriptions and Summary Statistics

The following table (Panel A) elaborates the study's variables, which are used to measure the relationship of the volatility in the WARDIR and WASDIR along with the behaviour of Jordanian investors, as captured by liquidity of ASE. On the other hand, (Panel B) reports the summary statistics for the liquidity of the ASE and the variables of interest rates, over the period Q1/2000-Q4/2016.

Panel A

WATDIR[1]

WASDIR[2]

Turnover Ratio[3]

Traded Value[4]

Panel B

Variable	# of Obs	Mean	Std. Dev.	Variance	Min	Max	Skewness	Kurtosis
WATDIR	68	4.261	1.199	0.43827	2.460	7.250	0.4421	2.4122
WASDIR	68	1.286	1.014	1.02860	0.560	4.440	1.9206	5.3205
Turnover Ratio	68	58.733	29.882	892.95	11.251	102.17	0.0363	1.5126
Value Traded	68	6.05e+0	5.82e+0	3.39e+1	3.35e+0	2.03e+1	0.9110	2.35758

From the above table, the first column in (Panel B) demonstrates the names of variables, which are used to achieve the main aim of this research. However, throughout the study period, the other columns show the summary statistics for the deposit and saving interest rates as well as the liquidity of ASE as measured by the turnover ratio and the value traded. Generally speaking, the table indicates that the variables exhibit significant variation in terms of magnitude. However, for the deposit and saving interest rates the standard deviation is relatively high; while for other is found to be very high (e.g. TOR). In addition, the above table shows that column number seven confirms that the distribution of WASDIR, and the value traded; are highly skewed to the right. However, variables including the turnover ratio are approximately symmetric with a slight skewness to the right. On the other hand, the kurtosis results signify that since the data of

[1]WATDIR: It is an independent variable refers to the weighted average time deposit Interest rates; those are paid by Jordanian commercial banks on time deposits' accounts.

[2]WASDIR: It is an independent variable refers to the weighted average saving deposit Interest rates; those are paid by Jordanian commercial banks on saving deposits' accounts.

[3] Turnover Ratio: It is a dependent variable utilized to measure the liquidity of ASE, and it is calculated by dividing the No. of traded stocks by the No. of initial offered stocks.

[4]Traded Value: It is a dependent variable utilized to measure the liquidity of ASE, and it relates to the total value of traded shares in a specific period of time.

WATDIR, TOR and VT are less than three; the data seem to have flatness and they have lighter-than-normal tails. Variables including WASDIR are found to be highly skewed with a kurtosis 5.32. Briefly, the table demonstrates that the variables are normally distributed and highly skewed. To achieve the core aim of this research, a set of time series data were collected from the statistical bulletin of Amman stock exchange. Anyway, since authors including Ali (2016) mentioned that a majority of time series variables are vulnerable to fluctuate over time, it was compulsory to check for data stability in order to avoid the problem of getting spurious regression results. Therefore, the study employed the Augmented dickey fuller test to check for data statioarity. Consequently, the findings are described in the following table (2):

Table 2: Augmented Dickey Fuller

This table demonstrates the results of the augmented dickey fuller test, which was used to check for data stationarity. Consequently, results from (Panel A) showed that when the variables were examined at level they found to be non-stationary. However, after converting them into the first difference, results from (Panel B) proved that the examined time series variables became stationary and the trend was eliminated.

Panel A

Variable	Level 5%	P-Value	T-Statistics	No. of Lags	H_0
WATDIR	-3.485	0.309	-2.538	2	Accepted
WASDIR	-3.485	0.072	-3.262	2	Accepted
Turnover Ratio	-3.485	0.877	-1.341	2	Accepted
Value Traded	-3.485	0.688	-1.834	2	Accepted

Panel B

Variable	Level 5%	P-Value	1st Diff	Remarks	H_0
WATDIR	-3.486	0.0241	-3.674***	I(1)	Rejected
WASDIR	-3.486	0.0012	-4.568***	I(1)	Rejected
Turnover Ratio	-3.486	0.0007	-4.712***	I(1)	Rejected
Value Traded	-3.486	0.0192	-3.752	I(1)	Rejected

The above results indicate that the WATDIR, WASDIR, value traded and the turnover ratio are found to be non-stationary at level 5%. However, after adding the first difference; all the variables became stationary. Additionally, the examined variables are found to be integrated with the same order. Therefore, the study applied the Johansen Co-integration test in order to check for the long-run integration between the variables of interest. Therefore, the following table (3) explains the case of integration between the interest rates along with the behaviour of Jordanian investors:

Table 3: Johansen tests for Co-integration

The following table was constructed to test whether there is a long-run integration between the fluctuations in the WATDIR and WASDIR, along with the turnover ratio at the Amman stock exchange.

H_0: There is no co-integration between WATDIR and WASDIR along with the turnover ratio.

H_1: There is a co-integration between WATDIR and WASDIR along with the turnover ratio.

VEC-rank TOR, WATDIR, WASDIR, (trend) max Level99

Johansen tests for Co-integration

Trend: Trend — No. of Obs. = 66

Sample: Q3/2000 –Q4/2016 — Lags= 2

Maximum

Rank	Parms.	LL.	Eigen Value	Trace Statistics	1% Critical
0	15	-198.59	.	28.971	40.49
1	20	-192.26	0.1747	16.296	23.46
2	23	-187.60	0.1315	6.9883	6.400
3	24	-184.11	0.1004	.	.

After running the Johansen Co-integration test, results appearing in table (3) showed that the trace statistics are less than their critical values. Therefore, the null hypothesis was accepted. Meaning that, the study's variables are not integrated as well as there is no long-run relationship between the volatility in the WATDIR and WASDIR along with the liquidity of ASE. Thus, since there is no co-integration among the variables; the Vector Autoregressive test is applied to explain the nature of association between the variables of interest. Thus, results from the VAR test are described in table number 4:

Table 4: Vector Autoregressive Model "VAR"

The following table is constructed to test whether there is a short-run causality running from the fluctuations in the WATDIR and WASDIR towards the turnover ratio.

	Coef.	Std. Error	Z	P > /Z/	95% Cnof.	Interval
TOR						
TOR						
L1	0.8445	0.1234	6.840	0.0000	0.5264	1.1626
L2	0.0669	0.1235	0.540	0.5880	-0.2514	0.3852
WATDIR						
L1.	-0.3220	4.8634	-0.0700	0.9470	-12.849	12.205
L2.	-0.0876	4.8644	-0.0200	0.9860	-12.617	12.442
WASDIR						
L1.	-1.102	7.5045	-0.1500	0.8830	-20.433	18.227
L2.	0.2602	7.0419	0.0400	0.9710	-17.870	18.399
_Cons	8.647	5.657	1.530	0.1260	-5.926	23.220

The statistics, which are presented in the above table (4) prove that the first lag of the turnover ratio is significant to explain the turnover ratio at ASE, while neither the lagged WATDIR nor the lagged WASDIR are associated with the TOR. In other words, the results proved that on the short-run, the liquidity of ASE as measured by the TOR is not affected by the volatility in the rates of interest. Thereafter, the study moved on to run the Wald test in order to check if really the short-run association is not existed. Therefore, results from the Wald test are explained in the following table (5):

Table 5: Granger Causality Wald Test

This test is applied as a post-estimation test to confirm whether the short-run relationship is really existed or not.

Equation	Excluded	Chi 2	df.	Prob. > Chi 2
TOR	WATDIR	3.875	2	0.144
TOR	WASDIR	0.614	2	0.735
TOR	ALL	4.723	4	0.317

The above table (5) confirms that there is no short-run causality running from the volatility in interest rates towards the turnover ratio. Furthermore, the study was shifted to explore the impact of the WATDIR and WASDIR in investors' behaviour as captured by the value traded.

Table 6: Johansen tests for Co-integration

The following table is constructed to test whether there is a long-run integration between the fluctuations in the WATDIR and WASDIR, along with the value traded at the Amman stock exchange.

H_0: There is no co-integration between the WATDIR and WASDIR along with the value traded.

H_1: There is a co-integration between WATDIR & WASDIR along with the value traded.

VEC-rank VT, WATDIR, WASDIR, (trend) max Level99

Johansen tests for Co-integration

Trend: Trend — No. of Obs. = 66

Sample: Q3/2000 –Q4/2016 — Lags= 2

Maximum

Rank	Parms	LL.	Eigen Value	Trace Statistics	1% Critical
0	15	-1409.36	.	24.90	40.49
1	20	-1402.22	0.19469	10.61	23.46
2	23	-1396.91	0.14856	0.000	6.400
3	24	-1396.91	0.00000	.	.

After running the Johansen Co-integration test, the results showed that the trace statistics are less than their critical values. Therefore, the null hypothesis was accepted. Meaning that, the study's variables are not integrated as well as there is no long-run relationship between the volatility in WATDIR and WASDIR along with the liquidity of ASE. Thus, since there is no co-integration among the variables; the Vector Autoregressive test was applied to explain the nature of correlation between the examined variables. Therefore, results from the VAR test are described as shown in the following table (7):

Table 7: Vector Autoregressive Model

The following table is constructed to test whether there is a short-run causality running from the fluctuations in the WATDIR and WASDIR towards the liquidity of ASE as captured by the value traded.

	Coef.	Std. Error	Z	P > /Z/	99% Cnof.	Interval
VT						
VT						
L1	1.5382	0.1032	14.890	0.000	1.272	1.8043
L2	-0.579	0.1054	-5.500	0.000	-0.851	-0.308
WATDIR						
L1.	2.8000	5.250	0.530	0.594	-1.070	1.630
L2.	-3.910	5.220	-0.750	0.4530	-1.740	9.530
WASDIR						
L1.	2.830	7.590	0.370	0.7090	-1.670	2.240
L2.	-2.270	7.050	-0.320	0.7480	-2.040	1.590
_Cons	7.050	5.280	1.340	0.1820	-6.540	2.060

The above table (7) shows that both the first and the second lag of the value traded are significant to explain the value traded of ASE, while neither the lagged WATDIR nor the lagged WASDIR are associated with the market's liquidity. In other words, the results proved that on the short-run, the liquidity of ASE as measured by the VT is not affected by the volatility in the rates of interest. Thereafter, the study moved on to check if really the short-run association is not existed. Therefore, results from the Wald test are explained in the following table (8):

Table 8: Granger Causality Wald Test

The following test is applied as a post-estimation test to validate whether the short-run relationship is really existed or not.

Equation	Excluded	Chi 2	df.	Prob. > Chi 2
VT	WATDIR	0.820	2	0.663
VT	WASDIR	0.152	2	0.927
VT	ALL	1.469	4	0.832

Statistics appearing in the above table (8) confirm that there is no short-run causality running from the volatility in interest rates towards the liquidity of ASE as measured by the value traded. Eventually, the study wounded up by presenting a conclusion to discuss the main results, which are achieved by this research as well as putting some important recommendation for investors in general, and the participants of ASE particularly.

Conclusion

The current research aimed at exploring the causal relationship between the volatility in the WATDIR and WASDIR along with the liquidity of Amman stock exchange. For this purpose, the study employed a set of empirical techniques like the ADF, Johansen co-integration test, VAR model and the short run granger causality tests to analyze a time series data covers the period Q1/2000-Q4/2016. Consequently, the findings revealed that all the variables are non-stationary at level, while after converting them into the first difference; the variables became stationary. The results of the Johansen test proved that the examined variables are not integrated on the long-run. Therefore, the VAR analysis as well as the granger causality tests are employed and the results confirmed that the volatility in the rates of interest don't impact the market liquidity as captured by the value traded and the turnover ratio. However, studies including Wong and Fung (2002) proved that the liquidity of Hong Kong stock market as gauged by the turnover ratio and the trading volume is significantly related to the movements of interest rate. A recent study by Ali (2018) confirmed that the behaviour of Amman stock exchange investors, as captured by the Buffet indicator is significantly impact by the movements in interest rates. By contrast Ali (2016) confirmed that the liquidity of Amman stock exchange is insignificantly impacted by the movements in the time deposit interest rates. However, since the current research found a non-significant correlation between the volatility in the WATDIR and WASDIT along with the liquidity of Amman stock exchange; the study concludes that investors of Jordan are making their investment decisions irrationally, or maybe they are risk averse investors. Thus, since the decrease in the rates of interest does not lead to improve the market liquidity, meaning that the decrease in these rates does not motivate them to invest their surplus of funds in stocks. Therefore, investors of Jordan can be classified as irrational investors or risk averse investors who prefer to deposit their funds into the banks, though the level of interest rates is low. Moreover, the study recommends investors to take these rates into the accounts in the process of decision making, as well as the study advice researchers to conduct further studies in order to identify the potential determinants of the market's liquidity as a proxy for investors' decisions.

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