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The effect of conflict on Palestine, Israel, and Jordan stock markets

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ABSTRACT

This research studies how the Israeli-Palestinian conflict affects Palestine, Israel and Jordan stock markets, as well as the links between these markets on a daily basis. A violence index is built and used as an exogenous variable in a VECM-MGARCH model. Our findings suggest the existence of an equilibrium relationship between the three markets, which is essentially kept through Palestinian and Jordanian stock market adjustments and that does not respond to increases in violence. An increase in violence has short-run direct negative impacts on the Palestinian stock exchange, but does not directly influence the Israeli and Jordanian stock markets.

1. Introduction

Understanding the dynamic relationships between different stock markets sheds light on important financial market characteristics, and provides valuable information to international investors who seek new investment opportunities. To decrease overall risk, finance theory suggests that investors should include assets from less correlated markets into their portfolios. While a number of studies have analyzed how different world stock markets are related (Huang, Yang, & Hu, 2000; Gilmore & McManus, 2002; Chen, Firth and Meng Rui, 2002; Voronkova, 2004; Syriopoulos, 2007; 2011; Kenourgios & Samitas, 2011; Gupta & Guidi, 2012; Yunus, 2013; Guidi & Ugur, 2014; Chien, Lee, Hu, & Hu, 2015), Middle East stock markets have been widely ignored by the literature. A few notable exceptions are reviewed in this paper.

Bley and Chen (2006) examine the dynamic interactions between the stock markets of six Gulf Cooperation Council (GCC) countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates) using a Vector Error Correction Model (VECM). They find evidence of market integration across GCC countries increasing over time. Conversely, the GCC emerging markets are found to be weakly linked to the US and the UK markets. Aksoy, Akin, and Zeytunlu (2011) analyze long and short-run co-movements between Turkey, Egypt and Israel stock markets using cointegration and Generalized Autoregressive Conditional Heteroscedasticity (GARCH) models. They conclude that while these markets display no long-run equilibrium, they are characterized by strong GARCH effects. Palestinian and Jordanian stock markets are studied by Abdul-Hadi, Hamad, Yahya, and Iqbal (2013) using VECM and Impulse Response analysis. Results suggest these markets to be cointegrated and positively related in the long-run. The authors also find shocks impacting the Jordanian financial market to influence the Palestinian stock indices. More recently, Suryanto and Abdul Hadi (2015) have studied the interrelationship between Palestinian and Israeli stock markets by using a VECM and Granger causality tests. Their findings suggest

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that while a positive long-run cointegration relationship between both markets exists, no short-run causality between the two markets can be found.

The literature examining the interrelationships between Middle East stock markets has ignored the influence of the confrontation between Israel and the Palestinians, a crisis that shows no signs of abating and that has relevant economic impacts that should be reflected in stock markets. This constitutes the most relevant contribution of this research article to the literature. Relative to previous studies, this research also offers a more complete picture of economic bonds in the area by jointly considering Palestinian, Israeli and Jordanian financial markets. Regional proximity, social bonds and the signature of the peace treaty between Jordan and Israel in 1994, have fueled important economic interactions among the three countries (Palestinian National Authority - PNA, 2011). Consistently, a Violence Index (VI) is used as an exogenous variable in a VECM-MGARCH that depicts long and short-run relationships, as well as volatility spillovers between Palestinian, Israeli and Jordanian stock markets. As far as we know, this is the first article addressing the effect of conflict on the links between the stock exchanges of these countries.

The rest of the paper is organized as follows. A discussion on the Palestinian, Israeli and Jordanian economic links and financial markets is presented in section 2. After discussing the econometric methods in section 3, in section 4 we describe the data used and present the results. The article ends with the concluding remarks section.

2. Palestinian, Israeli and Jordanian economic bonds markets

The Palestinian economy has unique characteristics due to the continued Israeli occupation and the restrictions imposed on the movement of both individuals and goods. The absence of a Palestinian currency and the use of three different currencies (the New Israeli Sheqel -NIS, the Jordan Dinar - JD and the United States Dollar - USD) add to the exceptional nature of the Palestinian economy (Palestine Monetary Authority - PMA., 2014). Palestine's geographic location inevitably links its economy to Israel. Israel occupies a prominent position in Palestine foreign trade relationships by being the largest importer of Palestinian goods and the largest exporter to Palestine. In 2014, 70% (around 3.9 billion dollar) of total Palestinian imports were from Israel, followed, at a distance, by the European Union (10%). In the same year, the percentage of overall Palestinian exports directed to the Israeli market was 81% (around 792 million dollar). Only 10% of Palestinian exports were directed to Arab countries and 9% to the rest of the world (PMA, 2015). The Israel-Palestine conflict has also caused massive economic losses in the form of opportunity of income lost and the destruction of Palestine agricultural land and economic activity. Israeli restrictions on the flow of goods and labor constitute another sensitive aspect of the Palestinian economy.

Many Jordanian companies, especially in the banking sector, operate in Palestine, which is a key characteristic of the economic relationship between the two countries. In 2013, the number of banks in Palestine was 17, of which 8 were Jordanian banks, accounting for a large share of the market in terms of deposits and credit facilities. By the end of 2013, Jordan banks represented around 52.4% of the total bank assets operating in Palestine. According to PMA. (2013), the trade value between Palestine and Jordan is still modest, accounting for just 6% and 2% of imports and exports, respectively. The economic performance of Palestine is further affected by the Jordanian dinar, which is one of the three currencies used in the Palestinian economy (PMA., 2014).

After the peace treaty between Israel and Jordan in 1994, the borders between the two countries were opened, and factories under Israeli ownership were transferred to Jordan, where labor was cheaper. In 2013, the export of goods from Israel to Jordan reached around 99 million dollars. The Israeli imports from Jordan increased in 2013 by about 30% reaching about 267 million dollars (Israel Ministry of Foreign Affairs, 2014). To sum up, the strong dependency of the Palestinian economy on the Israeli economy and the linkages between the Palestinian and Jordanian economies, especially in the banking sector, make the developments in these two economies of capital importance to the evolution of the Palestinian economy. These economic linkages should be reflected in the stock exchanges of these countries. Our analysis aims at shedding light on this issue by analyzing the interrelationships and volatility spillovers between Palestinian, Israeli and Jordanian stock markets.

Major world stock markets, especially in the US and Europe, have been investigated by a large number of research studies. However, stock markets in the Middle East have received much less scholarly attention. This paper attempts to fill this gap by analyzing the interrelationship and volatility spillovers between three related Middle East stock markets: Palestine and Jordan, two frontier markets, and Israel, a developed market. The following paragraph offers details on the three stock markets considered in this paper.

The Palestinian Stock Exchange (PEX) started its operations in 1997 with 19 listed companies. In 2014, the number of listed companies had increased to 48, with a total market capitalization of 3.2 billion dollars (a 5.5% decrease compared to 2013). Of the 48 companies listed on the PEX, 8 come from the banking and financial services sector, 12 from the industrial sector, 12 from the services sector, 9 are investment companies and 7 insurance companies (Palestine Capital Market Authority - PCMA, 2014). Amman Financial Market (AFM), the Jordan stock market, was founded in 1978. The number of listed companies at that time was 66, with a trading volume of 9.7 million Jordanian Dinar (JD).[1] In 1999, AFM was re-launched under a new name, Amman Stock Exchange (ASE). In 2014, the number of listed companies reached 236 with a market capitalization of about 18 billion JD and a trading volume of about 2.3 billion JD. Tel Aviv Stock Exchange (TASE) was founded in 1953. The Israeli stock market is the largest among all Middle East stock markets (MSCI, 2015). According to the Israel Stock Exchange website, by the end of 2014, the number of listed companies was 472, with a market capitalization of 705 billion New Israeli Sheqel (NIS),[2] compared to 656 billion NIS in the previous year (a 7.5% increase) and 554 billion NIS by the end of 2012. In the next section, a description of the methods used in this article is offered.

[1] 1 US$ = 0.71 JD. It is worth noting that the Jordanian dinar is pegged at a fixed exchange rate to the dollar.
[2] 1 US$ = 3.7 NIS.

3. Methods: VECM-MGARCH and violence index

Our methodological approach to study the linkages and volatility spillovers between the Palestinian, Israeli and Jordanian stock markets is based on a VECM-MGARCH specification that consists of two sub-models. First, the conditional mean model, that depicts the first moment and first-moment interactions between the three stock exchange indices studied. Second, the conditional covariance model, which is used to study the volatility and volatility spillovers between the time series studied. The characteristics of the time series used suggest the presence of unit roots in each of the stock exchange indices considered, as well as the existence of a single long-term relationship between them. The presence of nonlinearities in the conditional mean model is tested using the Hansen and Seo (2002) approach. Since our results suggest a linear conditional mean model, a linear VECM is used in this analysis.

Two exogenous variables are included in the model to allow for the economic influence of the Israel-Palestine conflict, as well as for the influence of the international stock markets, which is expected to be especially relevant for TASE. As explained, a Violence Index (VI) is used as a regressor in the conditional mean and the conditional covariance models in order to allow for conflict to affect stock exchange indices' first and second moments (Humphreys, 2002; Svensson, 1998; Guidolin & La Ferrara, 2010). With the increased international financial integration in recent years, world's largest financial economies are likely to exert an influence on the financial economies of other countries (Milani, 2011). The United States is not only the largest economy in the world in nominal terms, but it is also the top foreign investor in Israel (International Monetary Fund - IMF, 2017). This issue is addressed by adding the New York Stock Exchange (NYSE) index as an exogenous variable in the model. Therefore, we employ the following VECM in our study:

$$\Delta P_t = \alpha\beta' P_{t-1} + \gamma_1 \Delta P_{t-1} + \ldots + \gamma_{n-1}\Delta P_{t-n+1} + \lambda_0 \Delta \nu_t + \ldots + \lambda_{n-1}\Delta \nu_{t-n+1} + \delta_0 \Delta s_t + \ldots + \delta_{n-1}\Delta s_{t-n+1} + u_t \quad (1)$$

where Δ is a first difference operator, $P_t = (P_{P,t}, P_{I,t}, P_{J,t})$ represents the (3×1) vector of the stock exchange indices for Palestine, Israel and Jordan at time t, respectively. v_t is the violence information index and s_t is the NYSE index, which captures the effects of international stock markets on the exchanges considered. u_t is the (3×1) vector of random error terms. $\beta' P_{t-1}$ is the one period lagged deviation from the long-run equilibrium relationship. The VI variable (v_t) was considered as well as part of the cointegration relationship, but proved to be statistically insignificant and thus was dropped. The (3×1) vector α contains the error-correction parameters measuring the response of the endogenous variables to deviations from the long-run equilibrium relationship. At least one of the error-correction parameters must be statistically different from zero and have the correct (error-correcting) sign for a long-run equilibrium relationship among the series to exist. The (3×1) vectors λ_i and δ_i measure the short-run impacts of the exogenous variables on stock exchange indices' conditional mean model. The (3×3) matrices γ_i represent the autoregressive and cross-lagged stock exchange indices dynamics.

Previous literature shows that financial time series, such as stock prices, are often characterized by time-varying and clustering volatility. In this paper, to allow for this common feature and investigate volatility spillovers between the three stock markets, the conditional covariance model is specified as a multivariate Baba–Engle–Kraft–Kroner (BEKK) model (Engle & Kroner, 1995), which has the following matrix:

$$H_t = CC' + A' u_{t-1} u'_{t-1} A + B' H_{t-1} B \quad (2)$$

where H_t is the (3×3) covariance matrix.A and B are a 3×3 parameter matrices that show the effects of past market shocks $(u_{t-1})$and the influence of past volatility on current volatility, respectively. Matrix C is a 3×3 lower triangular matrix. The influence of exogenous variables on stock exchange index volatility can be allowed for through matrix C in (2) (Moschini & Myers, 2002).

Our specific estimation strategy can be summarized as follows. First, standard unit root and cointegration tests are conducted in order to determine whether time series are stationary or whether they are cointegrated, respectively. In particular, standard augmented (Dickey & Fuller, 1981; Phillips & Perron, 1988; Kwiatkowski, Phillips, Schmidt, & Shin, 1992) tests are applied to each series. The Johansen (1988) cointegration test is then used to investigate the existence of long-run relationship among the series.[3] Since evidence of unit roots and cointegration is found, a conditional mean approach (VECM) and covariance model (BEKK) are then estimated using standard maximum likelihood techniques.

To investigate the impacts of the Israeli-Palestine conflict on Palestinian, Israeli and Jordanian stock markets, the daily total number of casualties (injured and fatalities) that occurred in Palestine during the sample period is obtained from the United Nations Office for Coordination of Humanitarian Affairs (UN-OCHA) and used to define the violence index used in the empirical analysis.

4. Empirical analysis

4.1. Data

Our empirical model utilizes three series of daily stock exchange indices of Palestinian, Israeli and Jordanian stock markets, as well

[3] There are two main alternatives to test for cointegration. The Johansen (1988) method determines the number of characteristic roots of the cointegrating matrix that are less than one. The Engle and Granger (1987) method seeks to determine whether the residuals of the long-run equilibrium are stationary. We use the Johansen (1988) method as it has been shown to be superior to Engle and Granger in multivariate contexts (Engle & Yoo, 1987; Johansen & Juselius, 1990; Stock & Watson, 1993). Dynamic cointegration techniques have also been used by previous research (Chien et al., 2015; Lucey & Tully, 2006; Pascual, 2003). We apply the test for beta constancy of our cointegration vector (Hansen & Johansen, 1999) and we find evidence of constant cointegration relationships.

as the daily VI and the NYSE index covering the period from January 2nd, 2011 to January 11, 2015, yielding a total of 987 observations. The Al-Quds Index, TA-100 Index, ASE Index, and NYSE Index were used to represent aggregate stock market movements for Palestine, Israel, Jordan, and the US respectively. The Palestinian stock index is obtained from the Palestine Stock Exchange Website (www.pex.ps) and expressed in dollars, the Israeli stock exchange index is taken from TASE (www.tase.co.il) and expressed in NIS, while the Jordanian Stock index in JD, is from the Jordan Stock exchange (www.ase.com.jo). Finally, the NYSE index is from NYSE website (http://www.nyse.com/index). Indices reflect performance of all stocks traded on the exchange and are denominated in real values using the Consumer Price Index (CPI) for each country, to avoid results being affected by differences in inflation rates in different countries (Diebold & Yilmaz, 2009). We obtained monthly CPI data from the Palestinian Central bureau of Statistics (www.pcbs.gov.ps) for Palestine, the Central Bureau of Statistics in Israel (www.cbs.gov.il) for Israel, the Jordanian Department of Statistics (www.dos.gov.jo) for Jordan, and the U.S. Bureau of Labor Statistics (www.bls.gov) for the US. The variables used in the empirical implementation are presented in Fig. 1. The average number of casualties is 31.16 per day, with a standard deviation of 186.87. The maximum number is 4750 and occurred on July 24th, 2014, during the second war of Gaza Strip. The minimum casualties number is zero. To account for the effects of international stock markets on the Palestinian, Israeli and Jordanian stock indices, the NYSE index is included as an exogenous variable in our model. The empirical implementation is based upon logarithmic transformations of time series data. Days when the Palestinian Exchange is closed are discarded. The previous day's stock index is used otherwise for Israel, Jordan, and NYSE when their respective exchange is closed while the PEX is opened. A preliminary analysis of the time series data is carried out to test for the presence of unit roots in each series. As shown in Table 1, unit root tests confirm the presence of a unit root in each series except the violence index (or number of casualties). However, non-stationarity can be rejected for all stock indices first differenced series at the 5% significance level.

4.2. Empirical results

Given that stock exchange indices are integrated of same order; we apply the Johansen (1988) method to investigate whether the Middle East stock markets considered are cointegrated over the period studied. Results of the Johansen cointegration analysis are presented in Table 2. The specification of the cointegration relationship includes a constant, but not a trend.[4] It also allows for the sharp increase in the Palestinian stock market in January 2014 as a response to the doubling of the trading volume, and the subsequent decrease at the end of February 2014 (PEX., 2014) using shift dummies. The likelihood ratio test supports the existence of one cointegration relationship among stock exchange indices of Palestinian, Israeli and Jordanian stock markets. Other analyses have also found evidence of cointegration among international stock markets (Hassan & Naka, 1996; Maysami & Koh, 2000).

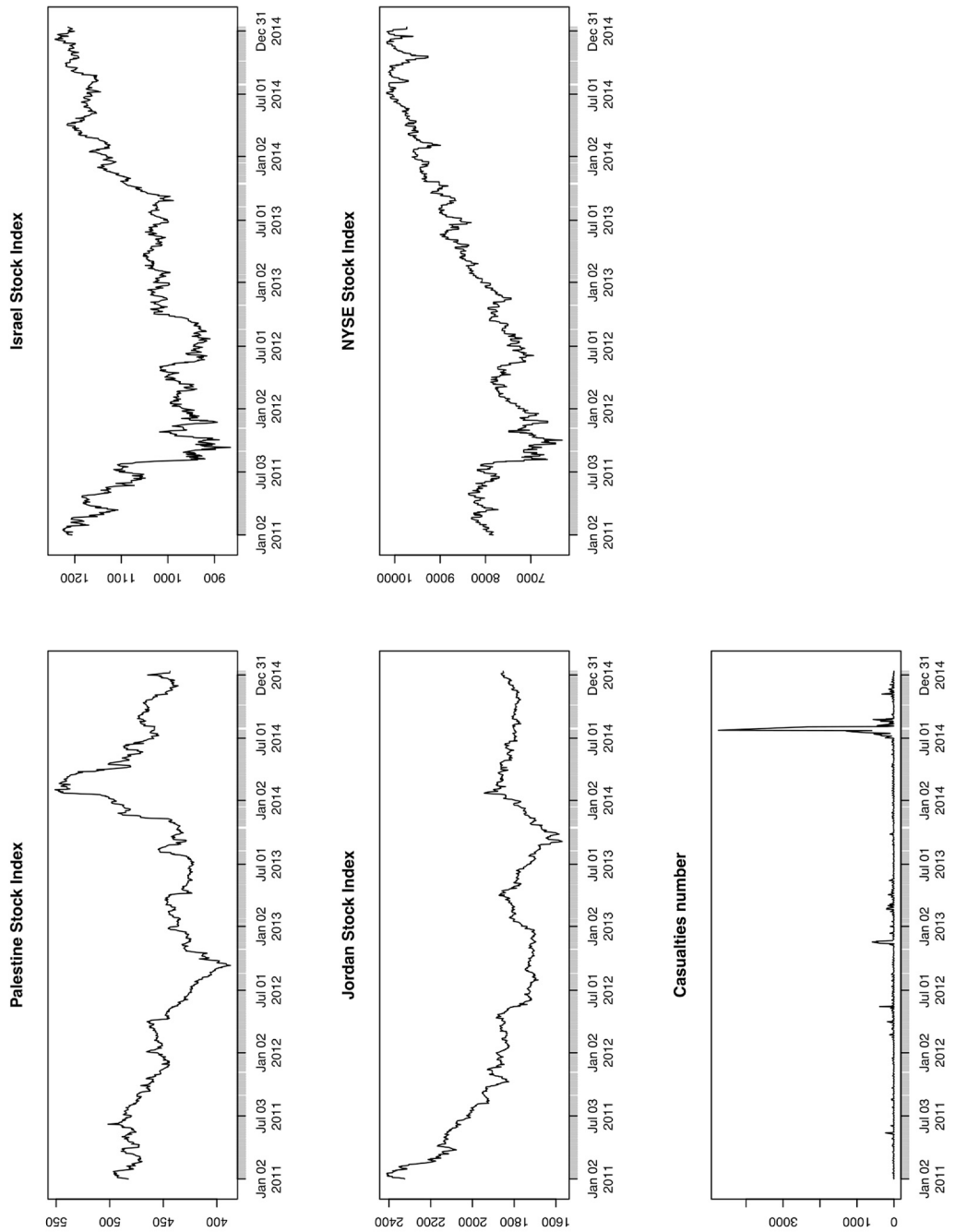
The long-run relationship suggests that both the Palestinian and Jordanian stock markets are positively related to the Israeli market (see Table 2).[5] Specifically, results show that a 1% increase (decrease) in the Israeli stock exchange index will be followed by a 2.2% increase (decrease) in the Palestinian stock market and a 1.69% increase (decrease) in the Jordanian stock market. Hence, results suggest that Palestinian and Israeli markets are more strongly related than Jordanian and Israeli markets. These results are expected as the Palestinian economy is highly dependent on the Israeli economy and its policies toward Palestine. Our result regarding the positive long-run relationship between Palestine and Israel stock markets is compatible with previous research findings (see Suryanto & Abdul-Hadi, 2015). Tests for weak exogeneity with respect to the long-run equilibrium are applied. At the 5% significance level, the Israeli stock exchange is weakly exogenous for long-run parameters, i.e., it does not react to deviations from the long-run relationship. In contrast, weak exogeneity tests suggest that both Palestine and Jordan economies depend on each other and Israel economies. Our analysis is restricted to the most recent period of the conflict, i.e., from 2011 to 2015. As noted above, while we tested for inclusion of the VI as an exogenous variable in the cointegration relationship, our results suggest that the VI does not influence the long-run dynamics between the three indices considered. The impact of the VI is thus restricted to short-run dynamics. This may be caused by the long-lasting nature of the conflict that may have increased the resiliency of the economies considered to changes in the level of violence.

After confirming the presence of cointegration, the VECM-MGARCH is estimated. Results are presented in Table 3.[6] We first focus on the conditional mean model that studies the first moment of stock exchange indices. The error-correction parameter estimates suggest that, while the Palestinian and Jordan stock exchanges adjust to restore the long-run equilibrium when being deviated, the Israeli stock exchange does not. In other words, our findings indicate that only the Palestinian and Jordanian stock exchange indices adjust to deviations from the long-run parity and adjust to the system, with a speed of adjustment on the order of -0.7% and -0.5%, respectively. This result is consistent with the Palestinian economy being strongly dependent on the Israeli and Jordanian economies and with the Palestinian weak financial system. The VI parameters (Δv_t) show the short-run response of stock exchanges to violence and suggest that the Palestinian stock market is the only stock market directly responding to the violence index and is negatively affected by an increase in the violence levels at lags one and two. Our results are consistent with previous literature that has suggested that political instability in Israel due to the Israel - Palestine conflict, does not undermine Israel basic economic developments (Fielding, 2003). Noteworthy is the fact that the effects are only visible in the short-run, which is a sign of the markets quickly discounting the increases in violence. Escalation of violence increases the Palestinian unity and national sentiment, which increases internal demand for Palestinian products. For example, during both the end of 2012 and mid of 2014 Gaza Strip wars, Palestinians boycott of Israeli products reached its peak:

[4] Inclusion of a trend would involve that the long-run equilibrium is characterized by a deterministic diversion among the indices, which does not appear to be the case (Fig. 1) and would not be consistent with the three economies being related.

[5] Hansen and Johansen (1999) test is applied to investigate the constancy of cointegration parameters. Findings suggest constancy of these parameters throughout the period studied.

[6] To determine the optimal number of lags to be used in the conditional mean model, the Akaike Information Criterion (AIC) and Schwartz Bayesian Criterion (SBC) are applied.



Note: The four stock index variables are in real values and non-log form. The casualties number is comprised of the number of injured and fatalities.

Fig. 1. Variables used in the VECM-MGARCH.

Table 1
Unit root test results for the time series used.

Variables	ADF test statistics		KPSS test statistics		PP test statistics	
	Level	First difference	Level	First difference	Level	First difference
Palestine	−1.447	−27.344	2.661	0.121	−1.564	−27.512
Israel	−1.599	−32.869	7.550	0.319	−1.520	−32.937
Jordan	−2.820	−27.715	8.876	0.327	−2.750	−27.686
VI	−17.083		0.459	0.007	−17.158	
NYSE	−1.165	−34.274	15.908	0.073	−1.092	−34.263
5% critical value	−2.865	−2.865	0.463	0.463	−2.865	−2.865
10% critical value	−2.569	−2.569	0.347	0.347	−2.569	−2.569

Note: Each test uses an intercept and no trend. The stock indices are in logarithm form and in real value. VI stands for Violence index and refers to the number of casualties. NYSE is the market stock index of the New York Stock Exchange.

many supermarkets de-shelved Israeli products and replaced them with domestic alternatives. Also, it is the Gaza Strip that has been more strongly hit by the conflict during the study period, while the West Bank, where most of the Palestinian trading companies are located, has been less affected. Our results also suggest that both Israel and Jordan seem to adjust to changes occurring in the international stock markets, through a direct response to NYSE changes. While Israel market responds at lags zero and one, Jordan stock market responds at lag one only and with a smaller magnitude. These findings reflect the role of the United States as a foreign investor in both countries. While by the end of 2009 the United States was in the first position (with a 27% share) in Inward Direct Investment in Israel, it was in the third position as investor in Jordan (with a 8% share) (IMF, 2017).

We now focus on discussing the conditional variance model results. The multivariate portmanteau test statistic (Hosking, 1981) is applied on standardized residuals to check for residual autocorrelations. The null hypothesis is that all autocorrelations and lagged cross correlations are zero up to lag *m*. The test's results provide evidence that the model is correctly specified for different lag orders (see Table 3). Although BEKK-MGARCH parameter estimates cannot be directly interpreted, inferences can be drawn from the nonlinear parameter functions in the conditional variance equations presented in Table 4. Results show that Palestinian stock market volatility (h_{11t}) has a relevant autoregressive component (h_{11t-1}) and is also affected by past volatility in Israel and Jordan stock markets (h_{22t-1} *and* h_{33t-1}). Some of the cross-product error terms are also shown to exert a statistically significant impact ($u_{2,t-1}u_{3,t-1}$) on the Palestinian stock market volatility. This emphasizes the importance of accounting for the three markets when estimating volatility spillovers.

The volatility in Israel market (h_{22t}) is positively affected by its own lagged volatility ($h_{22,t-1}$) and by past volatility in Palestinian and Jordanian markets ($h_{11,t-1}$ and $h_{33,t-1}$). Our model further suggests that international stock exchanges (s_1 *and* s_1^2) directly affect the current instability in the Israel stock market. The current volatility in the Jordan market (h_{33t}) is found to increase with increases in its own lagged volatility, the past instability in Palestinian and Israeli markets as well as with cross-market shocks ($u_{1,t-1}u_{3,t-1}$). The volatility spillover relationships suggested by the above results are not surprising and are due to the linkages as well as the regional proximity among these markets. None of the conditional variance equations shows a statistically significant impact of violence on stock index volatilities. This may be suggestive of quick adjustments in the conditional means, that are not translated to conditional volatilities.

Volatility spillovers between the markets considered suggest that while Palestine stock exchange index has no influence on the first moment of Israel Jordan stock exchange indices, it can cause an increase in the volatility in these markets. Interpretation of the dynamic interrelationships among related variables is best pursued through considering Impulse Response Functions (IRFs). An IRF traces out the

Table 2
Johansen λ_{trace} test for cointegration between Palestine, Israel and Jordan stock market indices and cointegration relationship.

Ho	Ha	λ_{trace}	P-value
$r=0$	$r>0$	66.716	0.019
$r\leq 1$	$r>1$	36.074	0.102
$r\leq 2$	$r>2$	15.947	0.159

Cointegration relationship

$$R_p - 2.173^{**}R_i + 1.381^{**}R_j + 0.607R_{NYSE} - 0.288^{**}D_{JAN14} + 0.521^{**}D_{FEB14} - 6.851 = e_t$$

(0.825) (0.562) (0.599) (0.114) (0.115) (4.551)

Note: r is the cointegration rank. D_{JAN14} and D_{FEB14} are shift dummies and refer to stock level increase during January month and stock level decrease in February month.
** denotes statistical significance at the 5 % level. Standard errors in parenthesis.

Table 3
Palestine, Israel and Jordan MGARCH model: mean and variance equations.

VECM parameters			
	Palestine market equation	Israel market equation	Jordan market equation
$\Delta P_{P,t-1}$	0.108** (0.032)	−0.110 (0.051)	0.103** (0.028)
$\Delta P_{I,t-1}$	−0.007 (0.021)	−0.173** (0.033)	0.005 (0.018)
$\Delta P_{J,t-1}$	0.005 (0.036)	−0.041 (0.057)	0.094** (0.032)
$\Delta P_{P,t-2}$	0.081** (0.032)	0.027 (0.051)	0.006 (0.029)
$\Delta P_{I,t-2}$	−0.018 (0.021)	−0.090** (0.033)	0.007 (0.019)
$\Delta P_{J,t-2}$	−0.001 (0.036)	−0.078 (0.057)	0.045 (0.032)
$\Delta P_{P,t-3}$	0.108** (0.032)	−0.110 (0.051)	0.103** (0.028)
$\Delta P_{I,t-3}$	−0.007 (0.021)	−0.173** (0.033)	0.005 (0.018)
$\Delta P_{J,t-3}$	0.005 (0.036)	−0.041 (0.057)	0.094** (0.032)
Δv_t	−0.016e-04 (0.035e-04)	−0.015e-04 (0.041e-04)	0.009e-04 (0.020e-04)
Δs_t	0.029 (0.017)	0.314** (0.027)	−0.014 (0.015)
Δv_{t-1}	−0.034e-04** (0.001e-05)	−0.026e-04 (0.03e-04)	−0.003e-04 (0.01e-04)
Δs_{t-1}	0.020 (0.018)	0.201** (0.029)	0.047** (0.016)
Δv_{t-2}	−0.035e-04** (0.001e-05)	−0.005e-04 (0.01e-04)	−0.005e-04 (0.02e-04)
Δs_{t-2}	0.010 (0.019)	0.025 (0.030)	0.027 (0.017)
Δv_{t-3}	0.002e-04 (0.03e-04)	0.003e-04 (0.01e-04)	−0.006e-04 (0.01e-04)
Δs_{t-3}	0.004 (0.018)	0.019 (0.029)	0.018 (0.016)
e_{t-1}	−0.007** (0.001)	−0.000 (0.002)	−0.005** (0.001)
GARCH model parameters:			
	$i = 1$	$i = 2$	$i = 3$
c_{1i1}	0.671** (0.077) [a]		
c_{2i1}	0.029 (0.040)	0.073** (0.026)	
c_{3i1}	−0.119 (0.121)	−0.255** (0.111)	−0.126 (0.237)
c_{1i2}	−0.962e-04 (1.865e-04)		
c_{2i2}	0.057e-04 (0.188e-04)	0.219e-04**(0.079e-04)	
c_{3i2}	−0.009e-04 (0.830e-04)	−0.160e-04 (0.350e-04)	0.003e-04 (0.327e-04)
c_{1i3}	2.133 (3.264)		
c_{2i3}	−8.716* (4.138)	−10.507** (3.453)	
c_{3i3}	0.603 (2.742)	4.147 (4.195)	4.397 (8.228)
a_{1i}	0.506 (0.134)	0.020 (0.019)	−0.169 (0.103)
a_{2i}	0.056 (0.050)	−0.066 (0.083)	0.057 (0.063)
a_{3i}	0.093 (0.066)	0.000 (0.028)	0.306** (0.106)
b_{1i}	0.531** (0.121)	−0.035 (0.029)	0.213 (0.142)
b_{2i}	0.020 (0.024)	0.984** (0.008)	0.025 (0.020)
b_{3i}	0.069 (0.056)	0.020 (0.020)	0.836** (0.115)
Hosking's Multivariate Q statistic (p-value)		Lags = 2	0.220 (0.999)
		Lags = 4	17.280 (0.996)
		Lags = 6	33.910 (0.985)

P_P, P_I and P_J = Palestinian, Israeli and Jordanian stock indices, respectively. v_1 = Violence index, s_1 = Stock exchange of New York.
Notes: *(**) denotes statistical significance at the 10(5) percent level.
[a] Number in parentheses are standard errors.

responses of one variable to a shock to another variable in the system (Koop, Pesaran, & Potter, 1996). The response of a variable to a shock over a forecast horizon $k(I_{t+k})$ can be expressed as follows:

$$I_{t+k}(\delta, P_t, P_{t-1}, \ldots) = E[P_{t+k}|P_t = p_t + \delta, P_{t-1} = p_{t-1}, \ldots] - E[P_{t+k}|P_t = p_t, P_{t-1} = p_{t-1}, \ldots] \quad (3)$$

We now derive the IRFs showing the Palestinian adjustments to a shock to the violence index since Jordan and Israel are not directly affected by the conflict. The Palestinian stock exchange response to a positive one standard deviation shock to the violence index is presented in Fig. 2. Compatible with parameter estimates in Table 3, Fig. 2 illustrates that an increase in the degree of violence leads to a decrease in Palestinian stock exchange index. The index decreases quickly following the shock and increases thereafter, with the effect disappearing after about 3 days. Quick adjustments in the stock exchange explains the irrelevant impacts of violence on stock volatility.

5. Conclusion

Understanding stock markets interdependency is important to shed light on the economic interactions between different economies and provides useful information for investors willing to diversify their portfolios. In spite of previous studies examining the interrelationships between Middle East stock markets, no previous research has allowed for the influence of the confrontation between Israel and the Palestinians on stocks performance. This article studies the dynamic relationships and volatility spillovers between the Palestinian stock market and Israeli and Jordanian stock exchange indices over the period 2011–2015. In assessing this link, the influence of the Israel-Palestine conflict is taken into consideration. To the best of our knowledge, no previous study has analyzed the joint relationship among these three markets by explicitly allowing for the degree of violence in the area. A VECM-MGARCH constitutes our

Table 4
Conditional variance equations.

h_{11t} =	0.4650**	$-0.0001v_1$	$0.0000v_1^2$	$2.2134s_1$	$-0.0005v_1s_1$
	(0.090)	(0.046)	(0.000)	(2.426)	(0.0009)
	$80.8839s_1^2$	$0.2561u_{1,t-1}^2$	$0.0032\ u_{2,t-1}^2$	$0.0086\ u_{3,t-1}^2$	$0.0571\ u_{1,t-1}u_{2,t-1}$
	(63.094)	(0.1447)	(0.0062)	(0.0114)	(0.0661)
	$0.0937u_{1,t-1}u_{3,t-1}$	$0.0937^{**}u_{2,t-1}u_{3,t-1}$	$0.2823^{**}h_{11,t-1}$	$0.0004^{**}h_{22,t-1}$	$0.0047^{**}h_{33,t-1}$
	(0.0696)	(0.0142)	(0.0063)	(1.00e-06)	(5.40e-05)
	$0.0214h_{12,t-1}$	$0.0728h_{13,t-1}$	$0.0028\ h_{23,t-1}$		
	(0.0209)	(0.0653)	(0.0026)		
h_{22t} =	0.0702	$1.1000\text{e-}05v_1$	$0.0000v_1^2$	$-3.6388^{**}s_1$	$-5.930\ \text{e-}04v_1s_1$
	(0.0437)	(8.00e-06)	(0.0000)	(1.5152)	(2.80e-04)
	$127.59^{**}s_1^2$	$0.0004u_{1,t-1}^2$	$0.0043u_{2,t-1}^2$	$0.0000u_{3,t-1}^2$	$-0.0026u_{1,t-1}u_{2,t-1}$
	(47.4957)	(0.0009)	(0.0098)	(0.0000)	(0.0043)
	$1.00\text{e-}05u_{1,t-1}u_{3,t-1}$	$-2.80\text{e-}05u_{2,t-1}u_{3,t-1}$	$0.0012^{**}h_{11,t-1}$	$0.9684^{**}h_{22,t-1}$	$0.0004^{**}h_{33,t-1}$
	(0.0010)	(0.0035)	(4.00e-06)	(0.00019)	(1.00e-06)
	$-0.0688h_{12,t-1}$	$-0.0014h_{13,t-1}$	$0.0388h_{23,t-1}$		
	(0.0568)	(0.0024)	(0.039)		
h_{33t} =	0.0159	$-0.000v_1$	$0.000v_1^2$	$-1.1104s_1$	$-3.00\text{e-}06v_1s_1$
	(0.0482)	(0.000)	(0.000)	(2.1258)	(2.00e-04)
	$19.3310s_1^2$	$0.0286u_{1,t-1}^2$	$0.0032u_{2,t-1}^2$	$0.0939u_{3,t-1}^2$	$-0.0191u_{1,t-1}u_{2,t-1}$
	(53.722)	(0.0371)	(0.0069)	(0.0680)	(0.0292)
	$-0.1037^{**}u_{1,t-1}u_{3,t-1}$	$0.0346u_{2,t-1}u_{3,t-1}$	$0.0454^{**}h_{11,t-1}$	$6.030\text{e-}03^{**}h_{22,t-1}$	$0.6991^{**}h_{33,t-1}$
	(0.0307)	(0.0463)	(0.0043)	(1.00e-06)	(0.0414)
	$0.0105h_{12,t-1}$	$0.3565h_{13,t-1}$	$-0.0102h_{23,t-1}$		
	(0.0132)	(0.2131)	(0.0396)		

*(**) denotes statistical significance at the 10(5) percent level. Standard errors are in parentheses.
h_{11} = Palestinian stock exchange index variance, h_{22} = Israeli stock exchange index variance, h_{22} = Jordanian stock exchange index variance, v_1 = Violence index, s_1 = Stock exchange of New York, u_1 = Palestine market shocks, u_2 = Israel market shocks, u_3 = Jordan market shocks.

methodological approach.

The cointegration analysis between the three markets shows that the Palestinian and Jordanian stock exchange indices are positively related to the Israeli stock exchange index. Hence, Palestinian and Jordan stock quotations benefit from improvements in Israel firm performance in the long-run. Our results further suggest that Palestinian and Israeli markets have a tighter long-run link than Jordanian and Israeli markets. The estimated VECM-MGARCH model provides evidence that both Palestine and Jordan stock exchanges adjust to deviations from the long-run equilibrium relationship. Results further suggest that the level of tension between Palestine and Israel has a negative short-run impact in Palestine stock markets. No long-run impact of conflict on stock exchange performance is identified. The second moment of the stock exchange indices is not seen to change with the degree of violence either, which implies that new expectations are quickly incorporated into stock indices' levels.

In short, while the conflict has relevant impacts on the population, the long-run performance of the most relevant Palestinian firms depends mainly on the economic performance of neighboring countries, especially Israel. The impacts of conflict on stock exchanges are relegated to short-run adjustments that fade away quickly and that are negative for Palestine.

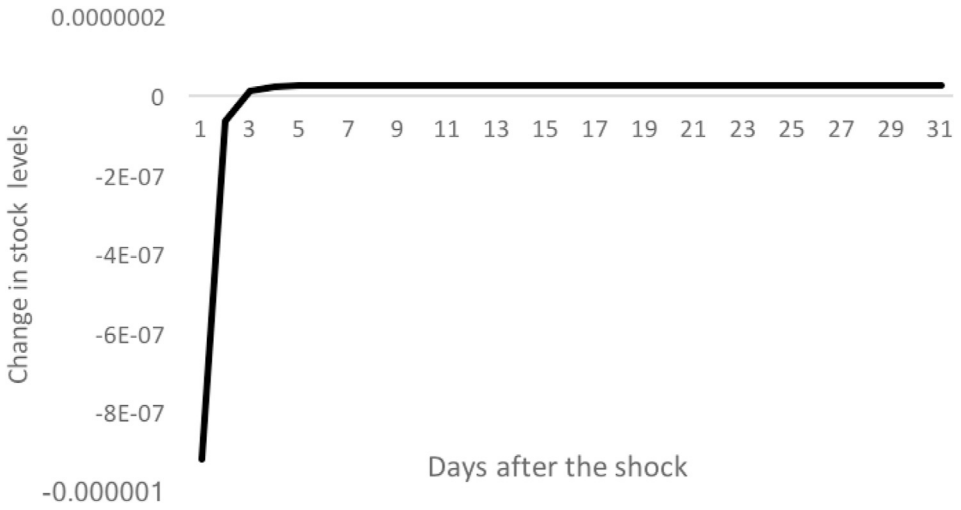


Fig. 2. Palestine stock exchange index-level response to a positive one-standard-deviation shock to the violence index.

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