

Integration of Financial Markets: A Study of Egypt and Palestine Stock Markets

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Abstract

The objective of this study is to determine the existence of equilibrium and dynamic relations between Egyptian Stock Exchange (EGX) and Palestine Stock Exchange (PEX). Utilising the framework of international trade theories, this paper employs the Engle-Granger Co-integration (1987) procedure as an estimation model on monthly time series data from February 1998 to April 2012. Results indicate that there is a significant equilibrium nexus between EGX and PEX but no empirical evidence was found on the existence of dynamic relations between them via Granger Causality tests. However, analysis of dynamic interactions of the post-sample period by means of Impulse-Response Functions and Variance Decomposition indicate sensitivity in EGX towards changes in PEX.

Keywords: PEX, EGX, co-integration procedure, granger causality, stock market

1. Introduction

1.1 Palestine and Egypt

Palestine is closely related to both Egypt and Jordan due to having common borders and historical significance. These countries had shared economic resources and cultural values for many decades. As an aftermath of the Israeli occupation of Palestinian territories in 1948 and subsequently in 1967, many Palestinians were expelled from their own country and took refuge in various countries.

Today, the Palestinian population is geographically divided and made up into four groups: 6 million Palestinians live outside Palestine, 3 million in West Bank, nearly 1.7 million in Gaza and 1.5 million in Israel itself. Free movement of commodities and trade relations are lacking among the four groups. Transfer of funds is restricted by the Israeli rules, and there is neither an airport nor a seaport in the state of Palestine. While the economy of Gaza heavily depends on Egypt especially after the Israeli siege in 2006, international trade restrictions were imposed by Israel on Palestine since 1945 and only 29% of Palestinian imports come from Egypt and Jordan. Meanwhile, 95% of Palestine exports go to Israel and some 3% to Egypt and Jordan; the little remnant goes to the rest of the world (Ministry of National Economy, 2005). Some informal sources stated that about \$1.5 billion value of trade between Gaza and Egypt in 2011 was done mainly through the underground tunnels.

Due to limitations in investment opportunities within Palestine, savings are invested outside of Palestine, especially in Egypt and Jordan. El-Eqtasadia (2012) showed that 75% of total deposits in Palestinian banks were invested overseas and with the remaining 25% invested locally. This large percentage indicated that the country lacked investment opportunities and had to rely on the markets of Egypt and Jordan, especially their stock markets. Common culture, history, language, religion and kinship also facilitated personal interactions among the people and encouraged investments. This demographic patterns reinforced the trade relations, tourism, labor mobility and investment flows amongst these countries.

It is a general belief that many equity financial market participants prefer to invest in other countries rather than in their neighboring countries in order to enjoy an effective diversification effect. This notion was opposed by Arshanapalli and Doukas (1993), Sheng and Tu (2000), and Izquierdo and Lafuente (2004) who postulated that the recent financial turmoil globally is attributed to the mutual dependency of world financial markets. There are times when the effectiveness of cross-border diversification is disputed by fund managers. For this reason, regional portfolio investment

among neighboring countries is still a valid strategy in maximizing portfolio returns.

This paper looks at the financial market integration of the stock markets of Egypt and Palestine with emphasis on the trends in portfolio investment. Sample data is the monthly stock market indices obtained from the World Federation of Exchanges spanning from February 1998 till April 2012.

1.2 Egypt Stock Market (EGX)

The Egyptian stock market was established in the late 1880s, and it comprised both Alexandria and Cairo Stock Exchanges. During the period from 1888-1958, the stock exchange trade had been growing rapidly and at one point was ranked the fifth largest (in terms of market capitalization) in the world until Egyptian government put some restrictions on its trading activities in 1959 (Mohie and Sourial, 2000). Like any other financial markets around the world, Egyptian stock exchange has gone through some reforms which led to the consolidation of both Alexandria and Cairo stock exchanges. In 2009, Egyptian Capital Market Authority was replaced by Egyptian Financial Supervisory Authority which assumes the functions as both regulatory and governing body. Since that moment, the Egyptian stock market had made its peak in 2009, registering transaction value of 91.2 billion Egyptian dollars (Hassan, 2009).

At present, Egyptian Exchange (EGX) is the only registered stock market in Egypt. The Exchange has two trading locations – in Cairo and in Alexandria. The stock market performance of the Egyptian bourse is indicated by the EGX30 Index and as at the 1st Jan 1998, EGX's base value was 1000 points. In the North African region, the Egyptian Exchange is the first stock market whose index reflects the market movement in price and value of transaction. In terms of informational efficiency, the Egyptian stock market is found to be in weak form (Hassan, Seyed and Mark, 2004). Another study by Daniel in 2005 on African stock markets indicates a similar result.

1.3 Palestine Stock Market (PEX)

PEX started its first trading session on 18 February 1997, and by February 2010, it was converted into a public company in conformance to principles of good governance and rules of transparency. According to the Arab and international classification of financial markets, the Palestinian exchange attained advanced status in 2009; As of November 2012, a total of 48 companies was listed on the Palestinian exchange, with a market value of \$2.7 billion while it was \$2.45, 2.375, 2.123 billion in 2010, 2009, 2008. Palestinian-listed corporations are mainly involved in the five sectors of banking, insurance, investment, industry, and services.

The PEX is an emerging capital market as most of studies confirm, (Daraghma, (2010); Abu- Rub and Abu- Sharba, 2010). These studies describe the nexus between availability of information and its nexus with the share prices; some of them indicate PEX is efficient in the weak-form. The research of Zoa'rob (2005) and Abusharbeh (2009) showed that volatility of the PEX may be attributed to the lack of information efficiency.

Studies of the trends in stock prices of the past ten years indicate that movements are usually identified by sharp fluctuation in the indices' value from the year 2005 through to 2006 (Abdelkarim, (2007)); while from the year 2007 until 2010, the volatility and prices reversed from their normal trend, based on the study by Abu-Rub and Abu-Sharba (2010). The efficiency of markets and the strength of corporate governance remained the concern of financial market participants and regulators. It was widely recognized that these issues have negative effects on fair pricing of stocks which impaired confidence in the PEX as an outcome.

From 2006, the PSE, similar to other Arab markets, went through severe price corrections, which led to losses of up to 60% of its market capitalization; which was further aggravated by the Global Financial Crisis as reported in the study by Abdelkarim and Ijbara (2010).

Abdelkarim et. al. (2009) researched on stock market efficiency, with results pointing towards the timeliness and relevance of financial and non-financial information being important for both pricing efficiency and works to instill confidence in the financial markets. The study also supported the notion of financial market participants in having their own opinions and decisions on stock valuation. It is the desire to reach an efficient stock market that regulators continue to have concerns over the adequacy of disclosure requirements and easy access of these information.

The state of the Palestinian economy is considered unique in comparison with other markets in the region in the sense that there are severe scarcity of resources and limited financial capabilities of small and medium family enterprises. As such, there is a need for capital markets that are efficient to help lure foreign capital which can be used to help grow the economy through the provision of capital to these enterprises. The Al-Quds Index (QI) is a weighted index comprising the stocks of 12 listed companies from various sectors in PEX, which gives financial market participants a general idea about the direction and performance of the market and has been in use since 1997.

1.4 Objective

This research has the objective to examine the directional nexus between PEX and EGX, and to determine the relative strength of the nexus between the two stock exchanges. This is inspired by the well-known phenomena that in its

neighboring countries a strong economy enhances economic growth in one or more of the economies in the region. In the Middle Eastern Arab countries, Egypt and Jordan have been playing very important roles in the Palestinian economy and Palestine capital markets. This study attempts to establish useful information to local financial market participants and also to the prospective financial market participants into Palestine stock exchange. It utilizes econometric time series analysis such as the Engle-Granger (1997) co-integration approach, for building a predictive model on both the stock markets. Hadi et. al. (2009) employed similar methodology in examining market integration related to fossil fuel. The following are the research questions that the study will attempt to answer:

- a) Is the performance of PEX affected by the movement in EGX index over time?
- b) Is there a causality effect that exists between PEX and EGX?
- c) Is there a theoretical support for EGX to be the leading indicator between the two stock exchanges?

2. Data and Methodology

The vector auto-regressive (VAR) model and Granger-Causality test are primary methodologies utilised in examining the long-term equilibrium and short-run relations of both PEX and EGX. In Chart 1 below, the co-movements over a period of time of these two market indices are presented. PEX performance is represented by the Al-Quds Index and EGX performance is represented by the EGX30 Index. The method used by Lance and James (2006) was applied to explore theoretical nexus of the two market indices.

The stationarity tests were first applied to the time series data (via Augmented Dickey-Fuller tests), then followed by the Engle-Granger co-integration technique was used, and finally, Granger causality test (within sample) was employed for determining the existence of short-run nexus of the selected variables.

Monthly data were obtained for both market indices for the period covering January 1998 to April 2012 which involves 169 data points. The Engle-Granger Co-integration test was applied to explore the nexus between PEX and EGX. This statistical test originated from Granger and Weiss (1981), which was subsequently reformed by Granger (1986), Granger and Weiss (1983) and Engle and Granger (1987). This econometric technique was met with wide acceptability among researchers who employed it in testing the validity of numerous theories and models. In fact co-integration is in essence a common econometric technique to determine the correlation between time series which are not stationary. Both variables are considered to be co-integrated when a linear combination of them is stationary, although each one of them is non-stationary when examined in isolation. Such an unexpected state was proven to exist by Engle and Granger (1987). Based on Granger (1981) and Engle and Granger (1987), components in vector Y_t are co-integrated at d, b degree if :

- i) All components of Y_t is $I(d)$
- ii) There is a non-zero vector $\beta = (\beta_1, \beta_2, \dots, \beta_n)$ in order for the linear combination of $\beta Y_t = \beta_1 Y_{1t} + \beta_2 Y_{2t} + \dots + \beta_n Y_{nt}$ to be co-integrated at $(d-b)$ degree where $b > 0$. The vector β is the co-integration vector.

First (or higher) differentiated data are necessary in tackling the non-stationarity issue in data series. But, one should be aware of the fact that using this methodology may result in a loss of data points on the time-series data. In fact when there is an equilibrium nexus of these variables, as Engle and Granger (1987) had argued, the disequilibrium error should fluctuate around zero *or equivalently* the error terms should be stationary. Hence, unit root test is vital to apply in determining the stationarity of the given time series. The unit root test determines whether the variables have tendency to return to its long term trend after a shock (*i.e.* being stationary) or whether they exhibit random walk, (having unit root in other words). This test has to be applied before further tests could be done. This paper utilizes the Augmented Dickey Fuller methodology in dealing with the unit root problem which is formulated as below:

$$\Delta Y_t = \lambda_0 + \lambda_1 T + \lambda_2 Y_{t-1} + \sum_{i=1}^k \lambda_i \Delta Y_{t-i} + \varepsilon_t \text{ where } i = 1, 2, 3 \dots k \quad (1)$$

The tested hypothesis is:

$H_0: \lambda_2 = 0$ (data has unit root and is not stationary)

$H_1: \lambda_2 < 0$ (data has no unit root and is stationary)

A time series that appear stationary at first-differenced are considered as co-integrated. Subsequently, the Vector Error Correction Model (VECM) technique, which is a restricted VAR technique which restricts the long-run behavior of endogenous variables to converge to its co-integrating nexus, could be engaged. Additionally, it also permits short-term adjustments of the selected variables. Below is a representation of the VECM:

$$\Delta Y_t = \mu_1 + \sum_{i=1}^n A_i \Delta Y_{t-i} + \sum_{i=1}^n \xi_i \Theta_{t-i} + v_t \quad (2)$$

where:

Y_t is in the form of $n \times 1$ vector

A_i and ξ_i being the estimated parameters

v_t is the error correction term that explains unanticipated movements in Z_t and Θ

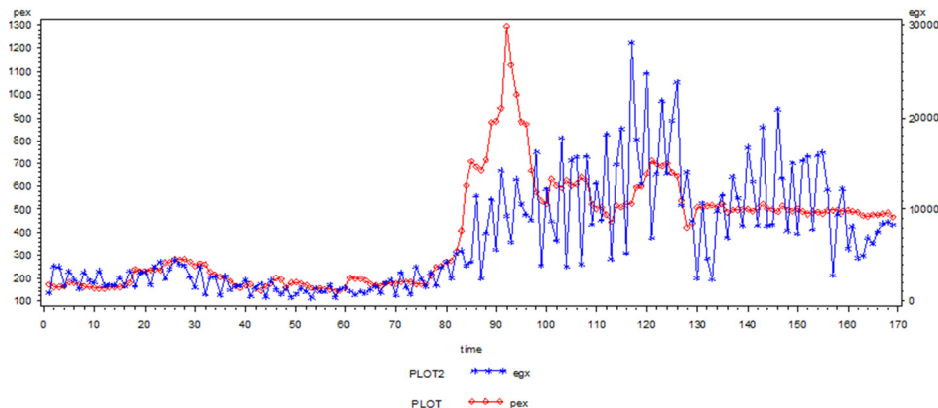


Chart 1. Movements of PEX and EGX

This VECM technique allows for the separation of short-term relationships from the long-term. The Ordinary Least Square Method (OLS) is employed as regression analysis with some fundamental assumptions that would be taken into consideration in answering the validity of the statistical results. The diagnostic tests employed comprise the ADF unit root test, moments of specification test (White test), Durbin-Watson test, Anderson-Darling test and variance decomposition test were also used. In establishing the directional nexus between PEX and EGX, this paper assumes only one direction of causality where EGX affects PEX. As a rule of thumb, a new stock exchange like PEX is affected by a long established one like the Egyptian stock exchange. The model adopted by this paper has the following expression:

$$PEX_t = \beta_0 + \beta_1 EGX_t + \varepsilon_t \tag{3}$$

where:

ε_t = Error Terms

3. Results

3.1 Diagnostic Tests

For determining effects produced by changes in EGX index on PEX, econometric tests were applied. Table 1 and Table 2 provides results showing both PEX and EGX being non-stationary at every lag, while, the results in Table 3 and Table 4 demonstrated that the first-differenced PEX and EGX series were stationary at all lags. This research found that both PSE and EGX are integrated at first-differenced at least. Hence, the prerequisite requirement for utilizing the Engel-Granger co-integration test is fulfilled.

Table 1. Unit Root Test on PEX at Level

H_0 : Data are non-stationary (there is unit root)

H_1 : Data are stationary (there is no unit root)

Type	Lags	p-value	Tau
ZERO MEAN	1	0.4452	-0.63
	2	0.4535	-0.61
	3	0.3836	-0.77
	4	0.3587	-0.82
	5	0.4428	-0.63
SINGLE MEAN	1	0.3139	-1.94
	2	0.3245	-1.92
	3	0.2137	-2.18
	4	0.1940	-2.24
	5	0.2975	-1.97
TREND	1	0.4744	-2.22
	2	0.4859	-2.20
	3	0.2819	-2.6
	4	0.2154	-2.76
	5	0.4025	-2.35

Table 2. Unit Root Test on EGX at Level

H₀: Data are non-stationary (there is unit root)H₁: Data are stationary (there is no unit root)

Type	Lags	p-value	Tau
	1	0.0443	-2.00
ZERO	2	0.4273	-0.67
MEAN	3	0.3613	-0.82
	4	0.3798	-0.78
	5	0.4218	-0.68
	1	0.0104	-3.46
SINGLE	2	0.5085	-1.55
MEAN	3	0.4035	-1.75
	4	0.4166	-1.73
	5	0.4725	-1.62
	1	0.0003	-5.04
TREND	2	0.5382	-2.11
	3	0.3394	-2.48
	4	0.3675	-2.42
	5	0.4775	-2.22

Table 3. Unit Root Test on PEX at First-Differenced

H₀: Data are non-stationary (there is unit root)H₁: Data are stationary (there is no unit root)

Type	Lags	p-value	Tau
	1	<0.0001	-8.20
ZERO	2	<0.0001	-5.98
MEAN	3	<0.0001	-5.20
	4	<0.0001	-5.58
	5	<0.0001	-5.44
	1	<0.0001	-8.19
SINGLE	2	<0.0001	-5.97
MEAN	3	<0.0001	-5.19
	4	<0.0001	-5.58
	5	<0.0001	-5.44
	1	<0.0001	-8.18
TREND	2	<0.0001	-5.97
	3	0.0002	-5.18
	4	<0.0001	-5.57
	5	<0.0001	-5.44

Table 4. Unit Root Test on EGX at First-Differenced

H₀: Data are non-stationary (there is unit root)H₁: Data are stationary (there is no unit root)

Type	Lags	p-value	Tau
	1	<0.0001	-26.53
ZERO	2	<0.0001	-10.06
MEAN	3	<0.0001	-8.07
	4	<0.0001	-7.34
	5	<0.0001	-6.90
	1	<0.0001	-26.47
SINGLE	2	<0.0001	-10.04
MEAN	3	<0.0001	-8.06
	4	<0.0001	-7.33
	5	<0.0001	-6.89
	1	<0.0001	-26.39
TREND	2	<0.0001	-10.01
	3	<0.0001	-8.03
	4	<0.0001	-7.31
	5	<0.0001	-6.88

Having fulfilled the prerequisites, long-run regression is performed on the PEX and EGX data series using the model specification. Table 5 illustrates the results of the regression analysis supporting the rejection of the null hypothesis and suggesting the existence of significantly positive nexus between PEX and EGX. Table 6 and Table 7 show the descriptive statistics and the correlation matrix of the two market indices respectively, clearly demonstrating high

correlation amongst PEX and EGX. For the OLS estimation to be validated statistically, it was suggested that the long-run residuals has to be stationary (Engle and Granger, 1987). Hence, unit root tests are applied on the long-run residuals with results given in Table 8, which shows long-run residuals (r) being stationary at all lags. Here, two important results are pointed out: (1) as the long-run residuals are proven stationary, the PEX and EGX are considered co-integrated, and (2) PEX and EGX being co-integrated, the VECM is applied.

Table 5. Long-Run Regression Analysis (PEX = dependent variable)

H_0 : No long-term nexus between PEX and EGX

H_1 : Long-term nexus between PEX and EGX

Variable	Parameter Estimate	Standard Error	t-Value
Intercept	231.4533	19.66420	11.77*
EGX	+0.02459	0.00220	11.16*

* Significant at 5% level

Table 6. Descriptive Statistics

Variable	N	Mean	Std Dev	Minimum	Maximum
PEX	169	394.4641	225.4218	143.51	1295.08
EGX	169	6629.86	5991.95	345.00	28103.00

Table 7. Pearson Correlation Table (n = 169)

	PEX	EGX
PEX	1.00000	0.65356 < 0.0001
EGX	0.65356 < 0.0001	1.00000

Table 8. Stationarity Test for Long-Run Residuals (r)

H_0 : Residuals possess unit root (non-stationary)

H_1 : Residuals do not possess unit root (stationary)

Type	Lags	p-value	Tau
	0	<0.0001	-6.22
ZERO	1	0.0004	-3.62
MEAN	2	0.0276	-2.19
	3	0.0027	-3.02
	4	<0.0057	-2.78
	5	<0.0058	-2.77

3.2 VECM

By employing VECM, the PEX and EGX variables of the model were estimated where the long-term and short-term responses of the two tested variables were examined. Akaike Information Criterion (AIC) results showed that the optimum lag-length for the tested model lies at lag 2 (low AIC value are preferred). The relevant results are tabulated in Table 9.

Table 9. Vector Error Correction Model at Lag 2

Dependent Variable : dPEX				
Variables	Parameter	Standard Error	t-Value	P-Value
Intercept	1.3466	3.7647	0.36	0.7210
LdPEX	0.2407	0.0760	3.17	0.0018
Lr	-0.0474	0.0244	-1.94	0.0540
LdEGX	0.000912	0.000739	1.23	0.2193

Note: 1. dpex is first difference in PEX, ldpex is lag 1 of first difference in PEX

2. lr is lag 1 residual and ldeGX is lag 1 of first difference in EGX.

The lr is a lag 1 residual derived from VECM(2). Results supports the existence of long-term or equilibrium nexus

between PEX and EGX. A statistically significant equilibrium relation between PEX and EGX indices exist as observed by *lr's p* value in Table 9. Given *lr's* parameter value of 0.1053, this figure shows approximately 10.53% speed of adjustment towards equilibrium made by PEX in the equation. This adjustment is relatively swift and it could be ascribed to the market integration between the PEX and EGX as expected from many financial market participants. In theory, a higher speed of adjustment is preferred due to the reason that a statistically reliable endogenous variable ought to reflect high speed in its long-run adjustment to equilibrium.

Table 10. Granger Causality Test

Source	DF	F-Value	Pr > F
Numerator	2	1.34	0.2646
Denominator	160		

These significant positive nexus between PEX and EGX is applied by the positive parameter value of EGX (+0.0028) provided in Table 5. This shows that both PEX and EGX are positively correlated. The existence of long-term significant nexus between the two exchange markets are significant, the presence of a short-term relationship between the exchanges. Therefore, Granger-Causality test is conducted with results shown in Table 10 above. According to the F-value reported, the null hypothesis is accepted, which suggests non-existence of short-term nexus between the two exchange markets. In ensuring that the OLS assumptions hold, diagnostic tests are carried out on the tested model.

3.3 LM Tests for ARCH Disturbances

In order to examine constant variance of the error terms, LM ARCH test is applied. Results are tabulated in Table 11 supports the rejection of H_0 at 5% significance level that happens at order 11, which indicates that the residuals are homoscedastic and operating at constant variance.

Table 11. LM Tests for ARCH Disturbances

H_0 : Homoscedastic (Constant variance in ϵ_t)

H_1 : Heteroscedastic (Inconstant variance in ϵ_t)

Order	LM	Pr > LM
1	11.5796	0.0007
2	12.7644	0.0017
3	12.9379	0.0048
4	21.1685	0.0003
5	26.3552	< 0.0001
6	26.4306	0.0002
7	27.3811	0.0003
8	28.3523	0.0004
9	28.3969	0.0008
10	28.5286	0.0015
11	31.6470	0.0009
12	34.1780	0.0006

3.4 Normality Tests

Normality test on the distribution of error terms are applied before making any statistical inference. The test statistics explored by the study for normality depend on the distribution function involving the Kolmogorov-Smirnov, Cramer-von Mises, and Anderson-Darling statistics.

Table 12. Test of Normality

Variable: Short-run residuals			
Test		Statistic	P-Value
Shapiro-Wilk	W	0.933015	<0.0001
Kolmogorov-Smirnov	D	0.162904	<0.0100
Cramer-von Mises	W-Sq	.888047	<0.0050
Anderson-Darling	A-Sq	4.261113	<0.0050

The null hypothesis states the short-term residuals are normally distributed.

The results are summarized in table 12, showing that the error terms from ECM (2) do not possess normal distribution (based on the significant p-values) for all the applied test statistics. Such results do not detract from the whole picture, considering the preliminary nature of this study.

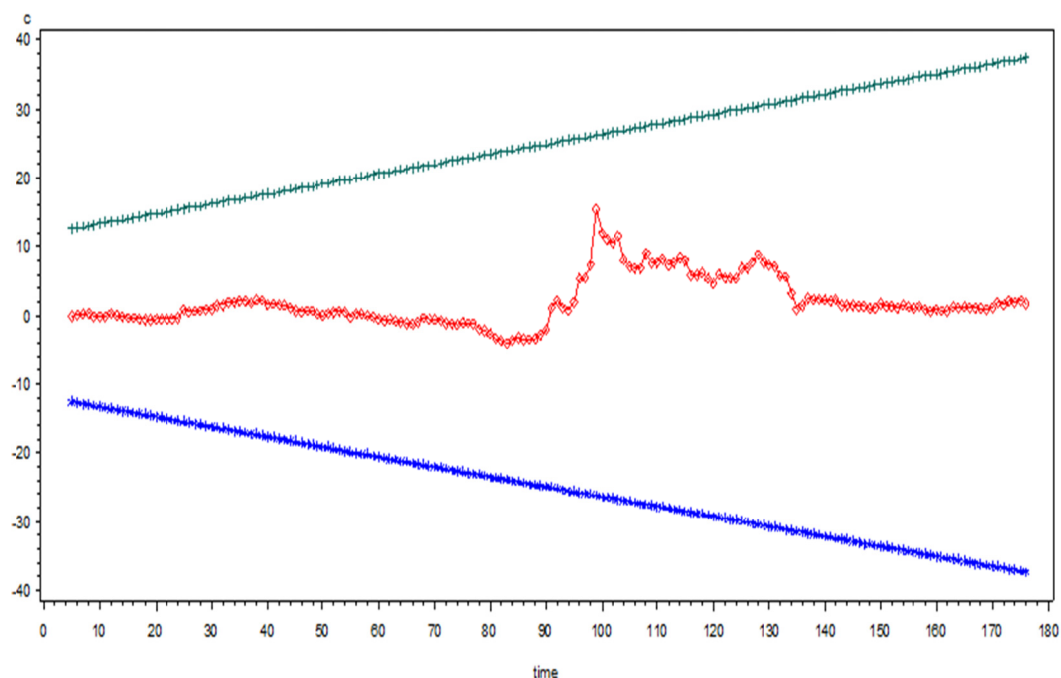
3.5 Autocorrelation Test

In ensuring all residuals are independent of one another, autocorrelation test is applied to determine the existence of serial correlation amongst the short-term residuals. Durbin-Watson test results exhibited in Table 13 support the absence of autocorrelation amongst the residuals.

Table 13. Autocorrelation Test (Ljung-Box Test)

Dependent Variable: dPEX	
To Lag	Pr > ChiSq
6	0.0806
12	0.0063
18	0.0022

No serial correlation or autocorrelation exists



The cumulative sum of residual (CUSUM) analysis is an important tool in econometric modeling where it is employed to tackle issues with diagnostics relating to parameter instability. From Chart 2 above representing CUSUM analysis, existence of parameter stability (both long-run and short-run) is confirmed, the short-run residuals lying within the lower and upper boundaries. In summary, the predictive model developed from this study can be considered credible since no major diagnostic shortcoming were met in the tested model.

4. Discussion

The empirical findings from this study have proved that both PEX and EGX are co-integrated. However, there is no significant short-term dynamic between the two markets indices as shown by Granger Causality test. Tests of dynamic interactions over the post-sample period indicated that PEX is the most endogenous of all. This is in line with our earlier expectation that performance of PEX would depend upon the movements in EGX. It is quite reasonable to argue the importance of an economic indicator such as market index in explaining the direction of an economic growth. Having known the equilibrium nexus between PEX and EGX, policy makers should devise an effective approach in rejuvenating economic activities. Similarly, stock traders and value financial market participants should use this piece of information to arrive at a trading strategy which is able to protect the value of their investment portfolio. The CUSUM analysis shown in Chart 2 suggests that both short-run and long-run parameters are stable over the time series.

This paper established that the Arab nations, in particular the neighboring Egypt, play crucial roles in supporting the growth of Palestinian economy as the EGX has spillover effect on the Palestinian economy. The results attained from

this paper clearly show the mutual benefits derived from international trade and portfolio investment involving the two countries. In particular, economic prosperity in Egypt will undoubtedly help boost Palestinian economy as the two countries share national borders, resources, language, culture and relatively same market structure. Moreover, the economic systems in Egypt and Palestine are mostly based on market economy with little government intervention. Hence, regional economic cooperation has to be improved between the two countries, which in turn help sustain long term economic growth.

The results from diagnostic tests are free from major drawbacks and support the adoption of the suggested estimation model in the study. Interestingly, the empirical results are also consistent with earlier studies. In a nutshell, the evidence presented here confirms the intuition (and also empirical evidence) that performances of regional stock markets are mutually dependent. It is strongly recommended that future research should incorporate other regional markets such as Turkey and Israel. The study urges both Palestinian and Egyptian governments to review their respective foreign policy and emphasize on beefing up bilateral trades among themselves. The fact that business globalization is inevitable, devising an effective and dynamic policy is of utmost importance in maintaining regional economic prosperity in Middle East.

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