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# Financial Market Theory of Development – Evidence from Palestine and Israeli Stock Exchanges

(*Teori Pembangunan Pasaran Kewangan – Bukti daripada Pasaran Saham Palestine dan Israel*)

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*ABSTRACT*

*This study is compelled by the motivation to find out potential equilibrium and dynamic relationships involving two neighboring stock exchanges - Palestine Stock Exchange (PEX) and Tel Aviv Stock Exchange (TASE). Based upon Financial Market Theory of Development, we attempt to explore the degree of integration between the two exchanges using Engle-Granger Cointegration procedures (1987). Data were collected on monthly basis over sample period from January 1998 till February 2012. The empirical results from bivariate Error Correction Model (ECM) reveal a statistically significant long-term relation between the two exchanges. However, the results from Granger Causality tests indicate absence of short-term relationships between them. To unveil Granger Causality in a dynamic context, we use out-of-sample testing via Impulse-Response Functions (IRF) and Variance Decompositions (VDC.) Interestingly, both tests show that performance of TASE does affect its archrival.*

*Keywords: Al-Quds index; Tel Aviv - 100 index; financial market theory of development; bivariate error correction model*

*ABSTRAK*

*Kajian ini menjurus kepada keinginan mencari potensi keseimbangan dan hubungan dinamik di antara dua pasaran saham berjiran di rantau bergolak – Palestine Stock Exchange (PEX) dan Tel Aviv Stock Exchange (TASE). Berdasarkan kepada Teori Pembangunan Pasaran Kewangan, analisa kadar integrasi ke atas kedua-dua pasaran saham dibuat menggunakan ujian kointegrasi Engle-Granger (1987). Data bulanan dikumpul dari Januari 1998 sehingga Februari 2012. Keputusan empirikal daripada analisa Bivariate Model Pembetulan Ralat menunjukkan wujud hubungan signifikan jangka panjang di antara kedua-dua pasaran saham. Walau bagaimanapun, ujian kesan-akibat Granger menunjukkan tiada hubungan jangka pendek yang signifikan. Ujian-ujian ex-post seterusnya menunjukkan bahawa prestasi TASE mempengaruhi pasaran saham Palestine.*

*Kata kunci: Indeks al-Quds, Tel Aviv – 100 indeks; teori pembangunan pasaran kewangan; bivariate model pembetulan ralat*

## INTRODUCTION

Territorial disputes involving Palestine, Israel, Egypt and Jordan have drawn worldwide attention since the formation of Israel in 1948. Although the four neighboring countries have a long shared history, they seem to have relentless disagreement over political and economic issues ever since. Subsequent to Israeli occupation of Palestinian territories in 1948 and in 1967, it was estimated that some 250,000 Palestinian Arabs were expelled out of their home or fled and reside in neighboring countries, particularly in Egypt and Jordan.

Looking at the current distribution of Palestinian Arabs, they are now divided geographically into four major groups; 6 million are reported living outside Palestine, 3 million in West Bank, about 1.7 million in Gaza and some 1.5 million in Israel itself. Movement of goods or commodities and trade activities are somewhat restricted among the four groups. Transfer of funds is strictly monitored by the Israeli monetary authorities, and there is neither an airport nor a seaport in the state of Palestine. The economy of Gaza today depends heavily on Egypt, especially after the Israeli siege in 2006. Since 1945, the international trade activities in Palestine has been reduced and controlled by Israel and only 29% of Palestinian imports come from Egypt and Jordan. Meanwhile, 95% of Palestine exports go to Israel and some 3% find their ways to Egypt and Jordan. The remaining 2% goes to the rest of the world (Ministry of National Economy 2005). Due to this stringent border surveillance, some informal sources quoted that approximately $1.5 billion value of trade between Gaza and Egypt in 2011 was done mainly through the underground tunnels connecting the two countries.

Following limited investment opportunities in Palestine, most of the domestic savings are channeled into

foreign financial markets, especially in Egypt and Jordan. A recent study reveals that 75% of the six billion worth of deposits in the banks in Palestine are invested overseas and just 25% are invested domestically (Mohammad 2012). The high percentages of these savings are invested in neighboring countries, particularly in Egypt, Jordan and Israel. Common culture, history, language, religion and kinship facilitate personal interactions among the people in the region. This demographic aspect reinforces the trade relations, investment, labor mobility and tourism.

The Palestinian economy is laden with limited resources and poorly funded small and medium family enterprises (SMEs). As such, the need for an efficient financial system is deemed important to support the business and economic growth. An efficient stock market is able to channel productive funds from surplus economic units to the deficit units, which in turn help create sustainable economic activities.

This study looks into economic and geopolitical scenarios in Palestine. Palestine is indeed a capital-deprived developing country that needs private capitals to develop its economy. Singh (1997) explains the importance of an efficient stock market in promoting financial liberalization and economic development for a low-income country. In this respect, Financial Market Theory of Development is put up as the underlying theory for this study. This theory suggests that financial markets could help improve economic growth because the market mechanism or the price system sends signals to market players to make informed business decisions. This system promotes risk-return matching and promotes allocative and informational efficiency in the long run. Hamid and Agarwal (2001) highlight the significance contribution of stock market in helping sustainable economic growth for developing countries. They explain that businesses in low-income countries are able to gain access to private capital from developed countries through the mechanism of the stock market.

Numerous studies have indicated that equity investors or stock traders prefer to invest in other countries rather than in their home countries in order to exploit an effective portfolio diversification effect. Yet this notion is opposed by Arshanapalli and Doukas (1993), Sheng and Tu (2000) and Izquierdo and Lafuente (2004). They argue that the recent global economic slowdown was attributed to the mutual dependency on worldwide financial markets. There are times when the effectiveness of cross-border diversification is mitigated. For this reason, inward foreign direct investment (FDI) across neighboring countries is preferred over foreign portfolio investment (FPI) in rejuvenating economic growth.

By the virtue of both FDI and FPI, this study is carried out to examine the degree of the capital market integration between Palestinian and Israeli stock markets with distinct attention given to the trend in portfolio investment. The data is collected from monthly stock market index of World Federation Exchanges website spanning from January 1998 till February 2012.

## BACKGROUND INFORMATION ON TEL AVIV AND PALESTINE STOCK EXCHANGES

Tel Aviv Stock Exchange (TASE) was founded in 1953 and owned by a consortium of 15 banks and 12 investment houses. At present, there are 622 companies listed in the exchange whose market capitalization valued at USD 216 billion. In 1993, TASE made a history by registering the third largest number of Initial Public Offerings (IPOs) of all the world stock exchanges. Headed by Esther Levanon, TASE was fully converted into computerized trading platform in 1999. Since 2007, there have been a number of international agreements formalized between TASE and other leading exchange around the world. Those are London Stock Exchange, NASDAQ and Canadian Stock Exchange to name a few. There are two main market indexes normally used as barometer to measure the performance of TASE. The two are TA-25 Index and TA-100 Index. The former is regarded as TASE's flagship index listing the top 25 largest companies by market capitalization (Barak 2012).

The Egyptian stock market has strong influence over the establishment of Palestine stock exchange in late 1990s. Established in the late 1880s, the Egyptian exchange comprised of both Alexandria and Cairo stock exchanges. During the period from 1888-1958, the stock exchange had been growing rapidly and at one point was ranked the fifth largest in the world (in terms of market capitalization) until the Egyptian government put some restrictions on its trading activities in 1959 (Mohie & 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. With better market mechanism, the Egyptian stock market had made its peak in 2009, registering transaction value of 91.2 billion Egyptian dollars (Hassan 2009). In terms of informational efficiency, the Egyptian stock market is found to be in weak form (Hassan, Seyed & Mark 2004). Another study by on African stock markets also reveals consistent result (Daniel & Samuel 2005).

It is interesting to note that Palestine Stock Exchange (PEX) started its first trading session on 18 February, 1997. In complying with good corporate governance and transparency, the exchange was listed as public company in its own exchange in early February 2010. According to the Arab and international classification of financial markets, the Palestinian exchange has attained advanced status in 2009. As at 5 November 2012, a total of forty-eight companies were listed on PEX, with market capitalization of $2.7 billion, the highest ever since its inception. Today, those listed companies operate in five major sectors - banking and financial services, insurance, investment, industry, and services.

## LITERATURE REVIEW

The PEX is an emerging capital market as most studies have indicated (Daraghma 2010; Abu-Rub & Sharba 2010). These studies describe the relationship between availability of information and its relationship with the share prices. Some indicate that PEX is efficient in weak form. The study of Zoa`rob (2005) and Abusharbeh (2009) report that the lack of informational efficiency could be the reason for the volatility in the PEX.

Studies of the historical movement of the stock prices in the last 10 years show that unjustified fluctuations of stock prices are characterized by erratic movement in the indices that took place during the period from 2005 through 2006 (Abdelkarim 2007). From 2007 until today, high market volatility has been observed (Abu-Rub & Sharba 2010). Market efficiency and poor governance are some major pertinent issues that require attention from policy makers, regulators and investors. It is widely perceived that this phenomenon has been negatively affecting the fair pricing of stocks and consequently impair investors' confidence in PEX as a whole.

In the beginning of 2006, PEX has gone through a severe price correction process, which led so far to a loss of around 60% of its capitalization value. This declining value has been even aggravated following the global financial crisis as pointed out by Abdelkarim and Ijbara (2010). Abdelkarim, Yasser and Arqawi (2009) posit that timeliness of financial and non-financial information are important for both pricing and market confidence. Also, this is the key element that justifies investors' decisions and judgments on intrinsic value of financial securities. Understanding the importance of building up an efficient stock market, the Palestine regulators promote disclosure and availability of financial and non-financial information to all market players.

The performance of PEX (as capital market) is measured by Al-Quds Index (QI). QI is a market value weighted index and it is made up of 12 listed companies from different sectors in PEX. This market index provides investors with a general idea about the direction and performance of the stock market. It is computed by dividing the total market value of all listed companies in the market for the current period over the total market value of companies included in the index from the previous period. This index has been used in PEX since the trading session in July 1997 where the closing prices in that session were used as a reference point in calculation.

This study is motivated by a twofold objective. Firstly, it aims at examining direction of relationship concerning PEX and TASE followed by the desire to find out the relative strength of relationship between the two stock exchanges. This study attempts to provide useful insights to both local and foreign investors on the degree of integration involving the two exchanges. Subsequently, three research questions are developed in this study:

1. Does change in TASE index affect the performance of PEX over time?
2. Is there a causality effect that exists between PEX and TASE?
3. Is there a theoretical support for TASE to be the leading indicator between the two stock exchanges?

## DATA AND METHODOLOGY

Econometric time series and Engle-Granger cointegration procedures (1987) are deployed as estimation tools on the observed stock exchanges – PEX and TASE. The same methodology was used in by Hadi, Yahya and Shaari (2009) research on market integration of fossil fuel. Chart 1 demonstrates how the two market indices move at level over time. Al-Quds Index and TA-100 Index represent PEX and TASE respectively. The TA-100 Index is made up of 100 largest firms listed in TASE. This study adopts the methodology by Lance and James (2006) in establishing theoretical perspective between the two observed market indexes. The research process is outlined in Figure 1 below.

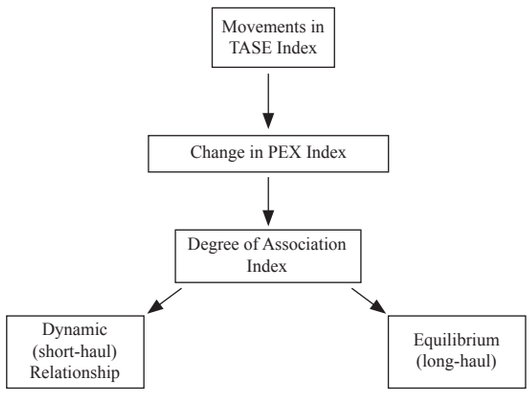


FIGURE 1. Research process

The data analysis process begins with Augmented Dickey-Fuller tests where the time series variables are checked for stationarity. Next, Engle-Granger Cointegration modeling (1992) is operationalized and parameter estimates are derived. Finally, Wiener-Granger test (short-haul causality) is deployed to investigate probable existence of dynamic relationship relating to both PEX and TASE indices.

Monthly data involving 169 observations (from each market index) spanning from January 1998 to February 2012 are used in this study. Historically, Engle-Granger Cointegration technique was first advanced by Granger-Weiss (1981) and subsequently improved in 1983. It was further enhanced by Granger and in the following year by both Engle and Granger (1986). As a result of its dynamism, this estimation technique is preferred by researchers who use it in testing the validity of various theories and models.

Today, cointegration is one of the important tools in econometric time series analysis. The Engle-Granger Cointegration procedure has proven that equilibrium

relationship is established between two time series variables (i.e. they are cointegrated) when a linear combination between them is found to be stationary. This relationship holds even when each one of them is non-stationary on its own. Engle-Granger Cointegration procedures (1987) also states that vector $Y_t$ components are said to be cointegrated at *d, b* degree if the following conditions are met:

1. All components of $Y_t$ is integrated at first difference i.e. *I(d)*
2. There is a non-zero vector $\beta = (\beta_1, \beta_2, \ldots, \beta_n)$ in the system so that the linear combination of $\beta Y_t = \beta_1 Y_{1t} + \beta_2 Y_{2t} + \ldots + \beta n Y_{nt}$ will be cointegrated at *(d-b)* degree (where $b > 0$). As such, the vector $\beta$ is the co-integrating vector.

In handling non-stationarity problem between time series data at level, method of data differencing at first or higher degree is necessary. However, researcher must bear in mind that differencing approach may reduce number of data points for observation and in turn impede the characteristics of the fifteen years' time-series data (1998-2012) used in this study. Engle-Granger (1987) points out that in the event when the long-term relationship prevails, the disequilibrium error should approach the value of zero. In other words, the error terms derived from the model must be stationary. For this reason, unit root test is employed to examine stationarity nature of time series data. It is important to note that there are two possibilities for the tested time series variables. The variable can either show tendency to return to its long term trend after a shock (*i.e.* being stationary) or it may exhibit a random walk pattern (*i.e.* having a unit root). Any presence of unit root in cointegration procedure directly implies a spurious regression relationship. Augmented Dickey Fuller (ADF) test is recommended in dealing with this issue. The model is expressed as follows:

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

The following hypotheses are put into test:

$H_0$: $\lambda_2 = 0$ (non-stationarity of data)
$H_1$: $\lambda_2 < 0$ (stationarity of data)

After the results of ADF test show the two time series variables are stationary at first difference (or higher), they study may now proceed to Engle-Granger Cointegration procedure via Vector Autoregressive (VAR) technique. At this juncture, the study will ultimately end up with only one of the two VAR techniques – full VAR analysis or restricted VAR analysis (popularly known as Error Correction Modeling). Error Correction Model (ECM) technique is preferred when the long-run residuals from OLS Regression model are found to be stationary. This implies that the long run behavior of endogenous variable in our model converge to its cointegrating relationship. In addition to that, it allows for short-run corrections between the observed variables. Since this study only involves two time series variables (PEX and TASE), this ECM technique is referred to as Bi-variate ECM. The mathematical expression of ECM is shown below:

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

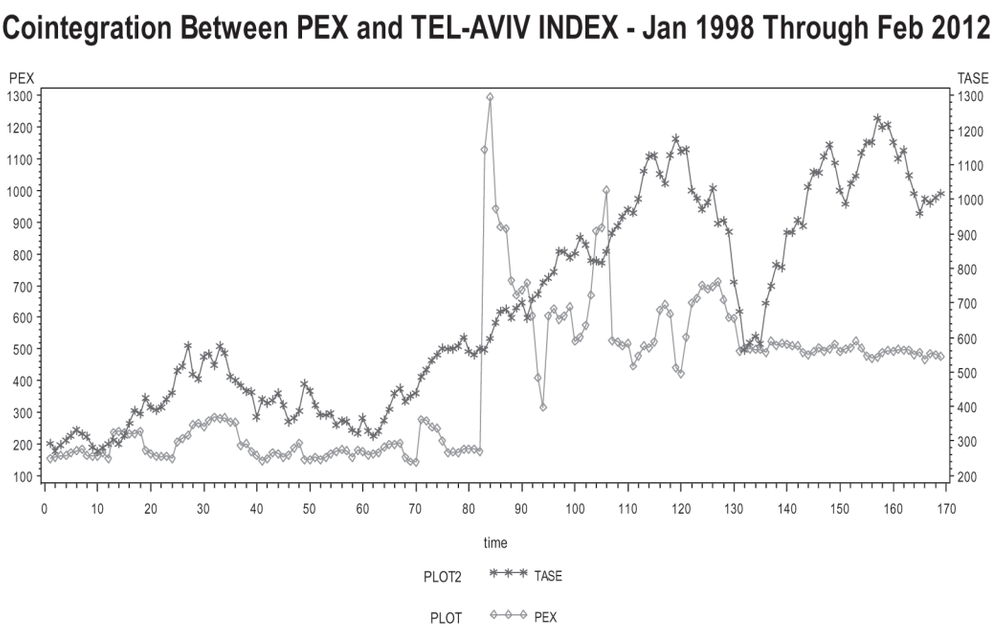


CHART 1. Index peformance - PEX vs. TASE

where:

$Y_t$ has the form of n x1 vector
$A_i$ and $\xi_i$ are the estimated parameters
$\Delta$ is the difference operator
$v_t$ is the reactional vector which explains unanticipated movements in $Z_t$ and $\Theta$ (error correction term)

The ECM technique allows separation of short-term adjustment from long-term relationships. Figure 2 explains the research flow of this study. The Ordinary Least-Squares method (OLS) is used as an estimation technique and Classical Normal Linear Regression assumptions are established. These fundamental assumptions must be observed in addressing the validity of the statistical findings. In probing the directional relationship involving the two stock exchanges, an assumption is made in that performance of TASE influences PEX. This is based on the argument that a newly set up stock exchange like PEX is always under the influence of a long established exchange like TASE. The case is even stronger as they are located so close to one another. The research model of this study is formulated as follows:

$$PEX_t = \beta 0 + \beta 1 TASE_t + \varepsilon_t \quad (3)$$

where:

*PEX* = represented by Al-Quds Index
TASE = represented by Tel Aviv - 100 Index
$\varepsilon_t$ = model error terms

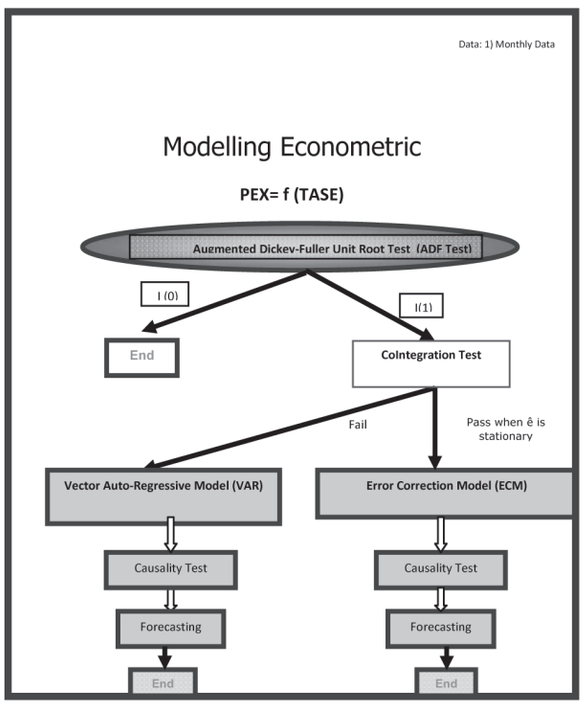


FIGURE 2. Research flow on effect of TASE upon PEX

EMPIRICAL FINDINGS

In investigating the causal-effect relationship between PEX and TASE, applied econometric time series involving ADF test and Bivariate ECM are employed. The results from ADF tests on both PEX and TASE are presented in respective Table 1 and Table 2.

Statistical inference is carried out through significance tests and the results are reported by p-values. The results from ADF tests (Table 1 & Table 2) clearly indicate both market indices are non-stationary at level. However, the first-differenced PEX and TASE demonstrate elements of stationarity as shown in Table 3 and Table 4. Findings from this first test warrant further analysis into Vector Autoregressive Modeling (VAR) as the first prerequisite in Engle-Granger Cointegration procedure has been met.

TABLE 1. Augmented Dickey Fuller Test - PEX (at level)

| Type | Lags | p-value | Tau |
|---|---|---|---|
| | 1 | 0.1506 | -1.40 |
| ZERO | 2 | 0.2773 | -1.02 |
| MEAN | 3 | 0.3059 | -0.95 |
| | 4 | 0.3355 | -0.88 |
| | 5 | 0.4257 | -0.67 |
| | 1 | 0.0151 | -3.33 |
| SINGLE | 2 | 0.0782 | -2.69 |
| MEAN | 3 | 0.0940 | -2.61 |
| | 4 | 0.1149 | -2.51 |
| | 5 | 0.2123 | -2.19 |
| | 1 | 0.0037 | -4.33 |
| TREND | 2 | 0.0460 | -3.47 |
| | 3 | 0.0557 | -3.39 |
| | 4 | 0.0679 | -3.31 |
| | 5 | 0.1845 | -2.84 |

$H_0$: Non-stationarity in data series (presence of unit root
$H_1$: Stationarity in data series (absence of unit root)

TABLE 2. Unit root test on TASE at level (via ADF)

| Type | Lags | p-value | Tau |
|---|---|---|---|
| | 1 | 0.8362 | 0.56 |
| ZERO | 2 | 0.8062 | 0.43 |
| MEAN | 3 | 0.7949 | 0.39 |
| | 4 | 0.8002 | 0.41 |
| | 5 | 0.7842 | 0.35 |
| | 1 | 0.6464 | -1.26 |
| SINGLE | 2 | 0.6270 | -1.31 |
| MEAN | 3 | 0.6261 | -1.31 |
| | 4 | 0.6456 | -1.27 |
| | 5 | 0.6357 | -1.24 |
| | 1 | 0.3862 | -2.38 |
| TREND | 2 | 0.2623 | -2.64 |
| | 3 | 0.2152 | -2.76 |
| | 4 | 0.2226 | -2.74 |
| | 5 | 0.1649 | -2.90 |

$H_0$: Non-stationarity in data series (presence of unit root)
$H_1$: Stationarity in data series (absence of unit root)

TABLE 3. Augmented Dickey Fuller Test - PEX (First-Differenced)

| Type | Lags | p-value | Tau |
|---|---|---|---|
| | 1 | <0.0001 | -11.11 |
| ZERO | 2 | <0.0001 | -8.78 |
| MEAN | 3 | <0.0001 | -7.56 |
| | 4 | <0.0001 | -7.60 |
| | 5 | <0.0001 | -6.76 |
| | 1 | <0.0001 | -11.08 |
| SINGLE | 2 | <0.0001 | -8.76 |
| MEAN | 3 | <0.0001 | -7.55 |
| | 4 | <0.0001 | -7.59 |
| | 5 | <0.0001 | -6.75 |
| | 1 | <0.0001 | -11.65 |
| TREND | 2 | <0.0001 | -8.73 |
| | 3 | 0.0002 | -7.53 |
| | 4 | <0.0001 | -7.57 |
| | 5 | <0.0001 | -6.73 |

$H_0$: Non-stationarity in data series
$H_1$: Stationarity in data series

TABLE 4. Augmented Dickey Fuller Test - TASE (First-Differenced)

| Type | Lags | p-value | Tau |
|---|---|---|---|
| | 1 | <0.0001 | -7.53 |
| ZERO | 2 | <0.0001 | -6.29 |
| MEAN | 3 | <0.0001 | -5.73 |
| | 4 | <0.0001 | -5.00 |
| | 5 | <0.0001 | -4.93 |
| | 1 | <0.0001 | -7.60 |
| SINGLE | 2 | <0.0001 | -6.37 |
| MEAN | 3 | <0.0001 | -5.81 |
| | 4 | <0.0001 | -5.08 |
| | 5 | <0.0001 | -5.03 |
| | 1 | <0.0001 | -7.58 |
| TREND | 2 | <0.0001 | -6.35 |
| | 3 | <0.0001 | -5.79 |
| | 4 | 0.0003 | -5.06 |
| | 5 | 0.0003 | -5.02 |

$H_0$: Non-stationarity in data series
$H_1$: Stationarity in data series

Having the preliminary requirements met, regression analysis is carried out on PEX and TASE datasets. Looking at the parameter estimates in Table 5, the statistical results show there is a positive relationship between PEX and TASE and it is significant at 5% level. In the meantime, descriptive statistics and correlation matrix involving both stock exchanges are presented in Table 6 and Table 7 respectively. Interestingly, there is a moderate correlation involving both exchanges.

The second prerequisite in Engle-Granger Cointegration procedure requires the long-run residuals derived from the long-run regression (r) to be stationary. Hence, ADF test is carried out on these long-run residuals and results are reported in Table 8. The results show these long-run residuals (r) are stationary at all lags. Here, two imperative implications are highlighted: (1) the stationarity of long-run residuals supports our theoretical model that PEX and TASE are cointegrated, and (2) as both indices are cointegrated, the bivariate ECM can now be mobilized.

TABLE 5. Regression analysis (PEX = DV)

| Variable | Parameter Estimate | Standard Error | t-Value |
|---|---|---|---|
| Intercept | 46.3181 | 33.3803 | 1.39 |
| TASE | +0.5095 | 0.0451 | 11.28* |

* Significant at 5% level
$H_0$: Absence of relationship involving the two exchanges
$H_1$: Presence of relationship involving the two exchanges

TABLE 6. Descriptive statistics analysis on PEX and TASE

| Variable | N | Mean | Std Dev | Minimum | Maximum |
|---|---|---|---|---|---|
| PEX | 169 | 392.46 | 226.05 | 143.51 | 1295.08 |
| TASE | 169 | 679.35 | 291.76 | 270.52 | 1235.44 |

TABLE 7. Pearson correlation matrix

| | PEX | TASE |
|---|---|---|
| PEX | 1.00000 | 0.6576<br>< 0.0001 |
| TASE | 0.6576<br>< 0.0001 | 1.00000 |

TABLE 8. Augmented Dickey Fuller Test - Long-Run Residuals

| Type | Lags | p-value | Tau |
|---|---|---|---|
| | 0 | <0.0001 | -4.15 |
| ZERO | 1 | <0.0001 | -4.72 |
| MEAN | 2 | 0.0002 | -3.84 |
| | 3 | 0.0002 | -3.77 |
| | 4 | 0.0003 | -3.69 |
| | 5 | 0.0013 | -3.26 |

$H_0$: Non-stationarity on long-run residuals
$H_1$: Stationarity in long-run residuals

BI-VARIATE ERROR CORRECTION MODEL (ECM)

By employing Bivariate Error Correction technique, the parameter estimates are made possible. The equilibrium and dynamic responses involving PEX and TASE in the model can now be examined. The optimum lag-length for this tested model lies at lag 2 as suggested by Akaike (AIC). Note that lower AIC value is preferred in ECM techniques. Table 9 below presents the summarized results of ECM.

TABLE 9. Error correction model at Lag 2 – ECM(2)

| Dependent Variable : Dpex | | | | |
|---|---|---|---|---|
| Variables | Parameter | Standard Error | t-Value | P-Value |
| Inter*cept* | 2.1819 | 7.4844 | 0.29 | 0.7710 |
| LdPEX | 0.1808 | 0.0779 | 2.32 | 0.0215 |
| L2dPEX | -0.1458 | 0.0791 | -1.84 | 0.0674 |
| *Lr* | -0.1738 | 0.0486 | -3.57 | 0.0005* |
| LdTASE | 0.0194 | 0.1802 | 0.11 | 0.9143 |
| L2dTASE | -0.0680 | 0.1798 | -0.38 | 0.7057 |

*Notes*: 1. dpex = first-differenced PEX
2. ldpex = lag 1 first-differenced PEX
3. lr = lag 1 short-run residual or error correction term
4. ldTASE = lag 1 first-differenced TASE

As indicated earlier on by AIC, ECM (2) is the efficient model. *lr* is the model's error correction term and it explains both equilibrium relationship between tested variables plus their speed of adjustment. Looking at *lr's* negative value and its p-value in Table 9, we can deduce that there is a statistically significant long-run relationship between the two stock exchanges. *lr's* value of negative 0.1748 infers 17.48% speed of adjustment towards equilibrium made by PEX in the system. This is a converging process made by PEX at relatively fast speed in the long run. Ultimately, this also suggests presence of financial market integration involving PEX and TASE.

TABLE 10. Bivariate causality test

| Source of analysis | Degree of freedom | F-value | Prob > F-test |
|---|---|---|---|
| Model numerator | 2 | 0.07 | 0.9301 |
| Model denominator | 160 | | |

$H_0$: Absence of short-run relationship
$H_1$: Presence of short-run relationship

A statistically significant positive relationship between the two exchange markets is implied by the positive parameter value of TASE (+0.5095) given in Table 5. Hence, there is a positive correlation between them. Negative error correction term indicates significant equilibrium relations and as such, it is also possible to establish dynamic interaction. However, looking at the p-value from Bivariate Causality test in Table 10, two exchanges have yet to demonstrate a short-run relationship. As part of Engle-Granger Cointegration procedure, full set diagnostic tests (underlying Ordinary Least-Squared assumptions) are performed on our model.

### LAGRANGE MULTIPLIER (LM) TEST FOR ARCH DISTURBANCES

Lagrange multiplier test is the first diagnostic test dispatched to check for constant variance in the error terms. As shown in Table 11, the p-value indicates acceptance of the null hypothesis at all level implying constant variance in the error term.

TABLE 11. Lagrange multiplier test (LM)

| Order | Lagrange Multiplier | Prob > LM |
|---|---|---|
| 1 | 0.0583 | 0.8093 |
| 2 | 0.0583 | 0.9713 |
| 3 | 0.0999 | 0.9918 |
| 4 | 0.1139 | 0.9984 |
| 5 | 0.1157 | 0.9999 |

(Constant variance in error terms) $H_0$: Homoscedastic
Inconstant variance in error terms) $H_1$: Heteroscedastic

### NORMALITY TEST

Normality test is the second diagnostic test carried out to check for distribution in the error terms. A number of normality tests are recommended (Shapiro-Wilk, Kolmogorov-Smirnov, Cramer-von Mises etc.) but this study reports only test results from Anderson-Darling statistics.

TABLE 12. Normality test

| Variable: Short-run residuals | | | |
|---|---|---|---|
| Normality Test | | Statistic | p-value |
| Shapiro-Wilk | W | 0.5165 | <0.0001 |
| Kolmogorov-Smirnov | D | 0.2343 | <0.0100 |
| Cramer-von Mises | W-Sq | 3.6899 | <0.0050 |
| Anderson-Darling | A-Sq | 19.2956 | <0.0050 |

$H_0$: Normal distribution in error terms
$H_1$: Absence of normal distribution in error terms

From Anderson-Darling statistics, its p-value indicates absence of normality in the error terms distribution. However, this is not a critical issue as many finance literature suggest that such a finding is common in researches related to stock markets.

### AUTOCORRELATION TEST

The next diagnostic test is autocorrelation test. It is deployed to examine any presence of serial correlation in the error terms. Durbin-Watson test is one of the celebrated techniques and its results are reported in Table 13. Its p-value indicate acceptance of null hypothesis implying absence of autocorrelation in the error terms.

TABLE 13. Autocorrelation test (via Ljung-Box Test)

| Dependent Variable: Dpex | |
|---|---|
| To Lag | Prob > ChiSq |
| 6 | 0.9476 |
| 12 | 0.3523 |
| 18 | 0.7124 |

$H_0$: Absence of autocorrelation in error terms
$H_1$: Presence of autocorrelation in error terms

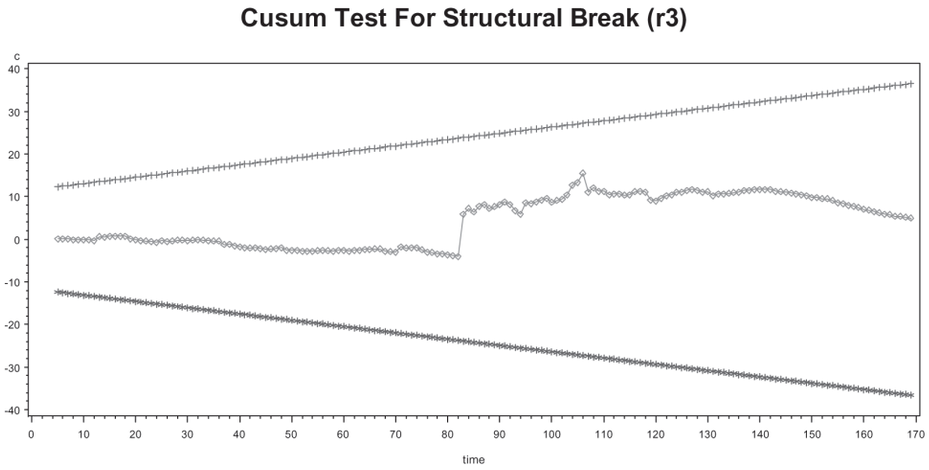


CHART 2. Cumulative sum of residuals test

The final diagnostic test involves examination on the model's structural changes over study period. As such, cumulative sum of residual test (CUSUM) is deployed to perform this critical task. CUSUM analysis aims at addressing problems associated with parameter instability. Chart 2 clearly shows the short-run residuals are lying within the lower and upper boundaries. This is a confirmation in that the model's parameters (short-run and long-run parameters) are in the state of stability. In a nutshell, the PEX-TASE model appears theoretically sound as no major setbacks were discovered throughout the diagnostic process.

TABLE 14. IRFs analysis

| Response/Impulse | Lag | PEX | TASE |
|---|---|---|---|
| PEX | 1 | 0.98165 | 0.09739 |
| | 2 | 0.78329 | 0.22193 |
| | 3 | 0.59666 | 0.32928 |
| | 4 | 0.45392 | 0.41053 |
| | 5 | 0.35108 | 0.46906 |
| | 6 | 0.27851 | 0.51039 |
| | 7 | 0.22767 | 0.53936 |
| | 8 | 0.19216 | 0.55960 |
| | 9 | 0.16738 | 0.57372 |
| | 10 | 0.15010 | 0.58357 |
| | 11 | 0.13805 | 0.59044 |
| | 12 | 0.12965 | 0.59524 |
| TASE | 1 | 0.04138 | 1.15927 |
| | 2 | 0.08408 | 1.16851 |
| | 3 | 0.11804 | 1.15535 |
| | 4 | 0.14292 | 1.14233 |
| | 5 | 0.16060 | 1.13247 |
| | 6 | 0.17302 | 1.12543 |
| | 7 | 0.18170 | 1.12049 |
| | 8 | 0.18776 | 1.11704 |
| | 9 | 0.19199 | 1.11463 |
| | 10 | 0.19494 | 1.11294 |
| | 11 | 0.19700 | 1.11177 |
| | 12 | 0.19843 | 1.11095 |

TABLE 15. VDCs analysis

| Variable | Lead | PEX | TASE |
|---|---|---|---|
| PEX | 1 | PEX | 0.0000 |
| | 2 | 0.9991 | 0.0009 |
| | 3 | 0.9957 | 0.0042 |
| | 4 | 0.9894 | 0.0105 |
| | 10 | 0.9125 | 0.0874 |
| | 20 | 0.7796 | 0.2203 |
| TASE | 1 | 0.0036 | 0.9964 |
| | 2 | 0.0018 | 0.9981 |
| | 3 | 0.0053 | 0.9946 |
| | 4 | 0.0120 | 0.9879 |
| | 10 | 0.0552 | 0.9447 |
| | 20 | 0.0846 | 0.9153 |

## CONCLUSION AND IMPLICATIONS

Despite the long hostility between Palestine and Israel, there is one thing that they share in common. The empirical findings from this study have proven that both PEX and TASE are cointegrated. In a dynamic context, the study fails to establish short run relations between them as revealed by Granger-causality analysis. From variance decompositions (VDCs) and impulse response functions (IRFs), PEX appears to be the most endogenous of all. Analysis of variance decomposition reveals 78% variations in PEX is explained by itself as compared to 92% in TASE. From the analysis of impulse-response function, PEX is seen more responsive towards a given shock in TASE. As such, TASE is said to be econometrically exogenous. These findings are very much in line with our expectation that TASE influences PEX's performance over short run.

It is quite reasonable to argue the importance of an economic indicator such as stock market index in explaining future growth. From the empirical findings of this study, policymakers should devise an effective approach in rejuvenating economic activities in the two countries. Corporate managers should use this piece

of information to explore investment opportunities in both countries. One must be cautious in adjudicating the effectiveness of stock markets in raising capital because there are evidences that they are exploited as the by-product of speculative activities just like a casino. Singh (1997) argues that some Asian countries like Japan, Taiwan, and South Korea are able to develop their industries with little help from the stock markets.

One must also realize the fact that the neighboring countries like Egypt, Jordan and Israel play important supporting roles in building up Palestinian economy. Besides Egyptian Stock Exchange (EGX) and Amman Stock Exchange (ASE), TASE does influence the Palestinian economy through its capital market mechanism. Also, one cannot deny the fact that international trade and cross-border FDI shall provide benefits to the two neighboring countries. In particular, economic prosperity in Israel will undoubtedly help boost Palestinian economy as the two countries share national borders, resources and relatively same market structure. Hence, regional economic and political cooperation has to be devised through fair trade agreements, which in turn help sustain long term economic growth.

The results from diagnostic tests are free from major drawbacks and support the specification of our model. In a nutshell, the evidence presented here confirms the intuition that performances of regional stock markets are mutually dependent. It is strongly recommended that future research should incorporate other regional markets such as Iraq and Syria. The study urges both Palestinian and Israeli governments to review their respective international trade policy and emphasize on developing competitive advantage between them. Each government has no choice but to devise an effective and dynamic policy that helps sustain regional economic prosperity and peace in the Middle East.

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