**Deanship of Graduate Studies**

**Al-Quds University**

# Econometric Techniques to Examine Volatility in PEX Bulls and Bears and the Causal Relationship between PEX, ASE and TASE

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**M.A Thesis**

**Jerusalem –Palestine**

**1433/2012**

# Econometric Techniques to Examine Volatility in PEX Bulls and Bears and the Causal Relationship between PEX, ASE and TASE

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This thesis is Submitted in Partial Fulfillment of the requirements

For the Degree of Master in Accounting and Taxation

Institute of Business and Economics

Al-Quds University

1433/2012

Al-Quds University

Deanship of Graduate Studies

Institute of Business and Economics

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**A thesis Submitted in Partial Fulfillment of the requirements**

**For the Degree of Master in Accounting and Taxation**

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**Dedication**

*To the soul of My Mother and Father*

**Declaration:**

I certify that this thesis submitted for the degree of Master is the result of my own research, except where otherwise acknowledged, and that this thesis (or any part of the same) has not been submitted for a higher degree to any other university or institution.

Signed: ……………………

Abdel-Raman Mousa Husain Al-Ewesat

Date: June 27, 2012

## Acknowledgements

First and foremost, I would like to thank Allah for what I am and for everything I have.

I express sincere appreciation and thanks to my advisor **Dr. Ibrahim Awad** for his guidance, expertise, patience and support.

Sincere gratitude is given to the examining committee members, Dr. Mahmud Haddad and Dr. Afif Hamad, and to Dr. Mahmud El-Jafari, the director of the institute of Business and Economics.

Much appreciation is offered to:

- My Brother, Mr. Mohammad Al-Ewesat and his wife Rania Al-Ewesat for their support,
- My Brothers and My sisters and their sons,
- My family, and
- All my friends.

**Abstract**

This study is empirically aimed at conducting three tests; testing volatility persistent in PEX bulls and bears, testing market efficiency for PEX, ASE, and TASE, and testing the causality relationship between the three markets. That is, it attempts to explore whether stock market volatility present a different behavior during PEX bulls and bears phases and explore whether PEX, ASE, and TASE are efficient at weak level. For this purpose, long memory measure is used to indicate volatility persistence and market efficiency. In order to define bull and bear phases, we employed the 200-day moving average, already used by practioners and we found three cycles including 3 bulls and 3 bears. Thus, the study employed Rescaled Range (R/S) to calculate the values of difference parameter d to find evidence of long memory behavior for the daily data observations from August, 1997 to March, 2012. In addition to a long memory measure, the study used nonparametric ADF and PP tests to test market efficiency of PEX, ASE, and TASE at weak level.

According to Jarque–Bera test, the closing values of Al-Quds Index of PEX in each bull and bear don't follow the normal probability distribution. So, the study used nonparametric tests of ADF and PP to determine whether the time series are stationary. The time series are found to be non stationary at level in each phase implying that PEX is efficient at weak level in each phase. Further, according to R/S results, the study found that the estimates of parameter d are above 0 and below 0.5 for bear phases, while the values are above 0.5 for the bull phases implying long memory stationarity for the volatility process. This means that volatility is more persistent in the PEX bears markets than in the PEX bull markets. Further, the PEX bears markets are longer than PEX bulls markets. As a result, volatility persistent in PEX bears and risk associated with it should be considered by investors. Added to this, the overall market-

adjusted performance measurement indicates that PEX has average levels of returns and risk more than ASE and TASE. To avoid that, investors and other decision makers should consider both fundamental and technical analysis.

For market efficiency test, ADF and PP test are also used to find whether time series data of Al-Quds index, ASE index and TA-100 index are stationarity. In the three cases, means and variances seem to be not constant. This indicates that the three indices are found to be non-stationary at level implying that the three markets are efficient at weak level. For further investigation, R/S statistic is used to calculate the difference parameter to indicate market efficiency. The estimates of d are above 0.5 for the PEX and TASE cases implying that time series data are non-stationary, and there is no evidence of long memory behavior (long range dependence) in the time series data. For ASE, the value of d is above 0 and below 0.5 implying that the time series has long memory behavior. This indicates that ASE isn't efficient at weak level. So, we accept that PEX, and TASE are efficient at weak level but ASE isn't. Therefore, regulators and policy makers should support market efficiency.

The study further investigates correlation and causality relationship among PEX, ASE and TASE. It analyzes whether there is a long run linkage or interdependency between the three markets. The data sample includes daily observations for the January, 2000-March, 2012 time period. As mentioned before, the data are non-stationary at level, while the data are stationary at first difference and therefore conducting Granger causality tests isn't restricted. The correlation matrix indicates that the three markets aren't highly correlated. The correlation is verified for the direction of influence by the Granger causality test between the three markets. However, the study found that there is no significant causal relationship between the three markets except the

unilateral causality relationship of ASE over PEX, and the relationship of TASE over ASE, whereas reverse causality doesn’t hold true.

In general, the study finds that there is no multilateral causal relationship among the three markets and they are being highly correlated. Therefore, Palestinian investors don’t have to consider changes in TASE index, while changes in ASE index must be considered.

العنوان: تقنيات الاقتصاد القياسي لقياس التقلبات في اسعار الاسهم المدرجة في سوق فلسطين للاوراق المالية خلال مراحل الصعود والهبوط وقياس العلاقة السببية ما بين سوق فلسطين وسوق عمان وسوق تل ابيب

اسم الباحث:عبد الرحمن موسى العويسات

اسم المشرف: د. ابراهيم عوض

**ملخص**


تعد هذه الدراسة بمثابة دراسة عملية لتقيس ثلاثة امور: تتمحور هذه الدراسة حول قياس التقلبات في اسعار الاسهم المدرجة في سوق فلسطين للاوراق المالية ممثلة بمؤشر القدس، وايضا قياس الكفاءة المالية لسوق فلسطين وسوق عمان وسوق تل ابيب، بالاضافة الى فحص العلاقة البيية ما بين الاسواق الثلاثة الانفة الذكر.

وهدفت الدراسة الى تحديد فيما اذا كانت التقلبات في اسعار الاسهم المدرجة في سوق فلسطين تظهر سلوك مختلف خلال مراحل الصعود(الارتفاع) ومراحل الهبوط (الانخفاض) في اسعار الاسهم، كون تلك التقلبات مرتبطة بالمخاطر والخسارة. لذا لجات الدراسة الى تحديد مراحل الصعود والهبوط في قيم مؤشر القدس لتفحص مدى استمراية وتكرار التقلبات في اسعار الاسهم خلال تلك الفترات.وهدفت ايضا الى قياس كفاءة الاسواق الثلاثة وكذلك قياس العلاقة السببية ما بين الاسواق الثلاثة.

وفي هذا الخصوص،اعتمدت الدراسة على بيانات السلاسل الزمنية من سنة 1997 حتى سنة 2012 حتى تحقق الاهداف المرجوه.

و تم استخدام احدث التقنيات المستخدمة في علم الاقتصاد القياسي وبيانات السلاسل الزمنية, متضمنة النماذج التاليةThe 200-day moving average: لتحديد مراحل الصعود ومراحل الهبوط في اسعار الاسهم,

Rescaled Range statistics (R/S): لحساب قيمة d لفحص استرارية وتكرار التقلبات في اسعار

الاسهم وكذلك فحص الكفاءة المالية لدى الاسواق الثلاثة، Nonparametric tests: ADF and PP : يستخدم لفحص ثبات التغيرات في بيانات السلاسل الزمنية،Long Memory Model: لفحص فيما اذا كانت البيانات تستخدم في تنبؤات القيم المستقبلية لاسعار الاسهم. Granger causality test between the three markets: لفحص العلاقة السببية ما بين الاسواق الثلاثة.

وتوصلت الدراسة الى ان هناك 3 مراحل صعود و3 مراحل هبوط في اسعار الاسهم المدرجة في السوق المالي خلال 15 سنة الماضية من تاريخ السوق المالي الفلسطيني وذلك باستخدام The 200-day moving average، واستخدمت ايضا Rescaled Range statistics (R/S)لتجد قيمة d المعامل الذي يعتبر دليلا على long memory behaviorوكذلك استخدمت ADF و PP لتقيس الثبات في السلاسل الزمنية ولتقيس الكفاءة المالية على المستوى الضعيف بالاضافة الى JB لفحص التوزيع الطبيعي.

وبحسب JB تبدو مشاهدات مؤشر القدس في كل مراحل الصعود والهبوط تتوزع توزيعا طبيعيا وتشير نتائج استخدام ADF و PP ان تلك المشاهدات غير ثابته لتشير بذلك الى كفاءة السوق المالي خلال مراحل الصعود والهبوط على المستوى الضعيف. وبحسب فحص R/S كانت قيمة d ما بين 0-0.5 خلال مراحل الصعود والذي يشير الى ان التقلبات في اسعار الاسهم اكثر استمرارية في مراحل الهبوط مما جعل الاستثمار في مراحل الهبوط محفوف بالمخاطرة والخسارة وغير مربحة بشكل عام، ووجدت الدراسة ايضا ان مراحل الهبوط في اسعار الاسهم كانت اطول زمنيا من مراحل الصعود.

ولفحص كفاءة الاسواق الثلاثة، ايضا تم استخدام R/S بالاضافة الى ADF و PP ، فكانت قيم d الكبر من 0.5 بالنسبة لسوق فلسطين وسوق تل ابيب ولكنها كانت ما بين 0-0.5 بالنسبة لسوق عمان، لذا يمكن استنتاج ان سوق فلسطين وسوق تل ابيب تمتاز بالكفاءة على المستوى الضعيف بينما سوق عمان لم يبدو كذلك.

بالاضافة ان الدراسة فحصت فيما اذا كانت الاسواق الثلاثة ترتبط بعلاقة سببية فيما بينها, فاستخدمت الدراسة Granger Causality test لفحص ذلك. لذا لم تجد اية علاقة سببية ذات اهمية ما بين سوق سوق فلسطين وسوق تل ابيب لكون سوق فلسطين صغير ولديه مؤشر واحد يمثل جميع القطاعات بينما تتعدد المؤشرات في سوق تل ابيب الامر الذي جعل من الصعب اكتشاف العلاقة السببية بشكل دقيق، ولكن وجدت تأثير لسوق عمان على سوق فلسطين وان سوق تل ابيب يؤثر على سوق عمان.

لذلك اوصت الدراسة ان على المستثمر الفلسطيني وصناع القرار ان ياخذوا بعين الاعتبار الخسارة المرتبطة بمراحل الهبوط في اسعار الاسهم. وان يتم استخدام ادوات وتقنيات التحليل المالي الفنية والاساسية. واوصت ايضا ان على صناع القرار والسياسة دعم كفاءة السوق المالي الفلسطيني ، وان المستثمر الفلسطيني ليس مضطرا ان يعتبر التقلبات في اسعار الاسهم المدرجة في سوق تل ابيب، ولكن اعتبار التقلبات في اسعار الاسهم المدرجة في سوق عمان.

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Abbreviations

| | |
|---|---|
| ADF | Augmented Dickey Fuller |
| ASE | Amman Stock Exchange |
| DGP | Data generating process |
| MENA | Middle East and North Africa |
| GARCH | Generalized Autoregressive Conditional Heteroskedastic |
| GPH | Geweke-Porter-Hudak |
| FIGARCH | Fractionally Integrated Generalized Autoregressive Conditional Heteroskedastic |
| ISE | Istanbul Stock Exchange |
| LMSV | Long Memory Stochastic Volatility |
| PEX | Palestine Exchange |
| PP | Phillip Person |
| R/S | Rescaled Range Statistics |
| TASE | Tel-Aviv Stock Exchange |
| TA-100 | Tel-Aviv 100 |

# Chapter 1

# Study Overview

## 1.1 Background

The concept of volatility in stock prices is central to the professionals, investors, financial literature, and econometricians for many years. To measure financial markets' performance, long memory in stock market volatility and in returns is considered.This is because volatility in financial time series data was an important and active area of research over the last decades since it is linked to uncertainty and financial risk. Also,financial literature considers the time varying causality relationship between financial markets in order to investigate interdependency among them in the short and the long run. Obviously, this study focuses on three things to be measured: volatility in stock returns in PEX bull and bear phases, market efficiency of PEX, ASE and TASE at weak level as well as causality relationship among the three markets. The study highlights the behavior of stock prices during different time periods within PEX and in relative with other markets. As such, this study can provide crucial and helpful empirical results for investors and policymakers.

### 1.1.1 Palestinian Exchange(PEX) Evidence:

It was recommended to construct a financial market for securities in the Palestinian territories to attract capital and support investments in financial, service, industrial, and commercial corporations. In July, 1995 thePalestine Exchange (PEX) was established to promote investment in Palestine. The PEX became a public shareholding company in February 2010 responding to principles of transparency and good governance. The PEX operates under the supervision of the Palestinian Capital Market Authority.

The PEX strives to provide an enabling environment for trading that is characterized by equity, transparency and competence, serving and maintaining the interest of investors. The PEX is very appealing in terms of market capitalization; it is financially sound, and well capitalized to maintain a steady business in a volatile world, as it passed with the minimum level of impact from the global financial crisis compared to other MENA Exchanges.

There are 46 listed companies on PEX as of 31/12/2011 with market capitalization of about $2.7 billion across five main economic sectors; banking and financial services, insurance, investments, industry, and services. Most of the listed companies are profitable and trade in Jordanian Dinar, while others trade in US Dollars. Only stocks are currently traded on PEX, but there is potential and readiness to trade other securities in the future. In 2009, the PEX ranked thirty third amongst the worldwide security markets, and regionally comes in second in terms of investor protection.

On July, $7^{th}$ 1997 PEX adopted Al-Quds index as a general indicator for the daily market movements and consisted of ten corporations and it is considered to represent all the market. Also, PEX adopted 100 points as a base value of Al-Quds index at that date. Mathematically, Al-Quds index calculated by using the market-value weighted method as follows: Al-Quds Index = ((number of share issued * Market value of share) / (shares issued * base value)) *100.

In 2007, the PEX has increased the number of firms included in Al-Quds index to 12 firms. This decision was in response to the increase in the number of listed companies. In addition, PEX has adopted a general index which includes all the listed companies in PEX as well as sectors indices including five sub-indices; these are insurance index, banking index, investments index, industry index, and services index. Table 1depicts the companies included in Al-Quds index.

Table 1: Companies included in Al-Quds Index

| **Sector** | **Company Name** | **Market Code** |
|---|---|---|
| Industry | Birzeit Pharmaceuticals | BPC |
| | Golden Wheat Mills | GMC |
| | Jerusalem Cigarette | JCC |
| Insurance | Ahliea Insurance Group | AIG |
| Banking | Arab Islamic Bank | AIB |
| | Bank of Palestine | BOP |
| | Al-Rafah Microfinance Bank | AMB |
| Services | Palestine Telecommunications | PALTEL |
| | Palestine electric Company | PEC |
| Investment | Palestine Development and Investment | PADICO |
| | The Palestine Real Estate Investment | PRICO |
| | Palestine Industrial Investment Company | PIIC |

It is important to note that PEX has maintained sustained growth in numbers of listed companies, trade volumes, number of shares traded and market values since its foundation. Figure 1 shows the number of listed companies, shares traded, trade volume, market values. We notice that the return was very high in year 2005 compared with other years since the market value and trade volume were the highest in that year. It is worthy to shed light on this phenomenon so that we can investigate the main reasons behind this unjustified heights during this period.

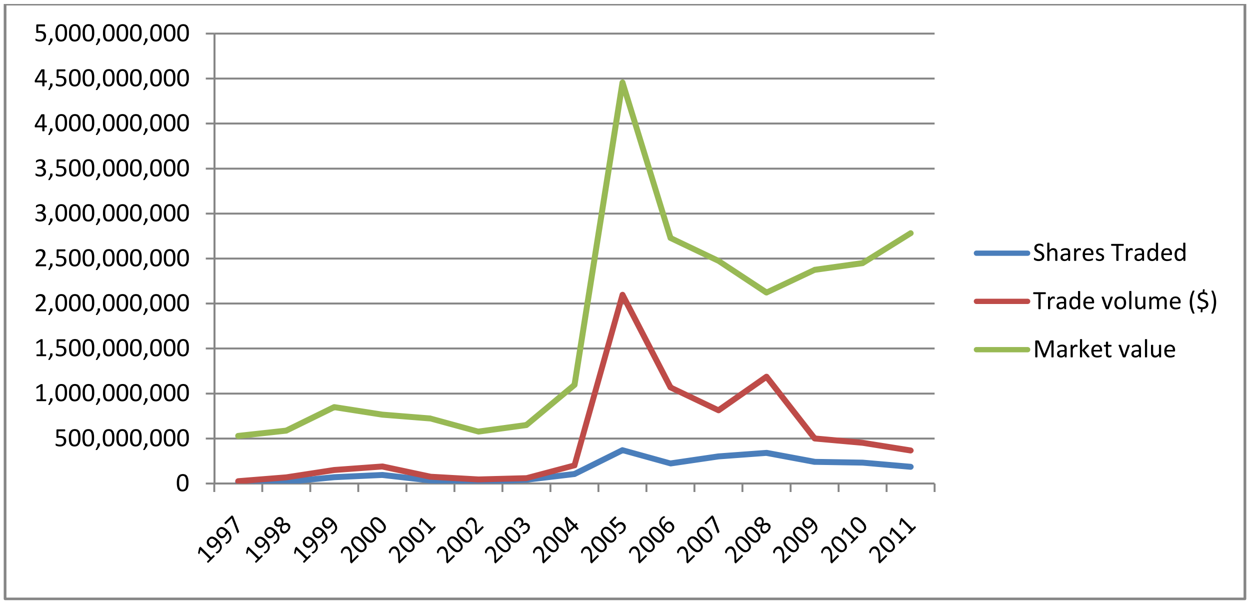


Figure 1:PEX figures over the period of 1997 to 2011

PEX seeks to be a model for Arab and regional financial markets, by providing innovative services, proposing ideal investment opportunities in securities, attracting investments, the use of state of the art technology, compliance to the rules of corporate governance and establishing constructive relations with Arab, regional and global markets.

Its mission is to provide a fair, transparent and efficient market for trading securities that serves investors, protects their interests, contributes to creating an enabling environment that attracts local and foreign investments, and interacts with local and Arab relevant institutions in a manner that serves the national economy and enhances the culture of investment in financial markets.

Added to that, it has several objectives to be achieved; first, it aims at providing a safe and enabling trading environment characterized by efficiency, fairness and transparency. Next, it tries to increase the investment awareness of the local community and enhance PEX relations with local, Arab and international economic institutions and forums. Further, developing domestic investments and attract Palestinian Diasporas& foreign capital. Finally, increasing the depth of the exchange by continuously listing new companies and providing new and diverse financial tools and services and creating a proficient working environment within the PEX by investing in human capital and maintaining up-to-date technologies of stock markets.(PEX Website)

PEX as a financial market is a mechanism that allows Palestinian investors and entities to buy and sell stocks and other securities at prices determined by supply and demand in trading environment characterized by efficiency, fairness and transparency. The importance of PEX stems from its contributions in providing innovative services, proposing ideal investment opportunities in securities, attracting investments, using technology to facilitate trading process, compliance with the rules of corporate governance and establishing constructive relations with Arab, regional and global markets. Therefore, on the basis of PEX mission, vision, and objectives, it could be considered one of the international stock markets that enhance these principles in trading environment, which leads to developing domestic investments in Palestine. The nature of PEX can add another justification for the importance of the present study.

Obviously, there have been two studies based on the time series of PEX price indices in Palestine. In the context of market efficiency, Awad and Daraghmah (2009) investigated the weak form efficiency of Palestinian Securities Market (currently Palestinian Exchange). The data used consisted of daily values of PEX price indices over the period of January 1$^{st}$, 1998to the end of October, 2008. Statistically, the study used parametric and non-parametric methods to investigate market efficiency at weak level including; normality tests, Augmented Dickey Fuller (ADF) unit root test (1979) parametric, and Philips Person (PP) unit root test (1988), non-parametric.The conclusions showed that the PEX is efficient at the weak level.

Another study based on trading data of the PEX was conducted in the context of causality investigation. Abu-Libdeh and Harasheh (2011) tested the correlation and causality relationships between stock prices and macroeconomic variables. The data used was quarterly values of Stock price indices and macroeconomic variables over the period of 2000 to 2010. Statistically, ADF and Granger causality were employed as well as a regression model. The results of regression analysis indicated a significant relationship between macroeconomic variables and stock prices, whereas, Granger causality negated any kind of causal relationship between each particular macroeconomic variables and stock prices.

Moreover, Rizik (2011) conducted a study about the behavioral determinants of small investors in PEX. The study aimed at finding out the most important elements that affect the decision making process in the financial market. The study adopted analytical descriptive approach and the primary source of data was collected by interviews and survey, and the secondary data was obtained from the exchange and deposit department of PEX that is located in Nablus. The results indicated that there was a negative effect of the money crisis and the political situation on investing in PEX, whereas banking facilities had a positive effect. In addition, the most important reasons of failure to achieve returns were lack of experience and transparency, while the reasons of success to achieve returns was daily watching of market and consulting of professionals.

However, there is currently no study analyzing long memory for volatility process in PEX bull and bear phases and no study tested the presence of long memory in PEX stock returns to find the evidence of market efficiency. In addition, no literature investigated the correlation and causality between PEX and any other stock markets.

### 1.1.2 Amman Stock Exchange (ASE):

Another stock exchange that has been considered in this study isAmman Stock Exchange (ASE). It is located in Jordan in the Middle East. The ASE was established in March 1999 as a non-profit, private institution with administrative and financial autonomy. It is authorized to function as an exchange for the trading of securities. The exchange is governed by a seven-member board of directors. A chief executive officer oversees day-to-day responsibilities and reports to the board. The ASE membership is comprised of Jordan's 68 brokerage firms. The ASE is committed to the principles of fairness, transparency, efficiency, and liquidity. The exchange seeks to provide a strong and secure environment for its listed securities while protecting and guaranteeing the rights of its investors. To provide this transparent and efficient market, the ASE has implemented internationally recognized directives regarding market divisions and listing criteria.

The ASE is charged with providing enterprises with a means of raising capital by listing on the exchange, encouraging an active market in listed securities based on the effective determination of prices and fair and transparent trading, providing modern and effective facilities and equipment for the recoding of trades and publication of prices, monitoring and regulating market trading, coordination with theJordan Securities Commission (JSC) as necessary, to ensure compliance with the law, a fair market and investor protection, setting out and enforcing a professional code of ethics among its member directors and staff, ensuring the provision of timely and accurate information of issuers to the market and disseminating market information to the public. ASE's vision is "Advanced financial market distinguished legislatively and technically, regionally and globally; rising to the latest international standards in the financial markets to provide an attractive investment environment". Its mission is to provide an organized, fair, and efficient market for trading securities in the Kingdom, and secure a transparent, strong, and safe environment for trading securities to deepen trust in the stock market. The ASE core Values arefairness, transparency, outstanding, and creativity.

ASE aims at creating an attractive and safe environment for investment, developing processes and methods of trading securities in the stock market, meeting the latest international standards, disseminating trading information to the largest possible number of dealers and interested parties, enhance the public awareness of all segments of society, while devoting especial attention to dealers of securities, enhancing transparency and credibility in the dealings of the stock market.

ASE indices are used to portray the pattern of stock price movement, and to measure the performance of the ASE in terms of return. Back in 1980, the Amman Financial Market (AFM) constructed an Unweighted Price Index supplemented by sub-indices for the four sectors: Banking and Finance Companies, Insurance, Services and Industrial. At that time 38 stocks were covered and a base value of 100 was stipulated on the opening session of January 1st 1980 for the Unweighted Price Index. The base was changed to 1000 as of January 1st 2004. As a result of a long statistical study, the AFM began in 1992 to calculate a Market Capitalization Weighted Price Index covering 50 stocks increased to 60 stocks in 1994, increased to 70 stocks in 2001 and to 100 in 2007.

Recently, as a result of the global development in the domain of the indices calculation, besides aiming to raise the capability of these indices to reflect market performance, the ASE constructed a new index that is based on free float shares, which provides a better representation of the shares' prices movement in the market without bias to large cap companies, thus limiting their impact on the index. The constituents of the ASE indices are reviewed and adjusted quarterly. Non-periodic adjustments can be made for stocks whose trading will be halted for a long time or permanently. (ASE website)

Generally, international markets are different in their trading environments and objectives. Nevertheless, we can find some similarities among ASE and PEX since trading is performed in JD currency and both focus on fairness, efficiency and transparency. The ASE market could be considered as one of international markets that enhance developing investment environment as well as allowing people to buy and sell securities in efficient ways. Further, data obtained on ASE price index support the investigation of causality relationship between PEX and ASE, which is important for investors and policy makers.

### 1.1.3 Tel-Aviv Stock Exchange (TASE):

Tel-Aviv Stock Exchange (TASE) is the third market that is considered in this study. It is located in Israel in the Middle East. It was founded in 1953 by a number of banks and brokerages. Since mid 1990 the Tel-Aviv exchange has been adapting the standards of the most advanced exchanges in the world. It aims at fulfilling a major role in the economy as well as enhancing economic growth. Tel-Aviv 100 index (TA-100) is a stock market index of the most highly capitalized companies listed on the TASE. The index began on January 1st 1992, with a base level of 100. The TA-100 index is one of the TASE's leading indices. The index consists of the 100 shares with the highest market capitalization that are included in the TA-25 and TA-75 indices. The TASE is a private company limited by guarantee. It is owned by its members, both banks and banking corporations, through which everybody may trade in the securities listed in the exchange.

TASE lists some 622 companies, about 60 of which are also listed on stock exchange in other countries. TASE also lists 180 exchange-traded funds (ETEs), 60 government bonds, 500 corporate bonds, and more than 1000 mutual funds. There are 29 members that make up TASE.

The major stock market indices of the TASE include: TA-25, TA-100, TA-75, TA Midcap, TA Composite, General shares and Convertibles, shares, convertible bonds, Warrants, Yeter Rest of shares, Yeter Rest of shares and Convertibles, Yeter 150, Mid Cap 30.

The TASE aims at promoting Israeli capital market through the provision of advanced infrastructure for securities and clearing, adhering to the standards of highest standards of excellence and guided by principles of market integrity. (TASE Website)

### 1.1.4 Long Memory in Stock Volatility, Long memory in Stock Returns, and Causality Relationship among Financial Markets

Investors invest in stock markets in order to achieve returns. So they always buy securities when prices are increasing because demand on securities is increasing, while they sell securities during prices decreasing stage because demand on securities is decreasing. This process cause stock prices to volatile across time periods. Indeed, volatility in stock prices is frequently investigated since it is associated with financial risk.

Volatility is related to upward and downward changes in stock market. In addition, characterizing the volatilities in stock prices as bull and bear phases is an important element to describe the behavior of stock market. If long memory is investigated in stock market volatility, then the test is for volatility persistence. So, volatility in bull and bear markets is investigated to indicate volatility persistence in these markets.

Some of empirical papers indicate that stock market volatilities are related to the business cycle (Gasarin and Trecroci, 2006), while others indicate that volatilities are related to bull and bear phases (Cunado et al., 2008). Further, Chordia et al., (2001) state that the different observed behavior in the stock market liquidity in bull and bear markets may be related with volatility. Moreover, they concluded that bull markets are subject to more investments and liquidity whereas bears markets are characterized by higher volatility and liquidity problems. Therefore, volatility has been considered across bull and bear stages and forecasted to detect its characteristics from financial time series.

Khan et al., (2010) argued that foreign investors are considered as positive feedback traders because they buy when the market increases and sell when the market falls. These actions result in upwards and downwards changes in stock prices at which investors realize returns or suffer losses. In particular, Dornbusch and Park (1995), Radelet and Sachs (1998), and Richards (2002) indicate that this process is viewed as destabilization because investors' sales will lead the stock market to fall further and their buys increase the stock market. Since the volatility tends to vary over time, assets holders always try to avoid possible financial losses (Schwert 1989). Because of risk and uncertainty associated with volatility, investors are likely to use analysis techniques to estimate and forecast future returns and avoid risk associated with stocks volatilities. Thus, investors try to expect the phases (time periods) when they decide to buy, hold, or sell. Therefore, investors are in need to time market in order to determine when they should buy at lower prices and when they should sell at higher prices.

Bull and bear markets are terms used to describe market conditions determine how stock markets are doing in general. That is, bulls and bears markets are a good way to describe changes in stock prices - upwards and downwards in stock prices. Bull and bear markets correspond to appreciating and depreciating in stock prices, respectively. Describing characteristics of bullish and bearish markets requires investigating stock volatility and its persistence during these stages. However, long memory is not only used to investigate volatility, but also used to investigate market efficiency at weak level.

Investigating long memory behavior or long range dependence in stock volatility enhance future predictability of stock returns. In addition, investigation of long memory behavior in stock returns indicates market efficiency. Lo. W. (1989) concluded from previous papers that the recent tests of efficient market hypotheses or stock market rationality hang precariously on the presence or absence of long-term memory. In the context of market efficiency, historical stock returns are autocorrelated enough to allow the prediction of future stock returns. In particular, Bilel and Nadhem (2009) stated that the question of whether or not financial markets are efficient in a straight line related to whether or not long-term dependence is present in stock returns. Some researchers considered market efficiency in financial markets along the time series, while other considered market efficiency during bullish and bearish markets.

The present study is an empirical study that depends on concrete prior studies about long memory in bull and bear markets since there is little work that have been done on investigating the PEX behavior and its characteristics along the past fourteen years. It also examines the causal relationship between PEX, ASE, and TASE to find the evidence of interdependency among those financial markets in the short and long-run. This study focuses on stock volatilities and stock returns as well as Causality relationship. Therefore; it attempts at answering these questions: (1) Does the PEX present periods of bullish and bearish phases? (2) Are bullish and bearish periods in PEX characterized by long memory in volatility? (3) Are PEX, ASE, and TASE efficient at weak level? Finally,is there a causal relationship between the three stock exchanges?

In the course of this study, we focus on identifying the characteristics of PEX bull and bear phases and extracting the behavior of the stock market volatility in these phases as well as investigating Granger causality between PEX, ASE and TASE. This exercise is performed using on financial time series data set about the PEX and ASE which captures daily price indices over the years 1997/8- 2011/12. In this regard, it adopts the 200-day moving averageto identify troughs and peaks in stock market indices. This technique is widely used by professionals to find bull and bear phases. It also uses significant estimation method for test of long memory behavior to find the evidence of long memory patterns in PEX bullish and bearish as well stationarity of time series.Added to that, the study seeks to test causality relationship between both markets by Granger causality tests. Consequently, this study will run E-views econometric software for statistical computing to maintain all tests on time series under examination. It is anticipated that the empirical findings of this study will provide policymakers and investors with policy recommendations that can play an important role for improving the performance of the PEX.

### 1.2 ProblemStatement

PEX is still young and lacking of Empirical studies focus on long memory behavior for stock volatilities using trading data from the PEXas well as no empirical studies are conducted to investigate market efficiency andcausality relationships among PEX and other exchange markets.However, the bull and bear markets are not figured out in the PEX.Nevertheless, there is one study investigating PEX efficiency at the weak-level but didn't employ long memory parameters to investigate market efficiency.

The number of investors who currently trade securities in PEX is about 75,000 investors. They perform daily transactions valued at an average of $2,000,000 per day. About 90% of those investors are small and may not invest on the basis of technical analysiswhich inreturn results in an inaccurate investment decisions. Rizik (2011) concluded that the reasons of investment losses in PEX were mainly because investors' education and experience were not quite adequate in this respect, whereas the reasons of investment profits were mainly experience, education, training, and consulting of financial analysts who adopt technical analysis to forecast future financial returns. At the same time, however,Palestinian investors actually need to understand the long term market trends from historical time series observations because bull and bear have considerable effect on their investments as well as determining what the market is doing when they are making their decisions.

Investigating long memory stationarity for the volatility process is an important area of research in the finance literature. Since there are no empirical studies investigating long memory behavior in volatility across bulls and bears in PEX, this study is likely to be the first one that examines persistence of volatility in PEX bulls and bears. It also reveals measurements of stock volatilities in both PEX bulls and bears.In particular,Maheu and et al. (2009) indicate that it is important to extract bull and bear from the data to analyze their properties and consider their use as input into investment decisions and risk assessment.

Toward that end, this study is to focus onexamining volatility during PEX bulls and bears and providinginvestors with precise identification of these stages. Kole and Dijk, (2010) stated that investors who actively manage their portfolios seek to invest in assets with bullish prospects and stay away from assets with bearish prospects, or even to go short in those. According with theory, volatilities in stock returns are associated with liquidity problems and uncertainty. Therefore, assets holders always try to avoid possible financial losses that can result from volatilities in stock prices.To properly follow such a strategy, the assets holders (Palestinian investors) needto have accurate identification and prediction ofPEX bulls and bears, but the academic literature doesn’t provide the required recommendations regarding identification of bearish and bullish periods in PEX and how the PEX has performed relative to other nearby financial markets, such as ASE and TASE.

### 1.3 Justifications of the Study:

Through this investigation in bull and bear phases in PEX, this study can help people with a better understandingof PEX bullish and bearish periods.The study is built on an investigation of long memory process for volatility process in financial time series because its existence supports market efficiency and predictability. Further, Investors are interested in thevolatility in stock prices during the holding period because they depend on capital gains for their returns as well as volatility presents opportunities to buy low priced stocks and sell overpriced stocks. Added to that, volatility is important issue and crucial to success in trading for investors. So, they need to acquire more precise understanding and accurate forecasting ofit. Accordingly, volatilities in stock prices are associated with risk and uncertainty. Candelon et al., (2008) stated that it is common sense that investors rebalance their portfolios by purchasing cheap stocks during bearish periods and selling expensive stocks when stock markets are bullish.

In particular, this study is likely toaid investors to identify and forecast risks associated with the stock volatility and it adopts statistical techniques to analyze bulls and bears characteristics which in turn can help investors to further improve the timing of their investment decisions and so generating more liquidity.

It is likely to be a real need for using trading data to develop an empirical study on how stock prices behave in both bull and bear phases. It will investigate PEX stock prices behavior since it facilitates translating of savings decision into investment decisions and therefore supporting economic growth. Bekaert et al., (2002) indicate that economic growth is related to financial development in developed countries.

Jones et al., (2004) found that the higher uncertainty and risk during bear markets together with a decline in equity prices and stock market liquidity could be related to the higher persistence volatility observed in the bear market. Investors need information about the estimation of bull and bear phases, and this information is important for investors to answer the following questions; 1- Are we in a bear market or in a bull market? 2- What is the probability for the market to turn into bear market? 3- Do the volatilities in bull market now represent increasing in stock prices or just correction? Added to that, it is likely tobe the first study aims atproviding important results and recommendations regarding measuring PEX stock volatilities and their risks in both bull and bear marketswhich are of potential interestto both policymakers and investors. In particular, Candelon et al., (2008) concluded that when the stock market bulls turn into bears, this can result in widespread liquidity problems and a credit crunch in the financial system. Thus monitoring the impact of stock market swings is also of potential interest to regulatory bodies caring about systematic risk and overall financial stability. Added to this, the study seeks to find evidence of the causality relationship between PEX and ASE since about half of the listed companies, namely, 24 companies adopt Jordanian Dinner for trading. Further, Palestinian economy highly depends on Israeli economy so it is plausible to investigate the causality relationship among PEX and TASE.

### 1.4 Hypotheses Formulation:

As mentioned above, this study looks atinvestigating the behavior of stock volatilities of Al-Quds index to detect long memory behavior in PEX bulls and bears in order to find evidence of volatility persistence.Added to this, it examines the causal relationship between PEX and ASE.Therefore, it investigates whether there is any evidence to support acceptance or rejection of null hypotheses thatthe volatility has no long memory stationarity and the testing whether or notStock market volatility present a different behavior in PEX bull and bear phases. Cunado et al., (2008) and Gursakal (2010) stated that the volatility is more persistent in bear market than in bull market. Therefore, it was concluded that the volatility is persistent in bearish periods rather than in bullish periods. Two hypotheses were developed regarding volatility and its persistence in PEX bulls and bears:

**Hypothesis 1**: Cunado et al., (2008) indicate that volatility tends to vary over time. So volatility can be estimated on the basis of long range dependence. Long memory behavior in time series can be defined as autocorrelation at long lags, of up to hundreds of time periods (Tolvi, 2003).The hypothesis regarding long memory is that more evidence for long memory will be found in the data. That is, PEX stock prices have long-memory properties;

- $H_0$: Time series for stock indices don't display long memory behavior, and the series are no longer covariance stationary, so $0.5 \leq d$; where d is the fractional differencing parameter,
- $H_A$: Time series of stock return for stock indices display long memory behavior, $0.5 > d > 0$.

**Hypothesis 2:** the presence of long memory stationarity in the stock returns supports that financial market is efficient at weak level. Bilel et al., (2009) stated that the ending of tests of efficient market hypothesis or stock market rationality as well depend precariously on the presence or absence of long-memory in the stock return series. Clearly, long memory behavior indicates stationarity in time series data, and so stock market is inefficient at weak level.

- $H_0$: PEX, ASE and TASEare not efficient,
- $H_A$: PEX, ASE and TASE are efficient.

Further, long memory behavior is going to be investigated in bull and bear markets. If the stock returns display long memory behavior in bull stage, the PEX is efficient in that stage.

- $H_0$: PEX isn't efficient during bull stage,
- $H_A$: PEX is efficient during bull stage.

If the stock returns display long memory behavior in bear market, then PEX is efficient in that stage.

- $H_0$: PEX isn't efficient during bear stage,
- $H_A$: PEX is efficient during bear stage.

**Hypothesis 3:** According to theory, the increased risk and uncertainty observed in bear markets make investors react to bad news more quickly, which add more volatility to the market. In this case *d bull* is less than *d bear*. So, the volatility is persistent in PEX bears rather than bulls;

- $H_0$: Volatility isn't persistent inPEX bear phases,
- $H_A$: Volatility is persistent in PEX bear phases.

However, in our study, we expect to find volatility is more persistent in PEX bull rather than bear markets, so in this case *d bull* is greater than *d bear;*

- $H_0$: Volatility isn't persistent in PEX bull phases,
- $H_A$: Volatility is more persistent in PEX bull phases.

To achieve the objective of examining the causality relationship between PEX and ASE, hypothesis 4 is formulated. Hence, on the basis of this, we can conclude whether PEX and ASE are being correlated.

**Hypothesis 4:**Testing causality between PEX, ASE and TASE, using Granger causality test, involves F-test to test whether or not available lagged information on ASE, PEX and TASE price indices have any significant effect on each other. If not, these markets don't Granger -cause each other.

This test considers whether or not X doesGranger -cause Y. If a variable X is found to be helpful for predicting variable Y, then a time series X Granger causes a time series Y and Ycan be forecasted by values of X. Therefore, we expect acausalrelationship between the three stock exchanges, PEX, ASE and TASE.

To capture causality between PEX and ASE, vector autoregression (VAR) models are used under two cases:

**Case 1:** $x_t = \alpha 1 + \sum_{i=1}^{p} \beta_i x_{t-i} + \sum_{j=1}^{q} \gamma_j y_{t-j} + \varepsilon_{x,t}$

- $H_0 : \square \beta_i = 0$
- $H_A : \square \beta_i \neq 0$

If the null hypothesis is rejected, X is said to Granger cause Y.

**Case 2:** $y_t = \alpha 2 + \sum_{i=1}^{p} \theta_i \, y_{t-i} + \sum_{j=1}^{q} \phi_j \, x_{t-j} + \varepsilon_{y,t}$

- ***$H_0$: □$\theta_i = 0$***
- ***$H_A$: □$\theta_i \neq 0$***

If the null hypothesis is rejected, Y is said to Granger cause X. In addition, if the null hypotheses are rejected under the two cases, there is mutual causal relationship between X and Y, otherwise there is no feedback relationship among two market

**1.5Objectives of theStudy:**

The study aims at investigating the long memory stationarity for the volatility process and its persistence in PEX bull and bear stages in order to find evidence that PEX is efficient. So, the study investigates the characteristics of volatility during the PEX bulls and bears over the period 1997 to 2011. Accordingly, to test thestudy hypotheses, this research will observe and investigate if stock volatility presents a different behavior in bulls and bears PEX phases.Later on, we will study the causal relationship between PEX andASE for the same period. Several specific research objectives can be achieved in this study, thoseare to:

1. Detect bull and bear phases in the PEX;
2. Investigate the long memory behavior in volatility and stock returns in financial time series ;
3. Determine whether or not the stock volatility is persistent in both bullish and bearish PEX;
4. Investigate market efficiency for the PEX, ASE and TASE and;
5. Investigate the long run causal relationship between PEX, ASE and TASE.

## Chapter2

## Theory and Literature Review

### 2.0 Introduction

The term volatility and its persistence in stock prices are frequently examined in the Global financial markets such US, Turkish, Thailand, Euro, and Asian markets. As a consequence of increased interest in stock markets, market trends, and volatilities in stock prices and its persistence in bull and bear markets have been extensively investigated and several econometrics techniques were employed to measure that. In particular, long range dependence is widely used in financial literature to measure volatility persistence in bull and bear markets and to measure market efficiency.

The overall findings of different studies related tovolatility focused on long memory stationarity in stock returns for volatility persistence.They tried to detect long memory patterns by using long range dependence measures (parameters) during bullish and bearish periods.See for example, Candelon et al., 2008; Ding et al., 1993; Elder and Jin, 2007; Cunado et al., 2008; Gursakal, 2010; Maheu and Mccurdy, 2000; Enders, 2010 and Triacca 2010.Further, if stock returns have long memory behavior, the stock returns will have positive autocorrelation. Then, financial time series support market efficiency and predictability. Therefore, the researchers have used long memory in investigating the stock returns to find evidence of efficient market hypothesis, namely, Mills 1993; Lobato and Savin, 1998; Tolvi, 2003; Caporale and Gil-Alana, 2004; Lux and Kaizoji, 2007; and Gil-Alana 2006.However, studies focused on the existence of long memory in stock returns during PEX bulls and bearsand PEX market efficiencyare still limited. However, Awad and Daraghma, (2009) examined the efficiency of PEX using daily observations of price indices from 1998- 2008, and they showed that the serial correlation tests revealed that the daily returns are inefficient at the weak from, as a result, PEX isn't efficient at the weak-level, but they didn't employ long memory behavior to test PEX efficiency.

Added to that, economic and finance literatures consider the relationship between stock markets and among economic variables themselves. Therefore, this relationship is going to be investigated among PEX and ASE. Clearly, we follow previous empirical studies that have investigated this relationship and the econometrics methods that have been used.

As mentioned above, this study is likely to investigate fourmain hypotheses regarding long memory behavior in financial time series, market efficiency, volatility persistence, and causality relationship among PEX, ASE, and TASE. It is also divided into three sections: The first section of this study shows long memory behavior in stock to measure its persistence during PEX bulls and bears phases. The secondis about investigating long memory in stock returns to measure market efficiency of PEX, ASE, and TASE. Finally, long term causality relationship between PEX, ASE and TASE is investigated. So this study relies on several previous studies and adopts econometrics techniques in this regard in order to achieve what it aimed at.

## 2.1 Related Literature:

### 2.2.1 Long memory in VolatilityduringBull and Bear Markets:

The behavior of stock prices listed in global financial markets has been investigated in numerous empirical studies and it is at the center of academic and business attention and most of these studies have focused on measuring stock market volatility. In particular,characteristics of long memory behavior are investigated during bull and bear markets to find the evidence of volatility persistence during these phases.

Volatility refers to variances in stock prices over time and it is known that stock prices experience periods of high and low volatilities. Volatility persistence defined by Triacca (2010) as a stylized statistical property of financial time series data such as exchange rates and stock returns. Garvey (2010) mentioned that during a market downswing, volatility increases and conversely, as asset prices increase volatility become muted. Added to that, measuring volatility was extensively considered by Candelon et al., (2008) who argued that a more statistical analysis to measure volatility in bulls and bears markets can help investors to further improve the timing of their investment decisions. Investors should consider the probability for risk diversification across bull and bear phases, not on a daily or monthly basis. That is, they should consider correlations over the duration of a typical stock market cycle for long time periods in order to predict future returns.

Indeed, this study not only seeks to find long memory property in the volatility of stock market during bull and bear phases of PEX, but also it tries to investigate long memory behavior in stock returns to find evidence of market efficiency.

In particular, Wu, Haibin (2006) described long memory process as a stochastic process whose autocovariance function decays very slowly as the distance between observations tends to infinity. That is, long memory is a property of certain stationary stochastic processes. Also, Sibbertsen (2004) indicates when the difference parameter is more than 0 and less than 0.5, and then observations far away from each other are still strongly correlated and therefore long-memory time series allow for long-term forecasts. Further, Tolvi, (2003) indicated that long memory in time series can be defined as autocorrelation at long lags, of up to hundreds of time periods. Long memory in volatility occurs when the effects of volatility shocks decay slowly which is often detected by the autocorrelation of measures of volatility, such an absolute or squared return. The ability to forecast future returns corresponds to market efficiency. Typically, long memory in volatility not only point to market efficiency, but also it is adopted to indicate volatility persistence during bull and bear markets. In financial literature the upwards and downwards trends in stock prices correspond to “bulls” and “bears” markets respectively.

Bull and bear animals like the markets that bear their names. The origin of bull and bear terms comes from the notion that animals behave in different way when they attack their opponents, namely, bull and bear animals. That is, a bull animal will thrust its horn up into the air, while a bear will swipe its paws down. Typically, investors consider market upward trends as bull stage, while they consider downward trends bear stage. Academicians, in this sense, tried to find the characteristics of those trends at each stage.

Historically, the term bull and bear have been used since 1900s. The financial market crash in 1929, presents a good example of the great bear market in the history. One of the most popular examples that identify how bull and bear markets behave is Standard and Poor’s 500 Index (S&P 500). Barsky and De Long (1990) indicate that major long-run stock price fluctuations, however- episodes like the major bull markets of 1949-1966 or 1921-1929 and the major bear markets of 1929-1933 or 1973-1975 – are larger than and appear unconnected to fluctuations in realized fundamental values.  The US market entered bull and bear phases two times since 1990. Because of financial crisis in 2008, the US market entered intobear phase but it is increasing since 2009.

In other words, bull and bear are termsused to describe market directions and general behavior. However, stock market behavior was initially investigated by Charles Dow who established the Wall Street Journal in 1900. Dow tried to investigate stock market behavior and how the market could be used to measure the health of the economic environment.

In particular, bull and bear phases are a terminology used to describe increases (upwards) and decreases (downwards) in stock prices respectively. Ramos et al., (2007) stated that bulls markets correspond to a generalized upward trend (positive returns) and bears markets correspond to periods of a generalized downward trend (negative returns). If the prices are increasing, then we will enter bull phase. While if the prices are decreasing, then we will enter bear phase. That is, bull phase is located between trough and peak points, because prices are going up, whereas bear is located between peak and trough because prices are going down. Maheu and McCurdy (2000) stated that as the bull market persists, investors could become more optimistic about the future and then they wish to invest more in the stock market which indicates that the probability of switching out of the bull market decreases with duration. Thus bulls and bears markets are common ways to describe changes in stock prices. For instance, Practitioners use a general rule: if the stock market has fallen more than a 20% this is identified with *bear* phase, on the contrary if the stock market has increased more than a 20% this is called *bull* phase (Biscarri et al., 2004). On the other front, causality relationships between stock exchanges are considered in the international finance literature and it is fundamentally linked to economic growth.

The importance of stock volatility stems from the risk associated with it. Bull markets are characterized by confidentiality and higher probability of returns, whereas bear markets characterized by higher probability of losses. In bull markets, investors take advantage of increasing prices by buying early in the trend and then selling them when they have reached their peak. In addition, any losses in these stages are minor and temporary because upward trend will cancel losses resulting from short term corrections. On the other hand, in bear markets there a higher chance of losses because stock prices are continuously losing their values as well as more volatility.

Commonly, more volatility in stock prices makes securities more risky. Researchers have observed upwards and downwards trends in stock prices (volatilities) and therefore they tried to investigate the behavior of long memory in volatility of daily returns. Tolvi (2003) indicated that the potential presence of long memory in stock market returns has been a popular research topic, although the results of these studies have been mixed. Rauing and Scharler (2010) stated that the economic uncertainty associated with financial crashes (periods where the prices of many stocks traded in the market suddenly drop dramatically) is typically reflected in high levels of stock market volatility. That is, increased volatility results in higher uncertainty about future economic conditions. Besides that, Maheu et al., (2009) stated that the positive and negative low frequency trends have been labeled as bull and bear markets respectively. If these trends do exist, then it is important to extract them from the data to analyze their properties and consider their use as inputs into investment decisions and risk assessment. As such, investigating bull and bear properties can be used to improve investors' cash positions and help them to sell, hold or buy.

Clearly, Casarin and Trecroci (2007) investigated the stock market volatility behavior and related it with the business cycle. On the other hand, other researchers such as Cunado et al., (2008) related stock volatility to behavior of bulls and bears markets.

Investors and financial analysts use two methods to analyze securities to make investment decisions; Fundamental analysis and technical analysis. Fundamental analysis involves financial information analysis in order to measure its profitability, liquidity and therefore, make predictions regarding its financial position, whereas technical analysis attempt to study stock price movements in the market on the basis historical stock prices in order to predict future stock prices. So, Dow Theory adopts technical analysis tools, charts, and techniques in attempt to discern long-run and short-run trends in stock market prices. In particular, Bodie et al., (2008) stated that Dow Theory posits three forces simultaneously affecting stock prices:

1- Primary trend is the long-term movement of prices lasting from several months to several years.
2- Secondary or intermediate trends caused by short term deviations of prices from the underlying trend line. These deviations are eliminated via corrections when prices revert back to trend values.
3- Tertiary or minor trends which are daily fluctuations of little importance.

The primary trend may be upward or downward lasting for months, but intermediate trends result in short lived-market increases or declines lasting a few weeks. The intraday minor trends have no long run impact on price. Traders, in this sense, use technical analysis to find trend in the market stock prices.However, professionals and academicians use bull and bear terms to express upward and downward changes in stock prices respectively.They also consider long term trend to be the determinant of bull and bear markets because short term trends only represent market corrections. That is, length of time period in which stock price is continuously increasing or decreasing determines whether the financial market is in a bull or a bear stage. Although bull and bear stages are used to describe market trends and they are marked by the direction of stock prices, the characteristics of each stage have been investigated, namely, characteristics of stock price volatilities in each stage.

Stock prices movements along time period is associated with market sentiment so investors always try to anticipate movements in stock markets using fundamental and technical analysis. During bull markets, market sentiment is bullish since investors anticipate upward price movements in stock prices. On the other hand, if investors expect downward trends in stock prices, the market sentiment is bearish and they are in a bear market. This behavior called Momentum Strategy that based on the psychological aspect trading. Coe and Laosethakul (2010) argued that Momentum Strategy assumes the pattern of trading based on events or economic data will continue for a period of time. If patterns of reaction occur, then stock prices don't follow a random pattern, as has been statistically shown in the past. Since the movements in stock prices could be driven by investors' anticipation, market sentiment is subject to financial announcement, economic events, and technical analysis.

Chan et al, (1996) and Hong and Stein (1998) found evidence of momentum trading with regards to analysts' earnings predictions and the subsequent earnings announcements by firms. In other words, momentum strategy is on the contrary to random walk theory, because the movements in stock prices are based on investors' anticipations.

Chauvet and Potter (2000) stated that in stock market terminology, bull (bear) market corresponds to periods of generally increasing (decreasing) market prices. This definition of bull and bear markets seems to correspond to that introduced by Biscarri and Gracia (2004); bull and bear phases in the stock market have been usually defined as periods of generalized upward trend and generalized downward trend in stock prices, respectively. Because of their characteristics, a bear market is an opposite of bull market. Sometimes, stock prices are increasing until reach the top (peak) point which is the highest price in the cycle indicating bullish market. After that, prices start to decrease until they reach trough point indicating the bearish market.

The percentage change in the stock price index from phase to another and the length of time period indicates the startor end points of bullish and bearish periods. In this regard, Kole and Dijk (2010) indicated that bull markets are commonly understood as prolonged periods of gradually rising prices, while bear markets are characterized by falling prices and high volatility than during bull markets. During bullish periods investors tends to expect increasing stock prices which in turn increase the number of shares traded. On the other hand, bearish market characterized by low confidence and investors don't expect high returns and so prices decrease. Further, Jones et al. (2004) provide two possible definitions for the higher volatility during bear markets. First, the increased uncertainty and risk observed in the bear market may generate a decline in equity value. Second, in the context of increased uncertainty investors react to bad news more quickly, adding then more volatility to the market. In addition, Cunado et al., (2009) stated that bulls markets tend to attract more investors while bears markets, on the other hand, could be subject to falling liquidity. Accordingly, investors prefer to invest during bull market rather than in bear markets. Kole and Dijk (2010) conclude that bull and bear markets are key elements in analyzing and predicting financial markets. Investors who actively manage their portfolios seek to invest in assets with bullish prospects and stay away from assets with bearish prospects or even to go short in those.

According to empirical works, the increased uncertainty and risk observed in the bear market may generate a decline in equity value. The risk is widely considered in financial literature. The risk is the possibility of financial losses. It is also the chance that an investment's actual return will be different than expected. Bodie et al., (2008) stated that if you want higher expected returns, you will have to pay a price in terms of accepting higher investment risk. If higher expected return could be achieved without bearing extra risk, then it will be rush to buy the high return assets, with the result that their prices will be driven up.

Schroeder et al., (2005) stated there are two types of risk: unsystematic risk and systematic risk. Unsystematic risk is that portion of peculiar to a company that can be diversified away. Systematic risk is the nondiversifiable portion that is related to overall movements in the stock market and is consequently unavoidable.

Empirical work indicated that unsystematic risk can be reduced by adding securities to a portfolio. Also, unsystematic risk is virtually eliminated in portfolios of thirty to forty randomly selected stocks. Therefore, high risk securities must be priced to yield higher expected returns than lower risk securities in the marketplace.

A simple equation can be formulated to express the relationship between risk and return. This equation uses the risk free return as its foundation and is stated:

$$R_s = R_f + R_p$$

Where $R_s$ is the expected return on a given risky security, $R_f$the risk-free rate, and $R_p$is the risk premium.

Since investors can eliminate the risk associated with acquiring a particular company's common stock by purchasing diversified portfolios, they are not compensated for bearing unsystematic risk.

The measure of the parallel relationship of a particular common stock with the overall trend in the stock market is termed beta (β). β may be viewed as a gauge of a particular stock' volatility to the total market. A stock with a β of 1 has a perfect relationship to the performance of the overall market as measured by a market index. Stock with a β of greater than 1 tend to rise and fall by greater percentage than the market, whereas stock with a β of less than 1 are less likely to rise and fall than the general market index over the selected period of analysis.

The previously stated equation can be restated to incorporate β. Recall that we stated the risk-retrunequation as: $R_s = R_f + R_p$

Restating his equation to incorporate β results in

$$R_s = R_f + P_s(R_m - R_f)$$

Where;

$R_s$: The stocks' expected return

$R_f$: the risk free rate

$P_s$: the expected return on the stock market as a whole.

$R_m$: the stock's bets, which is calculated over some historical period.

Since stock prices move in different directions along the time period and they move from bull stage to a bear stage and vice versa, the study of bull and bear behavior requires identifying peaks and troughs in the series. So, to identify bull and bear phases, we need to describe turning points in the stock prices. Pagan and Sossounov (2003) defined bull and bear markets in two ways; the first describes bull (bear) as contractions (expansions) in the business cycles, while the second, by emphasizing extreme movements.

Several empirical studies employed Bry and Boschan (1971) as an algorithm to identify these points and then locating and analyzing bull and bear phases in the time series. It helps us to locate starting and finishing points of the bull and bear markets. Using Pagan and Sossounov (2003) algorithm which is a modified version of Bry and Boschan (1971) algorithm, they located the turning points (peaks and troughs) in the series and identified bull and bear phases. Typically, Cunado et al., 2008; Gursakal, 2010; Pagan and Sossounov (2003); Hurvich and Soulier (2002); Biscarri and Gracia (2004) have employed that model to identify bull and bear stages.

The main issue being investigated is to find evidence of long memory behavior in the volatility of financial time series. Further, financial time series are divided into bull and bear stages to investigate long memory in each stage.Recently, Gursakal (2010) and Cunado et al., (2008) have found that the absolute and squared return present long memory behavior for the volatility processes. Added to this, Hurvich and Soulier (2002) concluded that many recent works have discussed the phenomenon of long memory in the volatility of financial and economic time series and they employed two models to capture long memory volatility; FIGARCH and long memory stochastic volatility model.

Most of the studies focused on an investigation of bull and bear behavior and they have concerned with the following issues: identification of market phases which involves locating the turning points (peaks and troughs) in the series, describing bull and bear phases in which the behavior of stock prices is investigated. These phases are compared against each other, and then the results are formulated regarding volatility and its persistence in bull and bear phases. More specifically, it is necessary to show how these studies dealt with describing bull and bear markets across international financial markets. So, we should focus on the methodological side including how turning points in the series are being located, describing bull and bear regimes, data used, and how the results are being statistically interpreted and formalized.

Giraitis et al., (2003) stated that various tools for detecting possible long memory in time series were proposed in the econometrics and statistical literature. Geweke and Porter-Hudak (1983) introduced a semi-parametric procedure, whereas following the work of Hurst (1951), Mandelbrot and Taqqu (1979) and others developed a nonparametric Rescaled range statistic type test, which has become widely applicable in empirical literature.

In particular, Cunado et al., (2009) studied stock market volatility in both bull and bear markets using daily prices indices from 1928 to 2006. Depending on long memory techniques, they concluded that the estimates of d are between 0 and 0.5 implying long memory stationarity for the volatility processes, which proved that volatility is more persistent in the US bear market than in the bull market. It means that there are wider swings in stock prices in bear market than bull market, which offers more opportunities for trading of assets.

Biscarri and Gracia (2004) conducted a study about bull and bear characteristics of Spanish stock using monthly price indices over the period of 1941-2002. They used four measures of bull and bear; volatility, duration, amplitude, and the shape within the phase. The results regarding bull and bear phases have been compared across international financial markets and across phases. The paper used the nonparametric approach to detect the expansionary and contractionary phases of the stock market. They found that bull phases are similar across countries in terms of volatility and duration. Bull phases, on the other hand, are quite different in terms of duration and the shape of the phase. The results regarding Spanish bull and bear markets agree with those of international stock markets in developed countries.

Clearly, Hurvich and Soulier (2002) tested long-memory in the volatility of financial time series. In their study, two models have been employed to capture this phenomenon; FIGARCH and long memory stochastic volatility (LMSV) models. More specifically, the study used econometrics techniques to find evidence of long memory in volatility depending on squared stock returns. This process is important as long range forecasts of volatility are crucially altered by the presence of long memory in volatility. These procedures are similar of those used by Lobato and Savin (1998,) Surgailis (2000), and Duo and Hurvich (2001).The study adopted log periodogram computed from the logarithms of the squared returns of the series and concluded the estimator is asymptotically normal with the same asymptotic mean and variance that would hold if the series were Gaussian.

Pagan and Sossounov (2003) provided a framework for analysis of bull and bear market characteristics. Their study located the turning points in the market in order to identify bull and bear market phases using monthly data for the equivalent of S&P 500 for the USA over the years 1835/1-1997/5. To detect turning points, the study adopted Bry and Boschan algorithm (1971). Statistical models that have been adopted are candidates for the data generating process (DGP) of the capital gains-random walk, generalized autoregressive conditional heteroskedastic(GARCH) and fractionally integrated generalized autoregressive conditional heteroskedastic (FIGARCH) models. These models were used to investigate bull and bear characteristics. The study found that pure random walk provides as a good explanation of bull and bear markets as the more complex statistical model.

Gursakal (2010) investigated the characteristics of bull and bear phases. His study aimed to detect long memory behavior for the volatility processes. The study used data set of daily closing prices of Istanbul Stock Exchange (ISE) National 100 index series from 1987-2007. It used Pagan and Sossounov (2003) algorithm which is the modified version of Bry and Boschan's (1971) algorithm. It also estimated long memory behavior by using the absolute and squared returns in the ISE. The study used wavelet methods for estimating long term memory parameter of d which provide more robust estimates of d than the other methods. The estimates of d are between 0 and 0.5 implying long memory stationarity for the volatility processes. The results showed that volatility is more persistent in the bear market than in the bull markets.

As mentioned above, some researchers relate volatility in stock prices with upwards and downwards trends in stock market. This notion motivated researchers to investigate volatility persistence in bull and bear markets. They found that stock market volatility is higher during bears markets than in bulls markets (Gursakal, 2010; Edwards et al., 2003; Jones et al., 2004; Biscarri and Garcia, 2004; Gonzalez et al., 2006; Cunado et al., 2008) and Maheu and McCurdy, (2000) indicated that bull markets have a declining hazard functions although the best market gains come at the start of a bull market and volatility increases with duration in bear markets. In addition, Chordia et al., (2001) suggest that the different behavior observed in the stock market liquidity in bull and bear markets may be related with volatility. Therefore, Cunado et al., (2009) concluded that the higher uncertainty and risk during bear markets together with a decline in equity price and stock market liquidity could be related to higher persistence volatility observed in the bear markets. Thus, bull markets tend to attract more investors while bears markets, on the other hand, could be subject to falling liquidity.

Generally, the mentioned studies investigatethe long memory behavior of volatilities in stock prices within bull and bear phases. In addition, they foundevidence that the volatility is more persistent in the bear markets than in the bull markets. In addition, some studies suggested long memory stationarity for the volatility process across bull and bear markets. Inthis study, we investigate long memory in PEX price indices to obtain comparable results. It also comes as follow-up step to examine their findings in PEX price indices.

### 2.2.2 Long Memory in Stock Returns and Market Efficiency:

In addition to the investigation of long memory in volatility during bull and bear phases, researchers focused on measuring long memory in time series stock returns to find evidence of market efficiency. Thestrong form of efficient market hypothesis states that newly generated information is sufficiently to be reflected in stock prices, and therefore, stock prices follow random walk process. In addition, when the time series stock returns observations illustrate significant autocorrelation between them, then they violate market efficiency.That is, time series observations are dependent on time, so stock returns prediction is possible. So, long memory behavior indicates that observations far away from each other are still strongly correlated. That is, long memory behavior in stock returns violets the weak form hypothesis, because long memory structure of time series allows for long term forecasts. On the other hand, the weak form of efficient market hypothesis indicates that historical stock returns aren't efficient to predict future asset returns. Tan et al., (2010) concluded that the long memory property indicates that current data correlated with all past data to varying degrees and casts doubt on the Efficient Market Hypothesis(EMH). Indeed, some researchers applied long memory approaches to test market efficiency and they found the evidence for the EMH, such as, Lobato and Savin (1998) and Caporale and Gil-Alana (2006). Clearly, in this study, long memory behavior is going to be investigated in volatility during bull and bear stages along long term financial time series to find evidence of EMH.

One of the characteristics of the long memory behavior in stock returns series is the possibility of predictions because investors can use technical analysis to establish buy and sell decisions. However, the weak form of EMHimplies that price returns differences are insufficient to develop trading rules to take advantage of historical price patterns (Elton and Gruber, 1995).Undoubtedly, when the stock markets returns that far away from each other are still correlated, then financial market isn't efficient. However, the absence of long memory behavior in stock returns corresponds to efficient market hypothesis. Consequently, the historical stock returns are useless for prediction of future stock returns. The results of prior empirical studies, in this respect, come at two aspects: some showed that there is long memory in stock prices which indicates that the market isn't efficient, whereas other support the absence of long memory behavior and therefore, they supported random walk theory.

In particular, Dryden (1970), Cunningham (1973), Kalv et al., (2004) and McMillan (2006) supported that result and therefore accepted the weak form of efficient market hypothesis. On the other hand, other empirical studies examined efficient market hypothesis depending on the presence of long memory stationarity in the stock returns series, namely, Green and Fielitz (1977), Chen (1996), Volos and Siokis (2006), Olan (2002), Yamasaki et al., (2005), Wang et al., (2006), Bilel et al., (2009), and Yalama et al., (2011). Several studies investigated long memory behavior in stock market returns, including stock exchange markets (Cheung and Lai, 1995), in bond markets (Fung and Lo. 1993), in commodity markets (Corazza et al., 1997). Besides that, Tang and Shieh (2006), Baillie et al., (2007), Cunado et al., (2008) and Gursakal (2010) investigated long memory behavior for volatility process in stock prices.

As mentioned above, long memory process in financial time series is stochastic process whose autocovariance function- is used to estimate the dominant periods in the time series - decays very slowly as the distance between observations tends to infinity. Further, Bilel (2009) stated that if stock market returns prove long memory, they illustrate significant autocorrelations between observations habitually broken up in time. Also, when the time series are dependent over time, the historical realizations can facilitate the predication of future returns, which leads to profits. In addition, Gursakal (2010) reported that distant observations will be positively autocorrelated if returns have long term memory structure. In this case past returns can be used for future predictions and this calls into question the validity of the efficient market hypothesis. Therefore, this question is crucially related to long memory in stock returns.

In addition, parameter d indicates long memory process in stock returns when it is between 0 and 0.5. So, studies investigated long memory in stock markets have used different methods to estimate d. Green and Fielitz (1977), Bilel et al., (2009), Yalama et al., (2011) and Sibbertsen (2003), Aydogan and booth (1988), Olan T. Henry (2002), and Disario et al., (2008) tested for long memory behavior in stock returns using rescaled range statistic (R/S) and they found that the volatility series are characterized by long memory and the distant observations of the series are associated with each other. In particular, Kang et al., (2005), Wang et al., (2006) and Yoon (2007) used a modified R/S statistic and they found that long memory not present in time series stock returns. Another approach used is Geweke-Porter-Hudak(GPH) which is the approach of Geweke and Porter-Hudak (1983). Tan et al., (2010) and Mills (1993) used GPH approach and found a weak evidence of long memory in stock returns.

Further, Gursakal (2010) estimated long memory parameter by discrete Wavelet Transform method. Further, Lobato and Savin (1998), Gil-Alana (2003), Cotter (2005), and Elder and Jin (2007), used squared returns to measure stock market volatility and its persistence, while Bollerslev and Wright (2000), Gil-Alana (2005), and Sibbertsen (2004) used absolute returns to measure volatility, and therefore they found the value of parameter of difference d to indicate long memory in volatility in financial time series. However, Cavalcante and Assaf (2004), Cotter (2005), Elder and Jin (2007), Cunado et al, (2008), and Gursakal (2010) used both squared and absolute return for that purpose.

However, several studiesused unit root test to find evidence of market efficiency, namely Kawakatsu and Morey (1999), Narayan(2006), Narayan and Prasad (2007), Balvers et al., (2009), Qian et al., (2008) and Awad and Daraghma (2009). Although some of them support market efficiency, others didn't find evidence of market efficiency and therefore, support the weak form of efficient market hypotheses.

In brief, there are several studies that used a number of methods to find the evidence of market efficiency as well as testing for long memory persistence in time series stock returns. Some of them supported market efficiency, while others violated it on the basis of these procedures. This study, in this respect, uses R/S for simulating long memory and estimating the long memory parameter of d.

### 2.2.3 Causality amongStock Markets:

By the introduction of the advanced technologies and the emergence of open economies, investors are finding easy access to international stock markets. This allows investors to invest their funds in local and foreign financial markets and wherever they find investing more profitable. This process could create interdependency relationship among international financial markets in the short and the long run, which in turn activate multi-lateral interaction among financial markets. For example, many empirical studies investigated causality between international stock markets and it was found that international stock markets have become increasingly interdependent; especially USA financial markets have an important impact on the majority of financial markets.

Sometimes, changes in stock prices listed in a stock exchange may be affected by price changes in another stock exchange. Therefore, the causality relationship is investigated to determine whether or not stock exchanges are correlated and affect each other. Also, the causality relationship assumes a relationship between two variables, the first is cause and the second is effect, where the second is a consequence of the cause.

Having long memory behavior tested, it is applicable to investigate whether or not PEX, ASE and TASE cause each other or just correlated. Obviously, in this section, we test for linear and non-linear Granger causality between PEX, ASE, and TASE. This test depends on examining causality relationship between the three markets from 2000 to 2012. Many studies were prepared on this subject and they found mild-to-strong causal relationship between stock exchanges. So, we have employed Granger causality model to test the causality relationship between PEX, ASE and TASE.

Beine et al, (2008) examined the linear and non-linear Granger causality between the French, German, Japanese, UK, and US using daily stock index returns from 1973 to 2003.They found that the causality increased after 1987 and there is a bi-directional nonlinear causality between daily returns. To check for spurious nonlinear causality, they filtered out heteroskedasticity using a FIGARCH model. The dramatic decrease in the number of significant nonlinear causality lags confirms that heteroskedasticity played a major part in the previous findings. We then check if a few structural breaks can explain the remaining nonlinear causality. They found that a large number of nonlinear relationships vanish when they accounted for structural breaks, whereas linear causality remained.

Tudor (2011) investigated the causality between stock exchanges analyzed the evolution of linkages and causality between six Central and Eastern European (Bulgaria, Czech Republic, Hungary, Poland, Romania, Russia) and the USA stock exchanges. He found that the correlation between the US market and the CEE markets has increased significantly during the recent financial crisis, while before the crisis the US market Granger causes the Bulgarian, Czech and Hungarian, Polish, and Romanian stock markets.

Further, Zhou (2009) studied the relationship between stock exchanges in Shanghai, Hong Kong and US and found that the impact of the US market on the Hong Kong market is rapidly weakening, while the impact of the Shanghai market on the Hong Kong market is increasing.

In addition, Huyghebaert et al., (2010) examined the integration and causality of interdependencies among seven major East Asian stock exchanges before, during, and after the 1997-1998 Asian financial crises. They used daily stock market data from July 1, 1992 to June 30, 2003 in local currency as well as US dollar terms. The study revealed that the relationships among East Asian stock markets are time varying. While stock market interactions are limited before the Asian financial crisis, they found that Hong Kong and Singapore respond significantly to shocks in most other East Asian markets, including Shanghai and Shenzhen, during this crisis. After the crisis, shocks in Hong Kong and Singapore largely affect other East Asian stock markets, except for those in Mainland China.

Kumar (2010) analyzed correlations between South Asian Stock markets (India, Sri Lanka, Pakistan, and Bangladesh) and reported weak interdependency between these markets and global stock markets. Also, Booth et al., (1997)investigated the relationship between Scandinavian Stock markets and the study showed that the stock markets exhibit interdependencies both in term of price and volatility transmission.

However, several studies investigated causality relationship rather than relationship among stock exchanges, namely, between stock price returns and volatility (Koulakiotis et al., 2006); investments and stock market returns (Khan et al., 2010); and stock market and macroeconomic variables (Abu-libdeh and Harasheh 2011, Sahu and Dhiman 2011, Khan et al, 2010).

To conclude, the Granger causality relationship between international stock markets is highly considered in the financial literature. All the empirical studies being conducted in this respect employed correlation and Granger causality techniques to find the evidence of causality relationship. Meanwhile, the empirical findings found that interaction among stock markets have become increasingly interdependent.

## Chapter 3

## Research Methodology

### 3.0 Introduction

In our study, we used daily stock values of Al-Quds index, ASE index, and TA-100 index to measure volatility, market efficiency as well as causality relationship. Time series observations of Al-Quds index will be divided into bull and bear phases using 200-day moving average.we adopt easy ways to find evidence of long memory in the financial time series, namely Rescaled Range statistics. Further, it adopts Augmented Dickey-Fuller (ADF) and Philip Person (PP) to investigate market efficiency at weak level. Finally, Correlation and Granger causality models are used to investigate causality relationship between the three markets. As mentioned above, these techniques are widely used in the financial literature and their formulism will be presented in this section.

### 3.1 Scope of the Analysis

In the context of this study, we will undertake and apply various econometrics tests to investigate bullish and bearish periods in PEX and market efficiency, and to measure the volatility in each period depending on cyclical daily financial time series data[1] following an approach similar to that of Cunado et al., (2008), Gursakal (2010), Biscarri and Gracia (2004), Pagan and Sossounov (2000), Gonzalez et al., (2006), Candelon et al., (2007) and Khan et al., (2010). Many economic time series data don't have a constant mean and most exhibit phases of relative tranquility followed by periods of high volatility (Walter Enders, 2010). As such, the study employs specific

[1]A time series data is a sequence of numerical data in which each item is associated with a particular instant in time (Maddala, 1992).

econometrics models that can deal with time series data to determine whether the data are stationary or non-stationary. And then, volatilities in bull and bear markets will be modeled in order to investigate the behavior of volatility as well as market efficiency. Further, this study adopts correlation and Granger causality models to investigate short and long run interdependency relationships between PEX, ASE, and TASE.

### 3.2 Data

The series are  a good candidate to be GARCH (generalized autoregressive conditional heteroskedastic) process; so as we can clearly clarify periods in which there are only small changes in the series and others where there are clusters of large increases and decreases in the index (Walter Enders, 2010). Time series always represent periods of increases and decreases in stock returns with constant or non-constant variances. If they are followed by constant long-run variance, then we are concerned with short-run heteroskedasticity.

Stock price are always observed at daily, weekly and monthly manners and we then have time series data. The data used in this study consisted of time series of daily closing values of Al-Quds Price indexover the study period from 1997/8 to 2012/3.This period is selected because the data includes all observations of daily closing values since PEX has been established till 3/2012. Therefore, the study undertakes the daily data because it allows measuring of volatility and delves more into the characteristics of PEX bull and bear markets. However, the study uses time series data over the period from 2000/1 to 2012/3 to investigate causality relationship between the three stock markets. In addition, the daily data helps us to test long memory behavior in stock returns for market efficiency. In particular, Khan et al., (2010) showed that the results from daily data are more precise and are better able to capture the lead-lag dynamics throughout stock prices.

In finance, the survivorship bias is an important issue to take into account when analyzing past performance. This term is widely considered in the fund industry whereby the mutual fund companies with poor performance will be dropped because of poor results or low asset accumulation. Thus, a mutual fund company's selection will include only those that have been successful in the past. The exclusion of failed companies results in skewed findings in a study and leads a reader to believe that a study shows a good picture than it really does. With reference to PEX, there are no companies left the market over the past period from 1997-2012, so we conclude that the PEX has not failed companies. Accordingly, the PEX is also suffering this problem of survivorship.

Then, the data is used to find evidence of long memory behavior in stock returns and for volatility process.The data were retrieved from the PEX the ASE and the TASE websites. The three markets PEX, ASE and TASE are located in Palestine, Jordanand Israel, respectively. Moreover, the data includes all daily observations along the stipulated time period on a basis of 5 day a week. However, there are some observations being missed along the time series. Greene (2012), stated that there are several possible cases to consider, depending on why the data are missing. The data may be simply unavailable for reasons unknown to the analyst and unrelated to the completeness or the value of the other observations in the sample. For our study, the missing data is because of past political events (Al-intifada) during 2002 through 2003 and the many public holidays.For the data about ASE price index, we noted that price index increased from 261.45 Dec. 31, 2003 to 2668.2 at Jan.1, 2004, because the base value of 100 points (which on December 31$^{st}$, 1991 was stipulated for the Weighted Price Index) was changed to 1000 as of

January 1st 2004.Therefore, we retroactively multiply the values of ASE index by 10 points over the period before 2004.

## 3.3 Methodology

### 3.3.0 Introduction

In our study we focus on three aspects; (1) measure volatility during PEX bull and bear phases, (2) measure PEX, ASE and TASE market efficiency, and (3) investigate causality relationship between PEX and ASE. Therefore, it is necessary to look for the characteristics of the datato develop these tests. For measuring volatility during PEX bull and bear phases, this firstly requires locating peaks and troughs in time series to obtain PEX bulls and bears. Having the characteristics of bull and bear identified, we test whether or not the data are normally distributed, stationary or non-stationary and then test causality between the two phases based on econometrics models.

To identify peak and troughs in stock market, professionals widely used 200-day moving average technique. In our study we used that technique to identify PEX bull and bear phases. After that, the procedures for investigating volatility are identified. The implemented procedures are based on the concept of long memory. Tolvi (2003) stated that long memory in time series can be defined as autocorrelation at long lags, of up to hundreds of time periods. To find whether or not statistically significant long memory in the time series data, the study adopts Rescaled Range statistics (R/S) technique. On the basis of R/S method, it can be possible to estimate long memory parameter of d. When d is above 0 and below 0.5, this implies that there is stationary long memory volatility processes. Stock returns are calculated and then used to estimate d for each phase ofAl-Quds price index. As such, on the basis of statistical output regarding long memory stationarity for volatility process represented by d, we can conclude whether or not the volatility is persistent in both bull and bear markets.

Cunado et al., (2008), Gursakal (2010), Tudor (2011), Thomas and Laosethakul (2010), Khan et al., (2010) and others used the natural logarithm of daily closing values. We consequently used the natural logarithm of the daily closing values in each market to produce time series of continuously compounded returns.The advantage of looking at log returns of a series is that relative changes in the variable can be investigated and compared directly to other variables. Thus it is enabling evaluation of analytical relationships among them despite the fact that these log returns generated from price series of unequal values. Another advantage is that taking natural logarithm of the daily closing values versus prices, enhances normalization of data. Therefore the returns in each market ($R_t$) are computed as the first differences of the stock price indices. *That is,*

$$R_t = Ln\ (P_t) - Ln\ (P_{t-1}) = Ln\ (P_t / P_{t-1})$$

where $P_t$ is the price index at time t and $R_t$ is the natural logarithm stock price returns at time t.

Our study primarily depends on time series data that characterized by homoskedastic or hetroskedastic in variances. Enders (2010) stated that stochastic variable with a constant variance is called homoskedastic as opposed to hetroskedastic. For series exhibiting volatility, the unconditional variance may be constant even though the variance during some periods is unusually large. When the time series are not stationary; the sample means do not appear to be constant and/or there is strong appearance of Heteroskedasticity. Variances in time series decompose into two categories; conditional and unconditional. That is, time series are called conditionally hetroskedastic if the unconditional (or long run) variance is constant, but there are periods in which the variance is relatively high. Change in stock prices from period to another can be calculated as follows:

$$SP_{t+1} = SP_t + \square_{t+1} \qquad (1)$$

Or: $$SP_{t+1} - SP_t = \square_{t+1} \qquad (2)$$

That is; $$\Delta SP_{t+1} = \square_{t+1} \qquad (3)$$

Where SP is the price of stock on day t, and $\square_{t+1}$ is a change in stock price in a day t+1, which represent the random distribution term with the average of zero.

To predict the variance in stock prices, we use the following model;

$$SP_{t+1} = \varepsilon_{t+1}\square_t$$

Where; $SP_{t+1}$ denotes the stock price variable for the next period, $\varepsilon_{t+1}$ is a white noise disturbance term with variance $\sigma^2$ which is the daily change in stock price from period to another, and $\square_t$ is a price that can be observed in the initial period. If $\square_t$ continues to be constant, the $SP_{t+1}$will have constant variance. That is, if$\square_t = \square_{t-1} = \square_{t-2} = \square_{t-3}$ ……. are constants, the $SP_{t+1}$ is white noise with constant variance.

### 3.3.1 Normality Test

Since the study is based on time series data of the closing values of Al-Quds index, we must initially test whether these values follow the normal probability distribution. To do that, the study adopts Jarque-Bera (JB) as a test for normality. Khan et al., (2010) have employed the test to determine whether the closing value of stock market follow normal probability distribution. This test depends on skewness and kurtosis measures and uses the following model:

$$JB = (n/6)\,(S^2 + \tfrac{1}{4}(K-3)^2)$$

Where n= number of observations, S denotes skewness coefficient, and K denotes kurtosis coefficient. When S=0 and K=3, then the index values follow the normal probability distribution, and JB=0. So these statistics can be used to test the hypothesis that the data are from a normal distribution.

$H_0$*: JB=0, when S = 0 and K=3, which indicates homoscedasticity and absence of autocorrelation*

$H_1$*: JB ≠ 0, which indicates heteroskedasticity and the autocorrelation in the residuals*

Enders (2010) stated that when the series data aren't stationary, the sample mean don't appear constant and there is strong appearance of heteroskedasticity. Thus, the index values don't follow the JB normal probability distribution. So, it indicates that the time series is characterized by non-constant variance and more volatility alongside periods.

As mentioned, time series data are non-stationary means that the data don't have constant means and variances which make it difficult to predict or model that data. In addition, if non-stationary data have variances dependent on time, then the error terms are autocorrelated. Gujrati (2003) stated that data series are stationary if their mean and variance are constant over time and the value of covariance between two time periods depends only on the distance or lag between the two time periods and not on the actual time at which the covariance is computed.

### 3.3.2 Stationarity Test (Unit Root Test)

When the error term is a function of its past values, there is an autoregression, which is expressed as follows: $E_t = \rho E_{t-1} + V_t$ which means that the error term at period t is a function of itself in the previous time period t-1 times ρ, which is the first order autocorrelation coefficient, and V denotes the white noise error term and it is random. If there is an autocorrelation in error term, the data aren't stationary. However, data should be stationary in order to make predictions and receiving reliable results. So, non-stationary data need to be converted into stationary data.

To test stationarity, Augmented Dickey Fuller (ADF) and Philip Person (PP) are used. Khan et al., (2010), Ghaith and Awad (2011), Awad and Daraghma (2009), and Tudor (2011) used ADF test for higher order correlation by assuming that the series follows an autoregression error scheme. Also, they augmented the ADF approach controls for higher order correlation by adding lagged difference terms of the dependent variable. Because we need to detect behavior of volatility in bull and bear phases using high frequency data with heteroskedasticity; we will initially attempt to find whether or not data points present stationarity process. Therefore, we will use unit root tests by utilizing a Dickey Fuller test in order to test the stationarity of time series data. This equation indicates that current change in stock price is a function of past realization,

$$SP_t = f\,(SP_{t-1})$$

Dickey and Fuller (1979) actually consider three different regression equations that can be used to test for the presence of a unit root (Enders, 2010):

$$\Delta SP_t = (\square-1)\ SP_{t-1} + \varepsilon_t \text{............ (1)}$$

$$\Delta SP_t = \alpha + (\square-1)\ SP_{t-1} + \varepsilon_t \text{............ (2)}$$

$$\Delta SP_t = \alpha + (\square-1)\ SP_{t-1} + \rho t + \varepsilon_t \text{............ (3)}$$

From null hypothesis the time series has no clear overall trend direction, the relevant parameters restrictions for a stochastic trend are that $\alpha = 0$ and $\rho = 0$. The alternative of a stationary process corresponds to $-2 < \rho < 0$ and in this case $\rho$ is included to model the possibility of non-zero mean of the process (Heij et al. 2004). So, the hypotheses regarding the time series data are:

$H_O$: Time series aren't stationary, $\alpha = \rho = 0$

$H_1$: Time series are stationary, $-2 < \rho < 0$

That is, when the time series data are stationary, then data have constant means and variances, so $\rho$ is more than -2 and less than 0, while non-stationary data, on the other hand, have means and variances that change over time, so $\alpha = \rho = 0$ and therefore there is a trend, cycles and random walks. Accordingly, Enders (2010) introduced one example of non-stationary data which is random walk. Random walk model suggests that day to day changes in price of a stock should have a mean value of zero and the changes in stock prices should be normally distributed.

### 3.3.3 Identifying Market Phases

There are several methods that have been used to identify bullish and bearish phases in the stock market time series. However, empirical studies adopted the turning point algorithm developed by Bry and Boschan (1971) to locate peaks and troughs and then to identify bull and bear phases. The Bry and Boschan algorithm is used to identify turning points of business cycles. Pagan and Sossounov (2003), Maheu et al., (2009), Cunado et al., (2008), Gursakal (2010) and Tan et al., (2010) adapted this approach to divide time series data into phases in order to investigate the characteristics of these phases. Four criteria have been considered to avoid spurious periods: 1- Identify the peaks and troughs by using a window of 8 months. 2- Enforce alteration of phases by selecting the highest of the multiple peaks or the lowest of the multiple troughs. 3- Eliminate phases less than 4 months unless changes exceed 20%, and 4- complete cycle (trough to trough or peak to peak) should last for at least sixteen months and cycle less than 16 months should be eliminated.

The Bry and Boschan (1971) consider removing extreme values or outliers as well as smoothing of the time series data with a moving average technique to locate peaks and troughs.Furthermore, technical analysts use moving average technique to find peaks and troughs. Thomas and Laosethakul (2010) showed that moving average is a technique used to determine direction of stock prices. On the basis of moving average technique traders can decide whether to buy, sell or hold. Further, the moving average is based on the notion that time series data should be smoothed in order to highlight longer term trends or cycles. Moving averages are also called running means or rolling averages. The moving average is calculated based on two procedures: 1- the number of data points in each average remain constant, 2- each average is computed by excluding the oldest observation and including the next observation. The arithmetic moving average is the arithmetic average of prices of a stock (SP) over the most recent period of n days:

$$\text{MA} = \sum_{i=0}^{n-1} (SPt - 1)/n$$

The moving average generates a forecast from the past prices of a security. Also, moving average that is increasing indicates that, on average over time, prices are trending higher. The degree of sensitivity for the technique is determined by the value of n, the number of days in the period. Whereas, if n is too small, there is too much sensitivity to changes in daily prices, but if n is too large, the moving average will not be sensitive enough, so Bry and Boschan (1971) considered the elimination of outliers or extreme observations.

For our study, the PEX 200-day moving averages (8 months excluding public holidays) are adopted rather than 50-day moving averages. The 50-day moving average is an indicator of the secondary market trend and therefore it considers the short term changes in price direction within a primary trend and the duration is few weeks or a few months. However, the long term 200-day moving averages are an indicator of the primary trend and it considers changes in stock prices throughout the entire market lasting for a year or more. During primary trend based on

200-day moving averages, investors and analysts can locate peaks and troughs in time series, so they identify bull and bear phases.

To identify peaks and troughs in the series of stock prices, first we must consider the mean of the time series for stock prices SP in each bull and bear phase. This process helps us to find turning points of bull and bear phases. Gonzalez et al., (2003) assumed that the mean ***m*** is relatively stable within each bull and bear phase. If ***k***denotes a phase and $\Delta_{t+j}$denotes for the shift from phase to another whenever a mean value regime switch occurs at time t+j, then the new mean value in new phase is:

$$\boldsymbol{m_{k+1} = m_k + \Delta_{t+j}},$$

So,

$$\boldsymbol{SP_{t,k+1} = m_k + \varepsilon_t}$$

This mehod permits us to locate the starting and finishing points of the bull and bear markets (Cunado et al., 2008). Several studies have employed this method in order to identify troughs and peaks in stock price index and, therefore, we can find the starting and finishing points of bullish and bearish phases (See for example: Cunado et al., 2010; Gursakal, 2010). To identify peaks and troughs, let $SP_t$ denotes stock price and it is defined if $SP_t$ is the highest/lowest in a window of width 16. The study depended on the following expressions to identify peaks and troughs in bull and bear markets;

There is a peak at $t$ if: $[\, sp_{t-8}, \ldots\ldots, sp_{t-1} < sp_t > sp_{t+1}, \ldots\ldots, sp_{t+8}\,]$ (1)

And there is a trough if: $[\, sp_{t-8}, \ldots\ldots, sp_{t-1} > sp_t < sp_{t+1}, \ldots\ldots, sp_{t+8}\,]$ (2)

where$sp_t$denotes the natural log of the stock price, Ln $(SP_t)$.

Candelon et al., (2008) also used measures that allows for booms and busts. The study pointed that the key feature of nonparametric filters or dating algorithms is the location of turning points (peaks and troughs) that correspond to local maxima and minima of the series. To precisely identify these phases, the study includes the criteria mentioned above. On the basis of these criteria, alternation is enforced so that a peak will follow a trough and vice versa. Alternation is achieved by taking the highest (lowest) of two consecutive peaks (troughs). When bull and bear phases have been identified, the study requires to describe bull and bear phases as well as to describe the shape of the phase and volatility within each phase.

### 3.3.4 Testing for Long Memory in Stock Volatility and Returns

As mentioned before, long memory parameter is used to find the evidence of volatility persistence as well as market efficiency. Sibbertsen (2004) mentioned that a stationary time series $X_t$, $t=1 \ldots\ldots, N$ exhibits long memory or long range dependence when the correlation functionρ(k) behaves$lim_{k\to\infty}\,\rho(k)/c\rho k^{2d-1} = 1$ , here $c_\rho$ is a constant and $0 \leq d \leq 0.5$ denotes long memory parameter. This means that observations far away from each other are still strongly correlated. The long memory properties of such series depend on the value of *d*.

Cunado et al., (2009) tested whether or not the stock market volatility presents a different behavior in bull and bear phases. The study assumed that zero-mean covariance stationary process to be $\{x_t, t = 0, \pm 1 \ldots\ldots\}$ with auto covariance function, $\gamma_u = E(x_t, x_{t+u})$. The time domain definition of long memory is;

$$\sum_{u=-\infty}^{\infty} |\gamma u| = \infty$$

To measure long memory, squared returns and absolute returns were calculated. The return was calculated as;

$$R_t = \ln Y_t - \ln Y_{t-1},$$

Squared return as; $sqr\ R_t = (R_t)^2$

and absolute return as; $abs\ R_t = |R_t|$

Gursakal (2010) investigated whether or not stock volatility present different patterns of persistence in bulls and bear phases. It estimated long memory behavior by using the absolute and squared returns in the Istanbul Stock Exchange (ISE). The study used wavelet methods for estimating long term memory parameter of d which provide more robust estimates of d than the other methods. That is, estimating and testing the fractional differencing parameter and he concluded that volatility is persistent during bear stages.Hsu, Nan-Jung, (2006) stated that wavelets for long memory studies provide more robust estimates of d than the other methods.

Most of empirical studies on long memory ***I (d)*** have adopted the form: $(1-L)^d x_t = u_t$, t= 0, ±1,………, where L is lag operator and $u_t$ is I (0) and d is the differencing parameter, and the higher the d, the higher is the level of association between the observations (Cunado et al., 2008). As mentioned above, long memory parameter is considered in the literature to investigate volatility persistence as well as market efficiency. Tolvi (2003), Cunado et al., (2008), Bilel et al., (2009), Gursakal (2010) and Yalama (2011) employed the autoregressive fractional integration moving average or ARFIMA *(p, d, and q) model*to measure long memory parameter. For the observedseries $y_t$, t=1, ……, T, it is given by

$$ø(L)(1-L)^d (y_t - \mu) = \theta(L)\varepsilon_t$$

Where L is the lag operator $(L^j y_t = y_{t-j})$, $ø(L) = 1 - øL - \dots - ø_p L^p$ is the autoregressive polynomial, and $\theta(L) = 1 + \theta_1 L + \dots + \theta_q L^q$the moving average polynomial.The differencing parameter d need not be an integer, but integer values of *d* lead to traditional ARIMA. The fractional differencing operator $(1-L)^d$ is defined for non-integer *d* by an infinite binomial expansion; $(1-L)^d = \square\ (d, j)\ (-L)^j$. The analysis of long memory process in time series depends on the value of *d*. In this process if d=0 then $x_t = \varepsilon_t$, and there is a short run memory, when d=1, $x_t$ follows a unit process and memory is infinite. If 0<d<0.5 the auto covariance function of $x_t$ declines to zero, indicates long memory process and when 0.5≤d<1 $x_t$ will revert to its mean or trend in the very long run. In addition, for d € (0.5, 0) the autocorrelations are all positive. For d € (-0.5, 0) the series is said to exhibit intermediate memory. When d ≥ 0.5 the series are no longer covariance stationary, and have infinite variance.

There are currently a significant number of estimation methods for testing long memory behavior in stock returns and volatility. We consider one of the most widely used estimators and tests: The Rescaled Range Statistic as a parametric approach.

**Nonparametric Approach: The Rescaled Range Statistic**

The statistical measurement of long memory introduced by Hurst (1951), and subsequently used by Mandelbrot (1972) is the R/S statistic (rescaled range statistic). The rescaled range is calculated from dividing the range of values exhibited in a portion of the time series by the standard deviation of the values over the time series. Bilel et al., (2009) stated that Rescaled range *R(t,s) / S(t,s)* is statistically robust to investigate long run statistical dependence in records as well as estimating its intensity. Giraitis et al., (2003) stated that Hurst (1951), Mandelbrot and Taqqu (1979) and others developed a non-parametric R/S type test, which has become widely applicable in empirical literature. The Hurst exponent is used as a measure of the long term memory of time series when it relates to the autocorrelations of the time series.

The rescaled range statistic *R(t,s)/S(t,s)* (Hurst, 1951 and Mandelbrot, 1972) is defined as:

$$R_T = \text{Max } \{\sum_{j=1}^{k}(X - \bar{X})\} - \text{Min } \{\sum_{j=1}^{k}(X - \bar{X})\}$$

$$S_T = [(1/T)\ (X - \bar{X})]^{1/2}$$

$$R_T/\ S_T\ (n) = (1/S_T)\ [\text{Max } \{\sum_{j=1}^{k}(X - \bar{X})\} - \text{Min } \{\sum_{j=1}^{k}(X - \bar{X})\}]$$

Where $R_T$ is the range, $S_T$ is the sample standard deviation, and $\bar{X}$ is the sample mean.

Taqqu (1975) and Lo (1991) showed that

$p\ lim_{T\rightarrow\infty}\{T^{H}(R_T / S_T)\} = c$, *where c is constant.*

The values of rescaled range statistic are used to find value of d which is the difference parameter. These equations present statistical features of the price indices. After bull and bears have been detected with Bry and Boschan algorithm (1971), thestudy estimates the long memory parameter d of each phase for the series volatilities. If the estimates of d are above 0 and below 0.5, this implying long memory stationarity for the volatility processes. In addition, when d bull is less than d bear, this indicates that the volatility is more persistent in the bear than in the bull market. That is, this stage is characterized by higher uncertainty and risk with decline in equity values and it is subject to falling liquidity. Then investors are advised to buy stocks in bear stages and sell in bull stages since bull stage is characterized by less volatility and so more liquidity. The story is to determine whether volatility behaves similarly in the PEX bull and bear markets. Further, when $0<d<0.5$, this indicates long memory behavior and stationarity which indicates the stock market isn't efficient at weak level, and stock prices didn't randomly move. However, if $0.5<d$, this indicates non-stationarity time series, and therefore stock market is efficient at weak level.

### 3.3.5Granger CausalityTest

Roughly speaking, causality test of Granger is used in order to investigate whether or not there is a causal relationship between two variables in the long-run and which one causes this relationship. Thus, the Granger model is used to investigate how much of current Y can be explained by a past value of X- independent variable. If the independent variables- Xs are statistically significant, Y can be Granger caused by those Xs and then Xs help in the prediction of Y. However, to determine the relationship, Granger causality test can provide indication of the relationship between those variables. This leads to acceptance or rejection of $H_0$ using F-test and probability. The following equation can estimate the relationship between any variables:

$$\Delta x_{t-1} = \alpha_1 \Delta x_{t-1} + \beta_1 \Delta y_{t-1} + \square_{t,}$$

Granger Causality test, in this respect,is used to investigate whether or not there is a causal relationship between PEX and ASE and which one causes the other. Granger causality based on a time series data $X_t$Granger causes another time series $Y_t$ if series are stationary. That is, investigating causality involves determining whether PEX is a function of ASE or PEX is a function of TASE. Marinazzo et al., (2011) stated that Granger causality analysis (Granger , 1969; Wiener, 1956) is an approach that measures the causal association and effective connectivity and can provide information about the dynamics and directionality on both variables.

Testing for temporal causality between the three markets is centered on a VAR (vector autoregressive) model comprising two stationary series, x and y. This model is adopted in order to capture short run causality between the two markets. Khan et al., (2010) state that in VAR modeling the value of variable is expressed as a linear function of the past or lagged values of that variables and all other variables included in the model. Thus all variables are regarded as endogenous. The model can be written as:

$$x_t = \alpha 1 + \sum_{i=1}^{p} \beta_i x_{t-i} + \sum_{j=1}^{q} \gamma_j y_{t-j} + \varepsilon_{x,t}$$

$$y_t = \alpha 2 + \sum_{i=1}^{p} \theta_i y_{t-i} + \sum_{j=1}^{q} \phi_j x_{t-j} + \varepsilon_{y,t}$$

Where *x* and *y* are stationary variables, *β* and *γ* are the lag lengths for *x* and *y* respectively and □'s are the stochastic error terms or shocks in the language of VAR. Testing causality between the three markets is one of the study objectives. Generally, testing causality involves using F-tests to test whether lagged information on a variable Y provides any statistically significant information about variable X in the presence of lagged X. If not, Y doesn't Granger cause X. In other words, a variable Y is said not to Granger -cause a variable X if the distribution of X, conditional on past values of X alone, equals the distribution of X, conditional on past realizations of both X and Y. If this equality doesn't hold, Y is said to Granger cause X. If Y can predict future X, over and above what lags of X itself can, then Y Granger causes X.

In other words, if lagged information on ASE stock prices provides any statistically significant information about variable PEX in the presence of lagged observations of PEX, then ASE Granger causes PEX. Further, if lagged information on TASE stock prices provides any statistically significant information about variable PEX in the presence of lagged observations of PEX, then TASE Granger causes PEX and vice versa. Table 12 reveals the results of Granger causality test between each pair of the three markets in our dataset.

Equations above are valid for testing the causality of lagged volume changes on price changes (where $x$ is the stationary price series) and lagged price changes on volume changes (where $y$ is the stationary volume series). As such, by using E-views we can calculateGranger causalityparameters.

# Chapter4

## Empirical Results and Analysis

### 4.0 Introduction

As mentioned before, this study aims at measuring volatility persistence and market efficiency as well asinvestigating linkage causality relationships between PEX, ASE and TA-100. Itadopts data set of daily closing price of PEX, ASE,and TASE indicesover the period extending from 8/1997 to 3/2012. We consequently compute daily returns by taking the natural logarithm of daily stock prices of the mentioned indices.

### 4.1 Preliminary Analysis

#### 4.1.1 Chart Analysis

Stock charts enable analysts, investors and traders to study past and present time series observations in order to make reasonable predictions and wise choices. However, investors consider fundamental analysis and technical analysis to make their decisions. Investors depend on fundamental analysis by understanding and measuring the value of stock in order to determine future stock prices. On the other hand, technical analysis looks at historical data of a security to detect market movements in order to predict its future prices as well as to study market movements. For this purpose, we use graphs to see stock markets movements for each index. Figures below illustrate historical stock prices and show markets movements along the past 15 years. For each figure, the variable on the y-axis represents the value of stock (sock prices, stock returns, squared returns, or absolute returns) whereas the variable on the x-axis is the day in which market value is presented.These graphs represent historical stock prices which help analysts to detect market patterns and to do predictions.

As mentioned before, Abu-Libdeh and Harasheh (2011) tested the correlation and causality relationships between stock prices and macroeconomic variables. They found that regression analysis indicated a significant relationship between macroeconomic variables and stock prices, whereas, Granger causality ignored any kind of causal relationship between each particular macroeconomic variables and stock prices. According to figure 2, we notice that the changes in GDP and the index aren't compatible. There is consistency between the trend of GDP and stock prices especially the GDP has upward trend while stock prices indicate downward trend. This also confirms that there is no significant relation between GDP and stock prices.

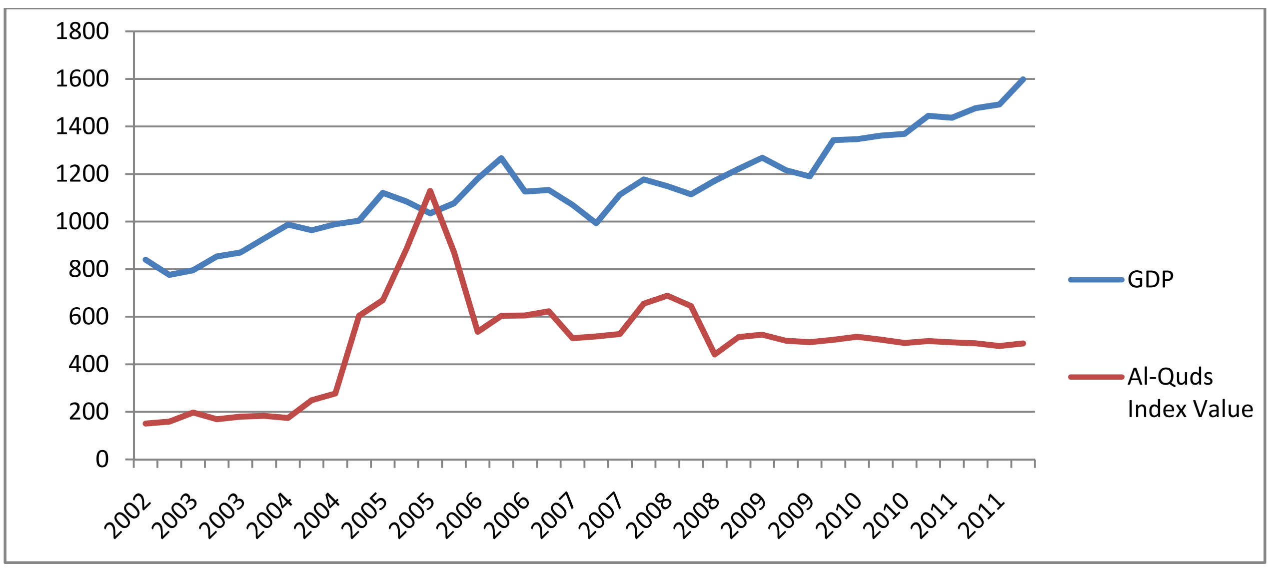


**Figure 2: GDP and Al-Quds Index over the period of 2002-2012**

To check stationarity, we plot time series graph for this purpose. Figure 1-aillustrates the changes in Al-Quds Price index including highest and lowest stock prices at which stock are traded over the previous 15 years. This chart plots the daily closing values of Al-Quds price index. The time series observations of Al-Quds index have been connected together in a single line to view changes in stock prices and to detect market trend during the stipulated period. The chart displays that price down days are more than up days which indicate that PEX stock prices move in the opposite directions and their time series data non-stationary. So, PEX exhibit a trend in the mean which means that the mean isn't constant. This supports the result that data is non-stationary. Also, the chart shows that stock prices fluctuate along the time period. Stock prices were increasing during before the year 2000, and then stock prices had decreased with some corrections until 2004. However, stock prices sharply increased during 2005 to reach the highest value of 1336.5 and then decreased followed by many ups and downs.

Figure 1-b displays daily stock returns which is the continuously compounded return in order to display stock price volatility patterns.It shows that vertical fluctuation isn't the same at different portions of the series. So, the time series of Al-Quds index aren't stationary. The graph shows that there is high volatility in PEX stock prices including upward and downward movements. Investors always predict future volatility by looking at historical volatility which in turn can indicate the risk. For PEX stock returns, there is a risk associated with that volatility.

Figure1-c illustrates daily squared returns of Al-Quds index in order to graphically view stock volatility. In addition, Figure 1-d shows the absolute returns of Al-Quds index which aims at producing positive values of stock returns regardless of the directions of the stock prices. The chart only consider the positive values of stock returns, so absolute value transfers all negative values of stock returns into positive values. This chart also displays the volatility in stock prices.

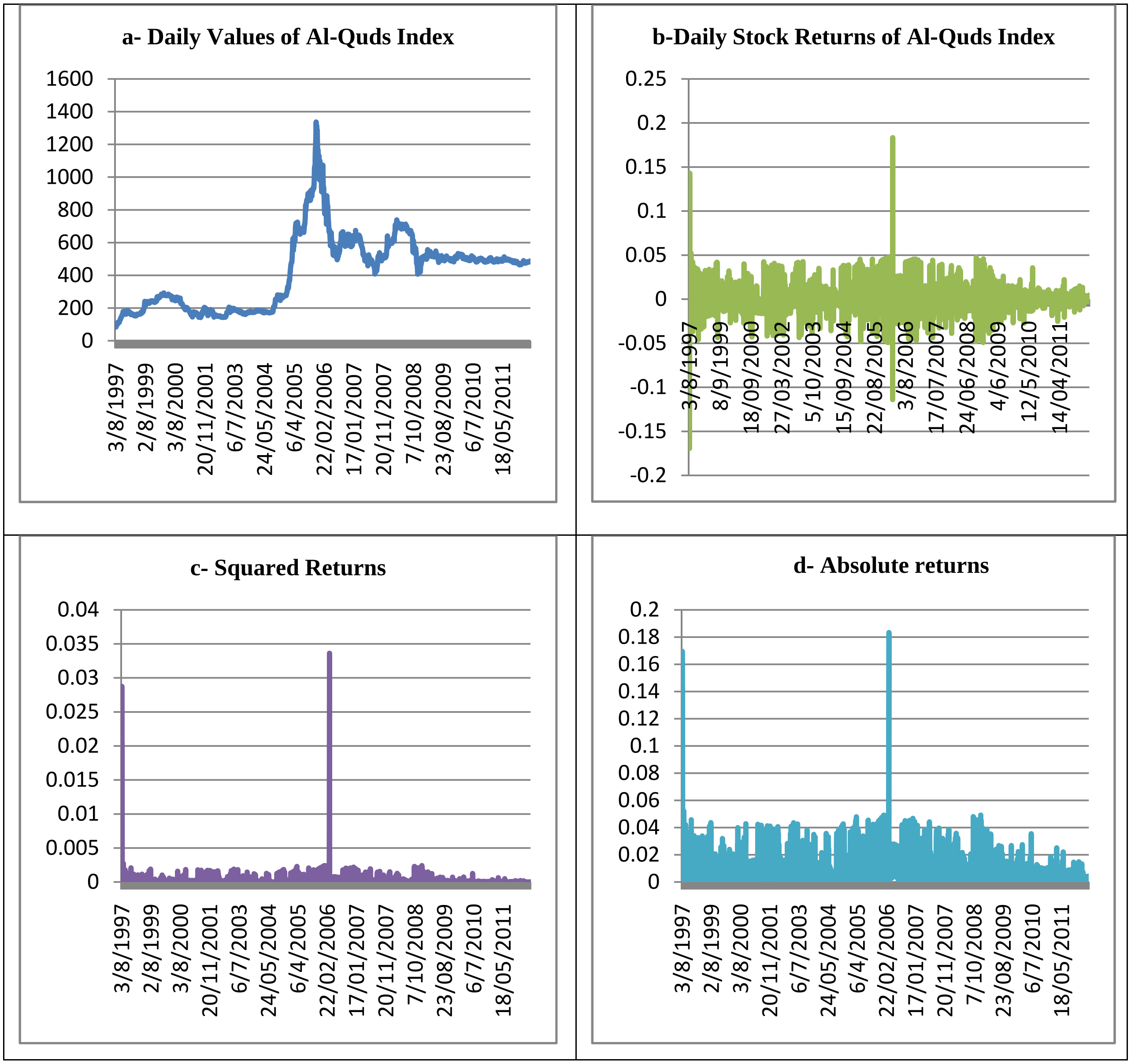


***Figure3: Time series Graphs of Al-Quds Index***

Figure 2 showsthe changes in historical stock prices as well as market trends of ASE index along the stipulated period. The chart displays the performance of highly volatile stock market and clearly shows how the stock market behaves. Indeed, the ASE market is now in downward trend.

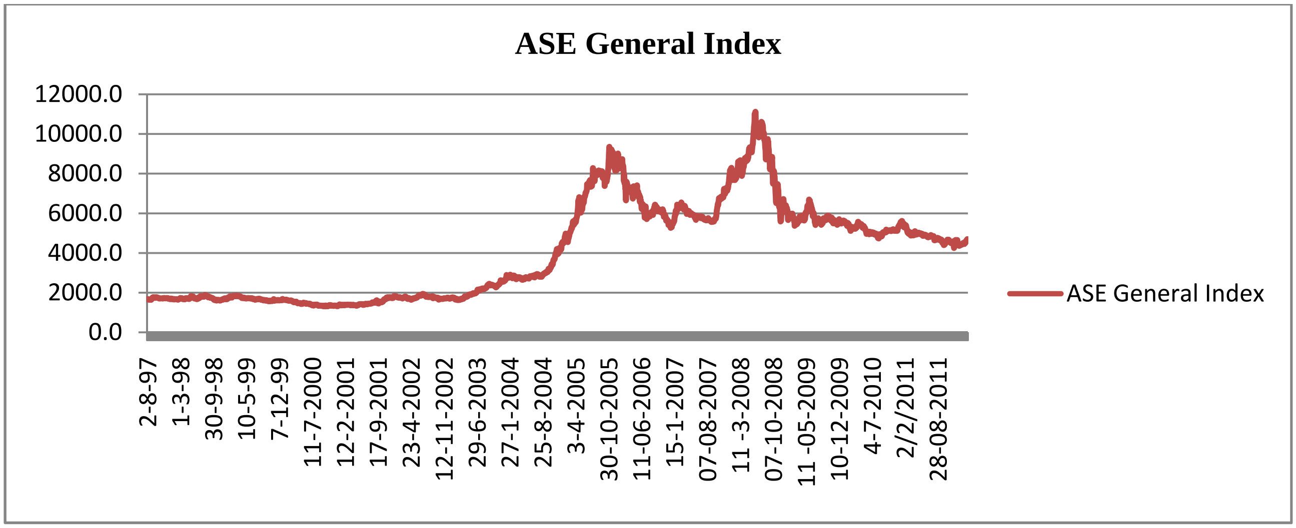


**Figure 4: Daily stock values Graph of ASE Index**

Further, figure 3 plots the vertical fluctuations of the financial time series. We note the volatility in the stock prices along the stipulated time period. This indicates that the stock returns are volatile at different portions of the series indicating that variance and mean aren't constant along the last 15 years. So, we can say the ASE time series is non-stationary.

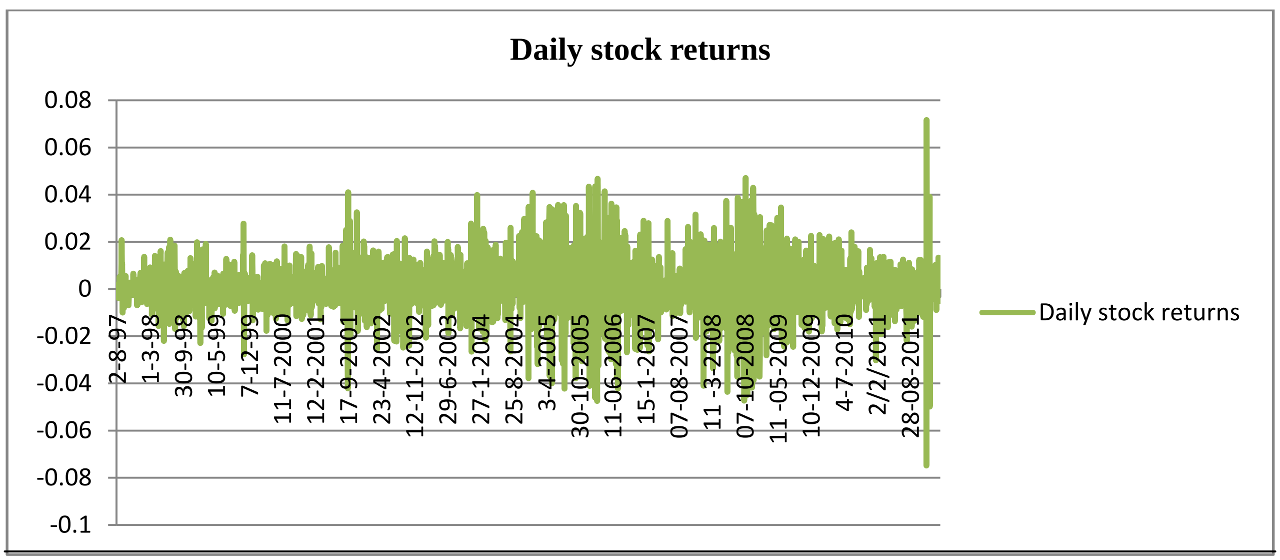


**Figure 5: Daily stock returns Graph of ASE Index**

Figure 4 plots the movements of TA-100 index along the last 11 years. It also shows highly volatile stock market indicating many ups and downs in stock prices and the market is now in a downward trend. TA-100 seems to exhibit a trend in the mean since it has clear upward slope which is sign of non-constant mean. So, uncertainty and risk should be considered when investors take their decisions.

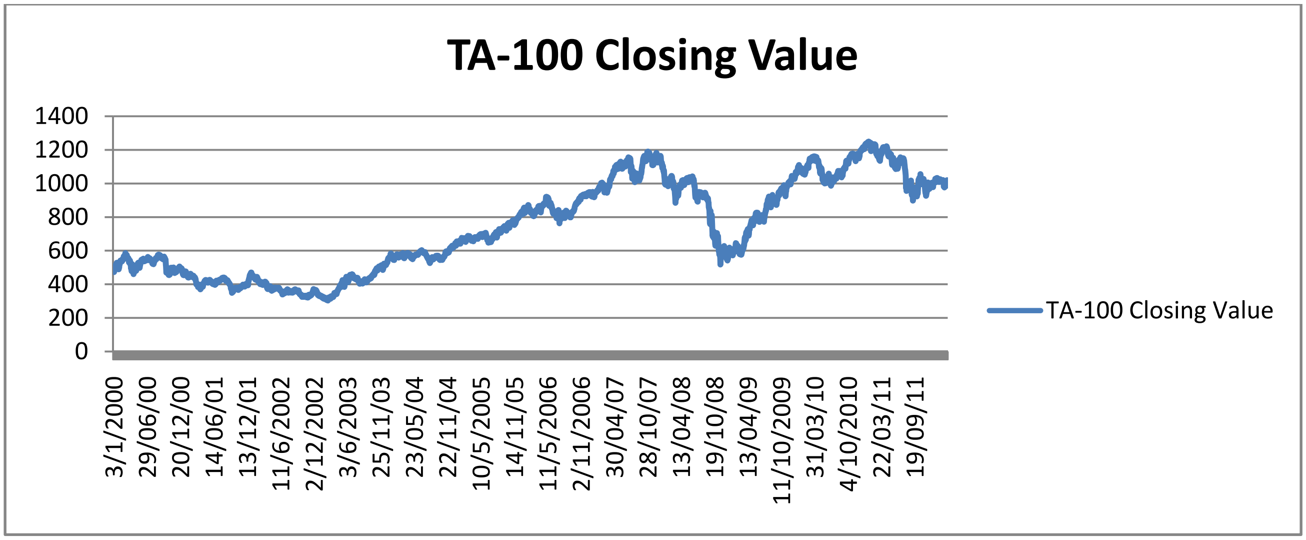


**Figure 6: Daily stock values Graph of TA-100 Index**

Further, vertical fluctuations aren't same at different portions of the time series, which support that variance isn't constant. Therefore, we can say that TA-100 time series data is non-stationary. Figure 5 indicates the vertical fluctuations aren't same along the financial time series, which indicates that mean and variance aren't constant. Thus, we can say that TA-100 is non stationary.

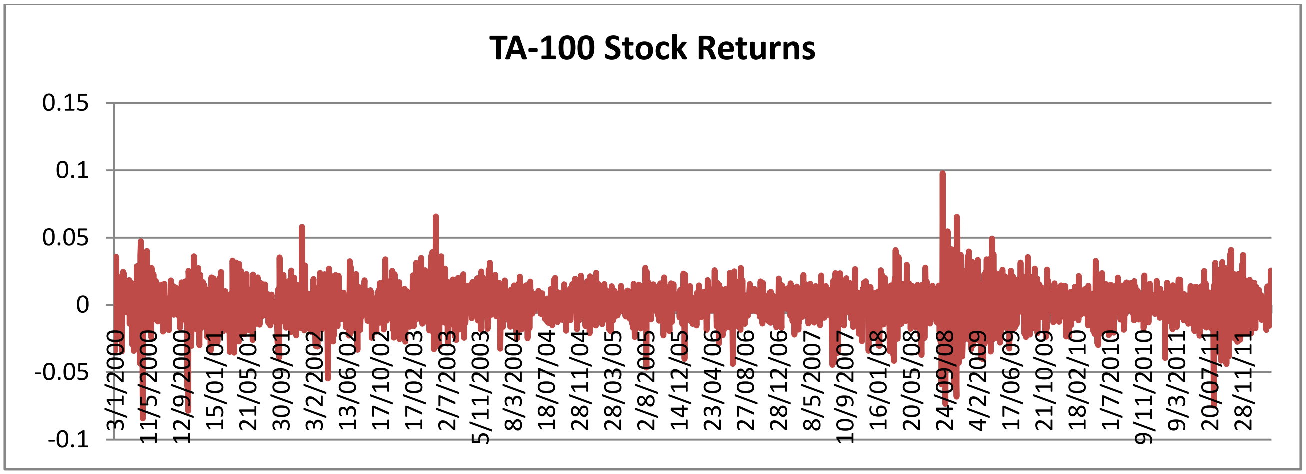


**Figure 7: Daily stock returns Graph of TA-100 Index**

In addition to visual inspection of time seriescharacteristics of the PEX, ASE and TASE, statistical and econometric techniques are also needed to investigate actual nature of time series data. So, normality test, ADF, PP tests are conducted to check the stationarity of time series.

### 4.1.2Normality Test

As outlined in the methodology, normality test is conducted in order to determine whether or not the time series observations are normally distributed. Normal distribution curve indicates that the data has fewer tendencies to show unusually extreme observations or values (outliers). When the time series data are normally distributed, there is an association between two observations of returns time series. The Jarque-Bera statistics are used for this purpose. Table 3 displays the results regarding normality tests along with descriptive statistics for the three indices. High or low kurtosis values indicate that data not normally distributed. Normality test is used to determine whether or not nonparametric test are required. When the skewness value equals 0 and kurtosis value equals 3, then data are normally distributed.

According to statistics shown in table 3, the data display a high degree of excess kurtosis and skewness. The distributions of data observations are not normally distributed in each market.

This result is supported by Jarque-Bera at significance level of 1% for each phase. Therefore, the null hypothesis of normality of the Jarque-Bera test is rejected for all indices in favor of alternative hypothesis.Thus non-parametric tests, namely ADF and PP tests will be used to draw conclusions about market volatility and market efficiency as well as causality relationship.

Table 2: Statistical Features of Daily Stock prices and Returns of Al-Quds Index, ASE Index and TA-100

| ***Statistics*** | ***Al-Quds Index*** | ***ASE Index*** | ***TA-100*** |
|---|---|---|---|
| *Mean* | *0.0005*<br>*421.22* | *0.000343*<br>*4494.935* | *0.00023*<br>*740.4714* |
| *Median* | *-0.00028*<br>*483.9* | *0.000248*<br>*44945.6* | *0.00056*<br>*701.225* |
| *Maximum* | *0.18336*<br>*1336.3* | *0.071603*<br>*11116.7* | *0.09781*<br>*1247.92* |
| *Minimum* | *-0.16955*<br>*84.34* | *-0.074822*<br>*1306.1* | *-0.08425*<br>*303.65* |
| *Std. Dev.* | *0.016336*<br>*223.5* | *0.011427*<br>*2406.821* | *0.0136*<br>*276.1* |
| *Skewness* | *0.288450*<br>*0.6803* | *-0.133815*<br>*0.252299* | *-0.031627*<br>*0.109957* |
| *Kurtosis* | *15.36753*<br>*3.5375* | *6.498352*<br>*2.121054* | *6.8735*<br>*1.61534* |
| *Jarque-Bera* | *19154.7*<br>*267.565* | *1537.223*<br>*128.267* | *1924.845*<br>*245.705* |
| *Probability* | *0.000*<br>*0.000* | *0.000*<br>*0.000* | *0.000*<br>*0.000* |
| *Variance rate of return* | *0.26*<br>*3548* | *0.153*<br>*32844.4* | *0.22*<br>*4383.04* |
| *Durbin-Watson Stat* | *2.001407* | *1.972228* | *2.000083* |
| *Prob (F-statistic)* | *0.000* | *0.000* | *0.000* |
| *Number of observation* | *2999* | *2992* | *3000* |

Standard deviation is considered in finance literature to report the volatility in stock prices, which shows increase and decrease in stock returns during certain period of time. That is, standard deviation considers the degree to which the stock prices fluctuations in relation to its mean. This parameter indicates whether or not there is a tendency of the stock returns to increase or decrease along the stipulated time period. If the security displays volatility, it is considered risky because of quick changes in either direction at any time. Taking the whole period, Table 3 shows that market volatility is low and therefore, the three markets offer a low level of volatility. These results are supported by standard deviation of returns forAl-Quds price index; ASE index and TA-100 which are 0.016336, 0.00968 and 0.0136 respectively. This implies that those time series could be modeled with GARCH models. As per the statistics included in Table 3, Jarque-Bera and standard deviation, indicate that the time series characterized by non-constant variance and low volatility periods.

Autocorrelation often appears when working with time series data. The autocorrelation means that the error term is a function of its past values. However, it is meaningless to look at autocorrelation when working with cross sectional data. The autocorrelation can be positive or negative, and it is related to the coefficient of autocorrelation$(U_t = \rho U_{t-1} + V_t)$

Durbin Watson (DW) test is the most common test for autocorrelation and it is calculated on the basis that time series have the structure of first order, because first order autocorrelation is likely to appear in time series data. Table 3 presents the result regarding *DW* and we see that DW takes the value of 2 for the time series related to the three indices. That is, DW=2 at p=0.000, so we reject the null hypothesis of serial autocorrelation in time series data in favor of the alternative hypothesis. As a result, the time series values of the three indices are not serially correlated.

The overall market risk-adjusted performance measurement presented by the coefficient of variance (CV) has been computed and showed in Table 4. Tudor (2011) defined the CV as a fund's deviation divided by return. It gives a risk-to-return ratio, i.e., units of risk per unit of return that can be used to compare mutual fund performance on a level basis. The CV computed as: CV = Average Return / standard deviation.

Table 3: Risk Adjusted Stock Market Performance

| | ***Al-Quds Index*** | ***ASE Index*** | ***TA-100*** |
|---|---|---|---|
| ***CV*** | *0.032* | 0.0016 | *0.017* |

For the three markets, the coefficient of variance is used to measure the risk-adjusted performance of these markets. The combination of average return and standard deviations of each market produce similar CV for the ASE of 0.0016, for the TASE of 0.017 and a CV for the PEX of 0.032. Therefore, PEX has higher CV so it has average levels of returns and risk more than ASE and TASE. Therefore, PEX market realized the best adjusted performance.

### 4.1.3 Stationarity Test

Empirical studies that depend on time series data assume that the underlying time series are stationary, which means that the mean and variance of the time series are constant. Stationarity test has been conducted for the three indices; ***Al-Quds index, ASE index and TA-index*** using ADF and PP tests.

Table 4: Unit root test for daily index prices for Al-Quds Index, ASE and TASE at level:

| ***Tests*** | ***Augmented Dickey Fuller (ADF) Test*** | | ***Phillips-Person (PP) Test*** | |
|---|---|---|---|---|
| ***Stock Exchange*** | ***T-Stat*** | ***P-value*** | ***T-Stat*** | ***P-value*** |
| ***Al-Quds Index*** | *-1.704953* | *0.0883* | *-1.644013* | *0.1257* |

| | | | | |
|---|---|---|---|---|
| ***ASE Index*** | -1.340334 | 0.1802 | -1.300448 | 0.2134 |
| ***TA-100*** | *-0.994902* | *0.3199* | *-0.940916* | *0.3541* |

The trend in mean and variance can be observed and so checked in the time series by using graphs. A time series is stationary when its means and variance are constant. Figures 1,2, and 4 plot the time series of the three indices;***Al-Quds index, ASE index and TA-index***respectively, and indicate that the three markets do exhibit clear upward trends in the mean which is a sign of non-stationarity.

Table 5 provides a summary of statistics for the three markets during the stipulated period. According to non-parametric tests of ADF test and PP test, mean and variance seem to be not constant in the time series of the three cases, which indicates that all time series data are non-stationary in the level. Therefore, we accept the unit root alternative hypothesis of stationarity for stock prices of the three markets at significance level of 1%. This indicates that stock returns of the three indices are random over the stipulated period. That is, this implies that stock prices are found to exhibit a random walk. On the basis of unit root tests (ADF and PP tests of stationarity) presented in Table 5, we conclude that PEX, ASE, and TASE areefficient at the weak level. So, we accept the alternative hypothesis that the three marketsareefficient.

### 4.2 VolatilityPersistent Tests during PEX Bulls and Bears Phases

#### 4.2.1 Identifying Bull and Bear Phases

PEX bull and bear phases are identified using the technique of the 200 day moving average taking into consideration the assumptions ofBry and Boschan(1971). Troughs and peaks have been identified in Al-Quds price index and thus the starting and finishing points of bull and bear markets are identified. Figure 4 shows PEX bull and bear phases along the 15 years.

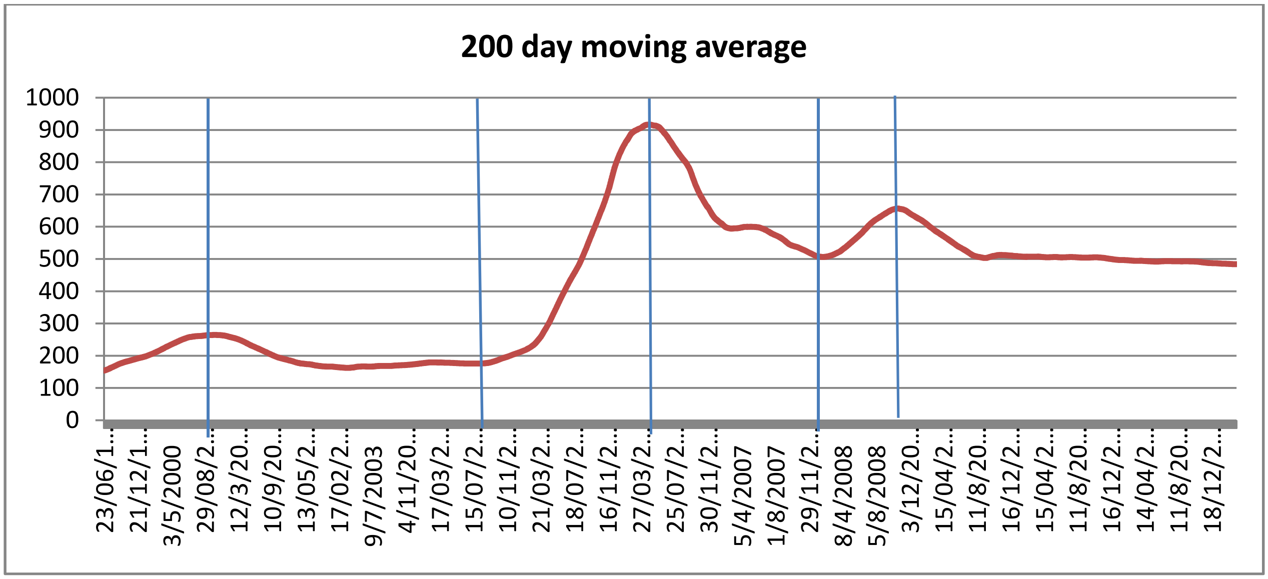


**Figure 8: Bull and Bear Graphs of Al-Quds Index**

Also, Figure 4 represents a secular market trend which consists of a series of primary trends. The PEX moved in six directions over the last 15 years. These trends consist of bull and bear phases. The bull and bear phases represent upward and downward market trends respectively.These directions represent trends to describe PEX as a whole (all sectors).

Table 5: Al-Quds Index Bull and Bear Phases: 1997-08 to 2012:03

| ***Cycles*** | ***Bull phase*** | ***Bear phase*** |
|---|---|---|
| ***Cycle 1*** | *1997:08 – 2000:12* | *2001:01 – 2004:07* |
| ***Cycle 2*** | *2004:08 – 2006:05* | *2006:06 – 2008:01* |
| ***Cycle 3*** | *2008:02 – 2008:11* | *2008:12 – 2012:03* |

As depicted in Table 6, there are three cycles consist of three bull phases and three bear phases have been detected for Al-Quds Index. We note that time series consist of smaller bull markets and larger bear markets, which indicates a secular bear market and therefore, downward trends continued for longer time than upward trends. However, there are 5 primary trends-three bears and two bulls- because they lasted for more than year, whereas there is one secondary trend- the third bullish phase in the cycle 3- because it lasted for less than one year. Further, we note that bull phases are shorter than bear phases, which indicates that more risk is associated with volatility during bear phases.

### 4.2.2 Volatility Persistence Test

One of the main objectives of this study is to investigate volatility persistence during PEX bull and bear phases. As it can be seen from Table 6 and Figure 6, three bull phases and three bear phases were observed for Al-Quds Index. We use 200-day moving average for this purpose. Then, we moved to measure volatility in Al-Quds stock price returns.

Table 6: Descriptive statistics of PEX Bulls and Bears:

| ***Statistics*** | ***Cycle1,bull*** | ***Cycle1,bear*** | ***Cycle2,bull*** | ***Cycle2,bear*** | ***Cycle3,bull*** | ***Cycle3,bear*** |
|---|---|---|---|---|---|---|
| ***Mean*** | *0.001393* | *-0.000263* | *0.002796* | *-8.86E-05* | *-0.000259* | *-0.000175* |
| ***Median*** | *0.000000* | *-0.000697* | *0.001139* | *-0.002260* | *-0.001169* | *-0.000438* |
| ***Maximum*** | *0.143046* | *0.042633* | *0.183361* | *0.045483* | *0.047519* | *0.045691* |
| ***Minimum*** | *0.169558* | *-0.043660* | *-0.114062* | *-0.046801* | *-0.048021* | *-0.049215* |
| ***Std. Dev.*** | *0.017450* | *0.016018* | *0.022714* | *0.018000* | *0.014360* | *0.009932* |
| ***Skewness*** | *-0.708450* | *0.138593* | *0.730998* | *0.231341* | *0.002757* | *-0.299209* |
| ***Kurtosis*** | *29.52715* | *3.717116* | *12.45632* | *3.083297* | *5.661050* | *9.377342* |
| ***JB*** | *14525.60* | *14.97421* | *1720.554* | *3.886149* | *57.53491* | *1417.196* |
| ***Probability*** | *0.000000* | *0.000560* | *0.000000* | *0.143263* | *0.000000* | *0.000000* |

Table 7 provides descriptive statistics of stock prices series during bull and bear phases. On the basis of the Jarque-Bera test, all phases except bear phase of cycle 2,do not follow normal probability distribution at 1% significance level. Also, the bull phase of cycle 2 represents the highest average daily return, while the lowest mean is found in the bear of cycle 2. The six phases offer different level of average returns and the volatility levels are substantially different. Further, the bear phase of cycle 3 seems to be less risky since the standard deviation is the lowest, whereas the bull phase of cycle 2 is the riskier because the standard deviation is the highest. That is, the six phases show different levels of volatility or risk.

Table 7: Unit root test of PEX bulls and bears at level:

| ***PEX*** | ***ADF Test Statistic*** | | ***PP Test Statistics*** | |
|---|---|---|---|---|
| ***Time Period*** | ***Level*** | ***First Difference*** | ***Level*** | ***First Difference*** |
| ***Cycle1,bull*** | *-2.063953* | *-10.80564* | *-2.160708* | *-17.92270* |
| ***Cycle1,bear*** | *-3.330091* | *-10.75448* | *-2-972744* | *-18.41712* |
| ***Cycle2,bull*** | *-1.417638* | *-8.738358* | *-1.398686* | *-17.92270* |
| ***Cycle2,bear*** | *-1.829127* | *-9.632463* | *-1.863928* | *-16.73451* |
| ***Cycle3,bull*** | *-0.930079* | *-5.981670* | *-1.040530* | *-10.96396* |
| ***Cycle3,bear*** | *-0.656784* | *-12.51544* | *-0.782648* | *-24.93581* |

As mentioned before, nearly all the phases aren't normally distributed which indicates that there are no restrictions to use non-parametric tests to measure volatility, including ADF, PP tests as well as R/S statistics. Table 9 shows the results regarding ADF and PP tests for each market phase. The results of the ADF and PP unit root tests indicate that all of the returns series of Al-Quds price index are found to be non stationary at level and it is stationary at first difference in all the cases at 1% level of significance.

Taken together, these results fail to reject the unit root null hypothesis for the stock prices at 1% level of significance. This implies that Al-Quds index prices in the six phases, bulls and bears, found to exhibit a random walk which indicates that PEX isefficient at weak level in the six phases. Therefore, we accept the alternative hypothesis that PEX is efficient at weak level during bull and bearmarkets.

The difference parameter of d is calculated on the basis of the returns, squared and absolute returns using R/S statistics. As indicated in Table 7 the stock prices aren't normally distributed in most phases. This implies that we can use nonparametric tests to investigate volatility and its persistence during bull and bear phases. Thus, this study applies R/S test since it is superior for its robustness in capturing long memory (long range dependence) in the presence of non-normality (Yalama et al., 2011). Table 8 displays the R/S estimates of long memory parameter d.

Table8: R/S Based Estimated Parameters of d

| ***Phases*** | ***d*** |
|---|---|
| *1997:08 – 2000:12 (Bull period)* | *1.13* |
| *2001:01 – 2004:07 (Bear period)* | *0.34* |
| *2004:08 – 2006:05 (Bull period)* | *0.82* |
| *2006:06 – 2008:01 (Bear period)* | *0.32* |
| *2008:02 – 2008:11 (Bull period)* | *0.42* |
| *2008:12 – 2012:03 (Bear period)* | *0.60* |

As mentioned before, when the parameterd in the interval (0, 0.5), this indicates that the time series are characterized by long memory and stationarity because these values are the relevant cases for the volatility. This means that observations far away from each other are still strongly correlated. Further, when d = 0 then $x_t = \square_t$, and this indicates short term memory. However, when d > 0.5, $x_t$ follows a unit process and this indicates non-stationarity case.

In all cases d is more than 0, and the confidence values of some cases are constrained in the interval (0, 0.5) indicating stationary long memory volatility process. The parameter d doesn't take value of 0 in the mentioned cases as well as no minus values of parameter d. In all cases, $d \neq 0$ so there are no exceptions of phases since the null hypotheses of stationarity can't be accepted at the 5% level.

We don't find systematically higher orders in one case over the other. Indeed, in 2 out of the 3 cases d-bull is higher than d-bear, and in one case d-bull is lower than d-bear. That is, we find statistical evidence of d-bull (.42) is lower than d-bear (.60) in cycle 3. However, we find in two cases d-bull is higher than d-bear: in cycle number 1, d-bull is 1.13 and d-bear is 0.34, and in cycle 2 d-bull is 0.82 and d-bear is 0.32.

The parameter d is also estimated on the basis of squared and absolute returns. The results are the same to those presented under the R/S statistics. In cycles phase number 1 and 2, we find evidence of d-bull is higher than d-bear, while in cycle 3 we find that d-bear higher than d-bull.Furthermore, we find the evidence of volatility persistence in bear markets in cycle number 1 and 2, where d-bears are 0.25 and 0.26 respectively, while d-bulls are 0.77 and 0.70 respectively. This implies that volatility is more persistent in PEX bear markets than in PEX bull markets. However, we find in the cycle number 3 that d-bear is higher than d-bull, which implies that volatility is more persistent in bull than in bear phase in this cycle. In general, time series data during PEX phases are characterized by long range dependence implying volatility is more persistent in PEX bear phases since d is above 0 and below 0.5.

According to estimation results showed in Table 8, three cases (volatilities) have long range dependence characteristics; otherwise have short term memory in volatility. Existence of long memory in volatility financial time series implies that the daily observations of the PEX during bear markets are related to each other. That is, the estimates of parameter d are above 0 and below 0.5 implying long memory stationarity for the volatility process.Further, the result indicate that the volatility is more persistent in the PEX bear markets the in the PEX bull markets. So, we reject the null hypothesis in favor of the alternative hypothesis that PEX stock volatility is more persistent in bear markets than in bullmarkets, and so we accept the null hypothesis that volatility isn't persistent during bull phases. This conclusion has been already documented in the financial literature that stock market volatility is higher during bear markets than in bull markets.

### 4.3 Market Efficiency Test at Weak Level

A long memory in stock returns makes investment decisions become extremely sensitive to investment horizons. When the past stock returns have a positive autocorrelation, then the returns have long memory structure. Tan et al., (2010) indicated that if stock price follows a process with long memory, this violate the hypothesis of efficient market and so random walk implying that historical information values provide useful information values for predicting future price changes. So, investors can use past observations for future predictions because the serial correlation between time series enhances the possibility of future returns predictions.

The study examined the presence of long memory property in daily stock returns of three markets; PEX, ASE, and TASE. Testing market efficiency of PEX, ASE and TASE is one of the study objectives. For this purpose, the study considers if there is a real evidence of long memory in time series. That is, the study investigates long memory for returns of the three markets to investigate market efficiency.

Table 9: Unit root test for daily index prices for Al-Quds Index, ASE and TASE over the period of 2000-2012

| ***Tests*** | ***Augmented Dickey Fuller (ADF) Test*** | | ***Phillips-Person (PP) Test*** | |
|---|---|---|---|---|
| ***Stock Exchange*** | ***Level*** | ***First Difference*** | ***Level*** | ***First Difference*** |
| ***Al-Quds Index*** | *-1.335886* | *-23.16904* | *-1.323847* | *-46.28650* |
| ***ASE Index*** | *-1.163262* | *-33.00313* | *-1.156782* | *-47.58110* |
| ***TA-100*** | *-0.946162* | *-24.32291* | *-0.924558* | *-53.82789* |

Bilel and Nadhem (2009) indicated that the stationarity doesn't preclude the possibility of long-memory in the returns data. That is, ADF and PP are used to indicate long memory in stock returns. Table 11 shows the results of ADF and PP tests. According to the results of nonparametric ADF and PP tests, all of the return series are non-stationary in level at 1% significance level. As a result, the three markets are efficient art weak level.

For further investigation, non-parametric estimator was employed in an organized manner to obtain inference that is robust to the non-normality in the stock returns. This is done by applying R/S to calculate the value of difference parameter d. As mentioned before, Bilel et al., (2009) stated that Rescaled range $R(t,s) / S(t,s)$ is statistically robust to investigate long run statistical dependence in records as well as estimating its intensity. Giraitis et al., (2003) stated that Hurst (1951), Mandelbrot and Taqqu (1979) and others developed a non-parametric R/S type test, which has become widely applicable in empirical literature. When parameter d is above 0.5, then time series data is non-stationary and then financial market is efficient at weak level. However, when parameter d is above 0 and below 0.5, this indicates long memory in time series data. The data were transformed into continuously compounded returns.

Table 10 displays the results that related to parameter d with different values for the three markets. In the cases of PEX and TASE, the results show that there is no evidence of long memory behavior in the time series because d values are above 0.5.However, the value of d is below 0.5and above 0 for the ASE case.

Table10: R/S of PEX, ASE, and TASE:

| ***Stock Exchange*** | ***d*** |
|---|---|
| *Al-Quds Index* | *1.36* |
| *ASE Index* | 0.36 |
| *TASE Index* | *0.84* |

Thus, there is no evidence of long memory in the return series for Al-Quds index and TASE index while we found the evidence of long memory in the returns of ASE index. We observed that most values of d are around the unit root. So, time series of stock returns for the PEX and TASE markets are non-stationary and no longer covariance. This result supports the conclusion that the PEX and TASE markets are efficient at weak level while ASE isn't. So, the PEX and TASE stock returns don't appear to have serial correlation while ASE does. That is, according to values of d which are above 0.5 there is no significant evidence of long memory in daily stock returns for the PEX and TASE. The results of the R/S statistics show that the null hypothesis of no long memory should be rejected since the values of d larger than 0.5. However, no negative estimates were found. So, significant evidence of long memory can be found in the returns of the PEXand TASE with a daily frequency. On the basis of the d values we accept the null hypothesis that the time series of PEX and TASE don't display long-memory behavior since d is more than 0.5, while we reject the null hypothesis that stock returns don't display long memory behavior.As a result, the PEX and TASE are found to be efficient at weak level. On the other hand, ASE isn't efficient at weak level despite that ADF and PP tests indicated that the ASE is efficient at weak level.

### 4.4 Causality relationship Test

The data set used to test causality relationship between PEX, ASE, and TASE comprises of daily observations over the period of 2000:1 to 2012:3. Normality of time series is checked. According to Table 3we found that the three indices are not normally distributed. So, this indicates that there are no restrictions to implement a unit root test. We implement unit root tests to examine whether market indices are stationary. Table 11 shows the results of ADF and PP tests for stationarity.

The ADF-test and PP-test results for the three financial markets indicate that all time series data are non-stationary at level and stationary at first difference at 1% level of significance. Since both ADF and PP tests suggest that all time series are stationary at first difference, we have no restrictions in conducting Granger causality tests between the three markets: PEX, ASE, and TASE. This test is used to test the causality relationship between the three markets in the long-run and which one causes the other.

Before investigating the causality relationship, we conduct the test for the correlation between the three markets. Correlation matrix is considered in order to find out the relationship between stock markets which provides information for the Granger causality test. Table 12 shows the correlation coefficients of daily stock returns of the three markets. The correlation coefficients for the three markets are more than 1, which indicates that the three markets seem to be not correlated with other markets and amongst each other.Further, the three markets moved independently and not correlated with the others. That is, linkages don't appear to exist among stock markets in the three cases.

Table 11: Correlation Matrix for the three stock Market indices:

| *Stock Exchange* | *PEX* | *ASE* | *TASE* |
|---|---|---|---|
| *PEX* | *1.000000* | *0.002717* | *0.020941* |
| *ASE* | *0.002717* | *1.000000* | *0.002764* |
| *TASE* | *0.020941* | *0.002764* | *1.000000* |

To conclude, the results being presented in Table 12 provide insights that the correlations between the three markets aren't significant depicting that there isn't certainly some relation between stock markets which needs to be studied in detail. These correlations need to be further verified for the direction of influence by the Granger causality test. Since the time series of the three indices come out to be stationary at first difference, we reject the applicability of cointegration test. So, we can expect anything about long-term movements among the returns of the three markets on the basis of Granger causality test. Therefore, we directly move to capture the degree and the direction of long term correlation between the PEX, ASE and TASE under study, so Granger causality test are conducted for this purpose.

Table 12: Results of Pairwise Granger Causality Tests:

| ***Pairwise Granger Causality Tests*** | | |
|---|---|---|
| ***$H_0$: X doesn't Granger cause Y*** | | |
| | ***F-Statistic*** | ***Probability*** |
| ***ASE →PEX*** | *2.65480* | *0.07050* |
| ***PEX →ASE*** | *0.64241* | *0.52611* |
| ***TASE →PEX*** | *0.32685* | *0.72122* |
| ***PEX →TASE*** | *0.65669* | *0.51865* |
| ***TASE →ASE*** | *4.07475* | *0.01709* |

| | | |
|---|---|---|
| ***ASE →TASE*** | *1.06843* | *0.34368* |

*Significance levels of 1%, 5% and 10%*

As we note from the results, nearly P-values > 0.1 in most cases except for ASE versusPEX and TASE versus ASE relationships. Thus, the Granger causality test results suggest that ASE leads PEXand this causality is significant at levels of 10%. So the null hypothesis of ASE doesn't Granger causePEX is rejected and the null hypothesis that PEX doesn't Granger causeASE is accepted at levels of 10%. We also see that the relationship between ASE and PEX isn'ta feedback relationship because the null hypothesis isn't rejected from both cases. That is there is a unilateral causality is found from ASE to PEX.

When considering the relationship between PEX and TASE, we observe that PEX and TASE don't have leading effect on each other. So we accept the null hypothesis regarding PEX and TASE causality relationship. Further, we note from Table 12 that there is unilateral causality relationship between ASE and TASE. That is, TASE has a leading effect on ASE. Therefore, we accept null hypothesis that ASE doesn't Granger cause TASE at significance levels of5% and 10%, whereas we reject the null hypothesis of TASE doesn't Granger cause ASE. We conclude that the three markets aren't increasingly integrated. Generally, the results show that there is no significant causal relationship between the three markets which corresponds to the result that the three markets aren't highly correlated and they moved independently.

## Chapter5

## Conclusions, Policy Implications, and Further Research

### 5.0 Introduction

The study is the first that itempirically aims at investigating long memory in volatility during PEX bulls and bears to determine whether or not the volatility is persistent in these phases. It investigates long memory in stock returns of PEX, ASE and TASE to test market efficiency for the three markets as well as causality relationship amongst these stock exchanges. The study uses data of daily stock prices ofAl-Quds index over the period of 1997 to 2012 and daily stock prices of ASE and TASE over the period of 2000 to 2012 to investigate causality relationship. The data was retrieved from PEX, ASE, and TASE websites. We take the natural logarithm of the daily closing values and so daily returns are computed as the first differences of the log-transformed series. For this purpose, econometric and statistical techniques are used. Finally, results are analyzed and conclusion and policy implications are presented.

### 5.1 How the Methodology Affects theStudy Results

In order to investigate long memory behavior in stock returns and volatilities, a non-parametric tests including R/S statistic, ADF and PP tests were used to detect whether the PEX volatility exhibits different patterns of persistence in bull and bear markets to improve PEX performance and investment decisions that enhance future economic growth. In general, time series data of price indices were used to achieve several tasks: (1) identify PEX bulls and bears; (2) determine whether time series follow a process with long memory; (3) determine whether stock volatility is persistent in PEX bulls and bears; (4) investigate market efficiency at weak level of PEX, ASE, and TASE.

In addition to above mentioned tests, Granger causality test was conducted to investigate the short and long run relationship among PEX, ASE, and TASE. JB test was employed to test whether the series are normally distributed in order to conduct nonparametric ADF and PP tests. Then, correlation matrix is considered. Afterwards, Granger causality test was conducted.

Generally speaking, the methodology of this thesis supports testing the hypothesis regarding volatility, market efficiency and causality. It also enabled us to conclude competent and crucial results that support decision making. Hence, the time series datathat are used throughout this study enhanced the accomplishment of study objectives.

## 5.2Conclusions

### 5.2.1 Volatility in PEX Bulls and Bears

Market volatility persistent was examined in PEX bull and bear phases using daily stock returns from 1997 to 2012. Graphical presentation of Al-Quds index prices and returns indicates that the vertical fluctuations aren't the same at different portions of the Al-Quds financial time series, which indicates that mean and variance aren't constant and this time series data is non-stationary in each phase. Using long memory techniques, namely R/S statistics, we investigated whether stock market volatility presents a different behavior in PEX bull and bear phases. The study used the 200-day moving average to identify PEX bull and bear markets.

According to 200-day moving average technique, we found 3 bulls and 3 bears along the stipulated time period. After determining these 6 phases, we estimated the difference parameter d for each phase. The estimated values of d are between 0 and 0.5 for two bear stages and one bull stage. These values indicate that persistence is found in bear phases implying long memory stationarity for the volatility processes so the volatility is more persistent in the bear market than in bull markets. This conclusion has been already documented in the financial literature that stock market volatility is higher during bear markets than in bull markets.

Long memory behavior in time series implies to risk, asset allocation decision, pricing derivatives, so that long memory in PEX as an emerging stock market is likely to show significant evidence of risk.

The volatility persistence during bear markets suggests that long horizon predictability is doubtful. Thus, investors aren't likely to predict future stock returns when they are in bears markets because of long range dependence in those phases. Added to this, long term strategy may represent an exploited profit opportunity. The long memory increases the exposure for market risk as the investment horizon increase into the future and during bear markets. Therefore, during bear markets transaction costs on short term sale are more significant than for those decisions based on long term sale.

### 5.2.2 Market Efficiency at Weak Level

The study examined the presence of the long memory in daily stock returns of three markets, namely PEX, ASE, and TASE. Non-parametric test are used to find evidence of long memory in time series to indicate market efficiency.  First of all, normality test of time series of the three indices is conducted. We found that the three indices are not normally distributed. We don't have restriction to conduct stationarity tests using non-parametric ADF and PP tests. According to ADF and PP tests, financial time series are found to be non-stationary at level, but they are stationary at first difference. That is, mean and variance seem to be not constant in the time series of the three cases, which indicates that all time series data are non-stationary in the level. As a result, the three markets seem to be efficient at weak level. Also, non-stationarity does preclude the possibility of long memory in the returns data. The difference parameter d is calculated by using R/S statistic to indicate long memory evidence in stock returns of the PEX, ASE and TASE. The values of parameter d are above 0.5 for PEX and TASE implying that time series are non-stationary, and therefore the two markets are efficient at weak level. However, the value of d was found to be 0.36 for ASE implying that there is an evidence of long memory in stock returns. This result isn't consistent with random walk theory. Therefore, it isn't possible to predict future returns using lagged returns on the basis of long horizon predictability for PEX and TASE while this is applicable for ASE.

### 5.2.3 Causality Relationship between PEX, ASE, TASE

In addition to volatility and market efficiency investigation, causality relationship among PEX, ASE and TASE were investigated. First of all, normality of time series is checked. The three indices are found to be not normally distributed. We conducted non-parametric ADF and PP tests. The three markets are found to be non-stationary at level and stationary at first difference. Since time series data are stationary at first difference, cointegration test not needed. We also applied correlation test among the three markets. The three indices aren't highly correlated.The correlation is further verified by the Granger Causality test among the three markets. However, we found that there is no feedback causal relationship between PEX and TASE. This is because TASE includes 15 indices while PEX includes only one. However, we use TA-100 which is one of the 15 TASE indices to study the relationship between the two markets. Added to this, PEX is still young and uses one index to represent its performance. So, the results indicate that there isabsence of feedback causality relationship between the two markets. We found that ASE Granger causes PEX, whereas reverse causality relationship doesn't hold true between ASE and PEX. Further, unilateral relationship was found from TASE to ASE. This is implying that stock returns in TASE couldn't be used to make predictions in PEX returns while stock returns of ASE could be used to predict future returns of PEX since most of investment in PEX are made in Jordanian dinner.

### 5.3 Policy Implications

As we have noted, in order to invest in PEX, it is crucial to investigate how stocks behave and how stock movements present different behaviors along time periods. This study sought to investigate long memory in stock volatility and returns to indicate volatility persistence, and market efficiency. The study also consider if there is any causality relationship between PEX, ASE and TASE. Specifically, through this study, several policy implications are found and presented below.

The study's conclusions regarding volatility persistence, market efficiency and causality relationship between stock markets are important for both investors and policy makers. The risk of uncertainty during bear markets and the decline in PEX stock price and liquidity could be related to the volatility observed in the bear markets. Therefore, investors are likely to consider the risk associated with changes in stock prices and decline in liquidity in PEX bear phases. So, they may invest during bear phases, while they sell in bull phases in order to avoid losses and achieve returns. Also, they should carefully investigate market movements and general market trends when they establish their buy and sell decisions since risk and liquidity problems are associated with PEX bear markets. The investors shouldn't only consider the uncertainty and risk for index level, but also they should consider that at company level. This strategy is likely to be applied in short term sale. This can help investors to avoid losses associated with bears markets.

Further, the investors may suffer financial losses since volatility is persistent and continues for a long time periods which add more risk and liquidity problems during those phases. Therefore, investors should consider the turning points when bull and bear phases start. They mustknow when they buy and when they sell securities since stock prices are more volatile during PEX bear phases for long time periods.To reduce the risk of losses, the combination of fundamental and technical analysis is to be used when investorsmake their investment decisions, because together, they may provide opportunities for enhancing investment results.

The results regarding market efficiency of PEX, TASE, indicate that the time series data is non-stationary of the two markets are efficient at weak level, while ASE isn't efficient at weak level since the existence of long memory in time series implies that the future returns are predictable and this doesn't correspond with weak form of efficient market hypothesis (random walk theory). However, price returns differences are insufficient to take advantage of historical time series observations when taking investment decisions in PEX and TASE, while this is held true to ASE. Accordingly, it isn't possible to predict future returns using lagged returns on the basis of long horizon predictability. As a result, technical analysis is recommended to be used by Palestinian investors to develop trading rules on the basis of short horizon predictability. Also, regulators and policy makers in Palestinian authority are likely toexamine the sources of long range dependence in stock markets to improve and enhance market efficiency.

The empirical results of causality relationship between the three indices indicate that there is no causality relationship among them excluding the unilateral causality of ASE over PEX. The outcomes can provide have two implications: First, the causality relationship between the two markets should be useful for short term investments in PEX and ASE; Second: the ASE stock prices changes might be good prediction of PEX Stock prices changes. These implications should be considered by both investors and policy makers. For investors, their investments in PEX are likely to be affected by change in prices listed in ASE. As a result, policy makers should consider market interdependency and market integration since they enhance economic growth.

Palestinian investors can consider these results when they manage their portfolios and evaluating of individual companies, rather than counting on general movements. Bull and bear phases' characteristics can be considered at index level as well as company level.

This study is important for both investors and policy makers in Palestine. Particularly, the results provide very important information on investment strategies in stock exchanges which in turn enable investors to take profitable decisions and achieve returns.

## 5.4Suggestions for Further Research

Investigating long memory behavior in stock volatilities and returns is widely considered by academicians and professionals. In Palestine, empirical studies of these topics are still limited or not exist. Non-parametric R/S, ADF and PP tests are used to investigate long memory behavior to indicate volatility persistence and market efficiency. The estimates of d parameter indicate that the study is likely to be introduced as evidence about the possibility of developing investment environment since stock market volatility is persistent during PEX bear phases. As a result, robustness of empirical results of R/S statistics, ADF and PP techniques are very necessary to be examined by further semi parametric techniques; GPH estimator and Wavelet based estimator and parametric tests; and ARFIMA Models to investigate long memory behavior in stock volatility and returns.

Additionally, the result of this study encourages investors to use trading techniques to study market behavior to establish their buy and sell decisions. However, most trading techniques are based on taking advantage of mathematical and statistical rules based on the tendency toward mean reversion. Another possible study could be to analyze the mean reversion in PEX bull and bear phases for further investigation in stock volatility characteristics.

As the GDP and the index have opposite directions, and there were an outlier observations of Al-Quds index in 2005, further empirical work on this issue is important to investigate the reasons behind thisphenomenon. This work is of special interest for investors, policy makers and policy makers.

Further,the study investigated causality relationship among the three markets; PEX, ASE and TASE. The findings show there is no causal relationship between the three markets over the sample period whereas the three markets seem to be highly correlated. Therefore, empirical studies that may investigate causality relationship among the three markets before, during, and after international financial crisis are necessary to be extended in future. Since the Granger causality doesn’t investigate the direction of the relationship, further research can consider that in the future. Further, correlation and causality between stock market and Macroeconomic variables in Palestine is recommended to consider in future research.

### 5.5 Summary

This study is the only study that has investigated volatility persistence, market efficiency as well as causality relationship between stock exchanges. Time series data were used to conduct tests from 1997 to 2012. So, several econometric techniques are used for this purpose.

The study concluded that stock market volatility is more persistent in the PEX bears markets than in the PEX bull markets. Further, the PEX bear markets are longer than PEX bull markets. As a result, volatility persistent in PEX bear and risk associated with it should be considered by investors.

This study also revealed that the estimates of d are above 0.5 for the three cases implying that time series data are non-stationary, and there is no evidence of long memory behavior (long range dependence) in the time series data. So, we accept that PEX, and TASE are efficient at weak level while ASE isn’t. Therefore, regulators and policy makers should support market efficiency.

The study also found that there is no significant causal relationship between the three markets except the unilateral causality relationship of ASE over PEX and TASE over ASE whereas reverse causality doesn’t hold true. That is, the study found that there is no multilateral causal relationship among the three markets. Meanwhile, they aren’t highly correlated. Therefore, Palestinian investors don’t have to consider changes in TASE index, while changes in ASE index must be considered.

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