THE STOCK MARKET AND ITS ECONOMIC INTERACTIONS:

AN EMPIRICAL STUDY OF EGYPT

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ABSTRAK

Tesis ini mengkaji hubungan antara perkembangan pasaran modal dengan pertumbuhan ekonomi di Mesir. Selain itu, ia bertujuan untuk menentukan kewujudan kausaliti dan haluannya diantara perkembangan pasaran modal dengan pertumbuhan ekonomi. Penyelidikan ini juga menganalisis perilaku pasaran modal, khususnya reaksi terhadap krisis antarabangsa, iaitu peristiwa serangan pengganas Luxor, perang Iraq dan 11 September. Analisis ini menggunakan pembolehubah ekonomi asas, iaitu inflasi, kadar bunga, kadar tukaran, penawaran wang, defisit, dan keluaran dalam negara kasar. Kajian ini menggunakan data sukuan yang meliputi tempoh 1993:1 hingga 2008:4 yang merangkumi tiga insiden antarabangsa tersebut. Hubungan jangka panjang antara perkembangan pasaran saham dan pertumbuhan ekonomi diuji menggunakan ujian kointegrasi Johansen, diikuti dengan analisis dinamik jangka pendek yang berdasarkan model VECM; Sementara itu penentuan kausaliti antara pembolehubah ditentukan dengan menggunakan ujian kausaliti Granger. Ujian kointegrasi menunjukkan bahawa wujudnya hubungan jangka panjang yang positif diantara perkembangan pasaran saham dengan pertumbuhan ekonomi Mesir. Selain itu, hasil ujian juga menunjukkan hubungan yang positif dan kausaliti daripada pertumbuhan ekonomi dan pembangunan pasaran saham. Kajian ini juga meneliti hubungan antara ketidaktentuan (volaliti) pasaran saham dengan asas ekonomi menggunakan model *generalised autoregressive conditional heterokedasticity* (GARCH). Dapatan kajian menunjukkan wujud hubungan antara volatiliti pasaran saham dengan keluaran dalam negara kasar, defisit, dan kadar bunga. Sementara itu, kajian keatas reaksi pasaran saham Mesir terhadap krisis dunia, iaitu peristiwa serangan pengganas Luxor, perang Iraq dan 11 September adalah menunjukkan reaksi yang berbeza sebelum dan selepas setiap krisis.

ABSTRACT

This thesis investigates the relationship between stock market development and economic growth in Egypt. Its aim is to determine the direction of causality between stock market development and economic growth. This study also includes the analysis of stock market behaviour, in particular the respond toward major international crisis namely the Luxor terrorist attack, Iraq war, and September 11. The analysis uses selected fundamental economic variables namely, inflation, interest rate, exchange rate, money supply, budget deficit, and gross domestic product and the data is analysed using quarterly data that covered the period between 1993:1 to 2008:4 which includes the above three international incidents. The existence of a long-run relationship between the stock market development and the economic growth is tested using Johansen's cointegration test, followed by the analysis of the short-run dynamic, which is based on the vector error correction model (VECM), while the determination of causality between variables is based on the Granger causality test. The result of the cointegration test shows the existence of the positive long-run relationship between the stock market development and economic growth in Egypt. It shows a positive relationship between economic growth and stock market development, while the causality is from economic growth to stock market development. Additionally, this thesis also examines the relationship between the stock market volatility and economic fundamentals using generalised autoregressive conditional heterokedasticity (GARCH) model. The result shows the existence of relationship between stock market volatility with gross domestic product, government budget deficit, and interest rate. Finally, as for the reaction of the Egyptian stock market towards the world crisis namely Luxor terrorist attack, Iraq war and September 11, the results exhibit different reaction from the Egyptian stock market before and after the crisis.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Since the early 1990s, many developing countries have launched new markets or revitalized existing ones to enhance the development of capital markets and ease access to long-run capital. And it is well known that high volatility characterizes emerging stock markets. The objective of this study is to investigate the relationship between macroeconomic variables and the stock market volatility for the Egyptian stock market, and which macroeconomic variables are more important in causing major shifts in market volatility, since it is proven that long trend volatility should be associated with economic growth (Officer, 1973; and Schwert, 1989). This study also examines whether global, regional or local crises are causing market volatility or not.

The importance of the study on emerging equity markets is derived from at least three reasons: investments in emerging financial markets (EFMs) are viewed as the high-risk component of a global investment portfolio. As such, it is important for investors to understand the mix of benefits, and as pointed out by Chen, Roll, and Ross (1986) as well as McElroy and Burmeister (1988) and Hamao (1988), there is a relationship between macroeconomic variables and the stock prices. They also concluded that stock prices respond to macroeconomic news.

This chapter is organized as follows: 1.2 deals with the relationship between financial sector and economic growth, while section 1.3 gives a definition of volatility in stock markets. The problem statement and overview of Egyptian market is presented in section 1.4. Research questions will be offered in section 1.5, while the justification or significance of this study is presented in section 1.6. The objectives of the study and the hypotheses are in section 1.7 and 1.8 respectively. Finally, the organizational structure of the thesis is presented in section 1.9.

1.2 Background

The main objectives of any studies on economic growth should clarify the possibility of raising the overall economic growth, and the increase in economic welfare and standards of living. To fulfill this goal, many economists study the relationship between financial markets and economic growth. Although this relationship is not new, the view of this relationship has changed over time.

Many economists have underlined the importance of financial sector's development in the process of economic development, while others think that this importance is over-stressed (e.g. Lucas (1988, p.6) and Robinson (1952, p.86)). However, the debate is not new in the developing economics literature, and may be traced back to Schumpeter's* Theory of Economic Development which was

* Schumpeter argued that finance does matter for economic development because financial institutions, by searching for successful innovation projects, finish by encouraging entrepreneurs to produce better and more.

introduced in 1912. Later, Gurley and Shaw (1955) pinpointed the credit channel; and more particularly the role of financial institutions in the supply of funds to the real activity, and underscored the idea that differences in financial systems development may explain economic performances across countries. King and Levine (1993) showed that, the level of financial intermediation is a good predictor of long-run rates of economic growth, capital accumulation, and productivity improvements.

Patrick (1966) introduced an explanation for this relationship by developing two terminologies; demand following and supply leading. Demand following is developed from Robinson (1952), of which meant that, the financial development is a consequence of high growth, and then when the economy grows, it generates new demand for financial services. On the other hand, the supply leading developed from Schumpeter (1912) is the opposite of demand following. The financial sector is essentially the leading sector of real economic growth process, and the economic growth increases as a consequence of financial development. Gaytan and Ranceire (2004) used a sample of 72 countries based on real per capita income growth, and domestic credit to private sector and liquid liabilities as proxies for financial intermediary to confirm that - Table 1.1- there is a positive relationship between financial development and growth.

This relationship depends on the level of country's wealth; it means that the effect varies from negative in countries that have experienced declines in per

capita income to positive in countries that grow faster, as well as in the middle-income economies. However, their study had received the main critics; it ignored capital markets and focused only on banking sector. There are at least five known ways in which financial development contributes to economic growth (Figure 1.1) and they are extensively described in the surveys by Pagano (1993) and Levine (1997, 2003).

1.2.1 Allocation of Resources

Financial intermediaries may lower the costs of gathering and processing information and thereby improve the allocation of resources. Such information improved all economic agents, which boost the economic growth. Besides, banks may also spur the rate of technological innovation by selecting those entrepreneurs with the greatest chances of launching successful ventures (King and Levine 1993). Levine (1997) also suggested that financial markets might improve the consequence of information and transactions frictions. From this point of view, Merton and Bodie (1995) argued that the financial system facilitate the allocation of resources, across region and time, in an uncertain environment. This phenomenon could happen by determining which borrowers obtain loans and judging the creditworthiness of borrowers at a lower cost than incurred by the average small investor (Khan, 2000). Information acquisition costs can be applied to all investors instead of individual acquisition, thus improving resources allocation by reducing the costs of acquisition of information.

Levine (1997) stated that stock markets might influence the acquisition of information. The same sentiment was shared by other researchers who said that market members will have incentives to acquire information if the stock market became larger and more liquid because it becomes easier for the member who acquired information to hide it to make money (Grossman & Stiglitz, 1980) and (Holmstrom & Tirole, 1993).

1.2.2 Monitoring Managers and Exerting Corporate Control

Bencivenga and Smith (1993) showed that banks, which alleviate the corporate governance problem by lowering monitoring costs, will reduce credit rationing, thereby spurring growth. Levine (1997) indicated that financial markets and intermediaries may mitigate the acquisition of information, fulfill the costs of monitoring managers and exert corporate control. Entrepreneurs' or managers' information on the operation and outcome of their projects tend to be superior to the information that outside creditors and shareholders have. Insiders' attempts to exploit this information by engaging in opportunistic behavior would tend to discourage savings. For example, managers might underreport their firms' profits to lenders and shareholders in order to raise their own earnings. To offset this information advantage, banks monitor borrowers, and equity markets allow shareholders to discipline managers by voting out poor management (Khan, 2000).

1.2.3 Facilitating Trade

Financial intermediaries and security markets provide vehicles for trading, pooling and diversifying risk by extending credit and guaranteeing payments. For example, currency, demand deposits, and credit card accounts allow individuals to exchange goods and services without having to resort to barter. Additionally, letters of credit help firms to order the inputs for current production when they experience delays in payment for past sales. Khan (2000) and Levine (1997) argued that financial process which lowers transaction costs may promote specialization, innovation, and growth. This relationship between specialization, innovation and growth is the cornerstone of Adam Smith's Wealth of Nations (1776). Adam Smith argued that lower transaction costs would permit greater specialization because specialization requires more transactions than an autarkic environment (Levine, 1997).

1.2.4 Risk Management

Financial systems allow agents to hold a diversified portfolio of risky projects that will induce society to shift towards projects with higher expected returns and positive incidence on economic growth. Cross-sectional risk diversification of financial systems may also improve inter-temporal risk sharing (Levine, 1991) and (Bencivenga et al., 1995). Bencivenga and Smith (1991) showed that, by eliminating liquidity risk, financial intermediaries can increase allocation of resources to high return, illiquid asset and accelerate growth.

Levine (1997) argued that, in the presence of specific information and transaction costs, financial markets and institutions may arise to ease the trading, hedging, and pooling of risk. Khan (2000) pointed out that, spreading investors' savings across many different investment opportunities reduce risk. Spreading savings diversifies risk for households and reduces their exposure to the uncertainty associated with individual projects. This reduction in risk encourages savings.

1.2.5 Mobilizing Savings

Financial system encourages the mobilization of savings by providing attractive instruments and saving channels. These instruments provide opportunities for households to hold diversified portfolios and invest in efficient scale firms. Khan (2000) pointed out that, since an individual saver may be unable or unwilling to completely fund a borrower, financial markets and institutions pool the savings of diverse households and make these funds available for lending. This activity reduces the transaction costs associated with external finance for both firms and households. By going directly to a financial institution, firms seeking to borrow may be able to avoid the costs of having to contact a diverse group of savers. Similarly, savers may be able to avoid the costs of evaluating every potential borrower by placing their funds with a financial institution. But the process of mobilizing savings of many disparate savers is costly .It involves (a) overcoming the transaction costs associated with collecting savings from different

individuals and (b) overcoming the informational asymmetries associated with making savers feel comforTable (Levine,1997).

From the aforementioned, the existence of a financial market and especially a stock market is more important because:

1. The capital market provides investors and entrepreneurs with a potential exit mechanism, and it gives the venture capital investor the ability to realize the gains from a successful project when the company makes an initial public offering. The option to exit through a liquid market mechanism makes venture capital investment more attractive and might well increase entrepreneurial activity in general.
2. Capital inflows – both foreign direct investment and portfolio investments – are potentially important sources of investment funds for emerging market and transition economies; both of them have grown rapidly in recent years. So the existence of capital market facilitates capital inflows and the ability to finance current account deficit.
3. The provision of liquidity through organized exchange encourages both international and domestic investors to transfer their surpluses from short- to long-term capital to finance large and invisible projects that induce firms to have the advantages of scale economies.
4. It provides important information that improves the efficiency of financial intermediation from management to owners and quickly produces a market evaluation of the company (Schwert, 1989, p.91).

These studies and others clearly show that there is a strong and positive correlation between development of stock markets and the level of economic development and capital accumulation; this is solid and uncontroversial result. Indeed, the development of economy urges stock market to expand in listed companies and market capitalization (Capasso, 2006).

However, financial market transactions are affected by three categories of problems: uncertainty, information asymmetries and transaction costs; all of them can be related to the inability of prices to reflect information (Gross, 2001):

a. Uncertainty in financial transactions arises on the supply-side of funds through capital allocation and on the demand-side of funds through risk allocation. Economies of scales allow financial intermediaries to gather information and decrease uncertainty at a relatively low cost.

b. Asymmetric information concerns the fact that private information is costly to obtain. Financial intermediaries can set-up special arrangements and contracts, such as the collateralization of credit, to generate the correct incentives.

c. Transaction costs are reduced by financial institutions, which enable intermediacy between a large number of small savers and big borrowers (Gross, 2001).

Financial markets feature uncertainty on returns and imperfect information about borrowers and their projects. These uncertainties are too costly to be eliminated completely by the private agents. Although industrialized and

developed financial markets have tools and instruments to hedge risk, credit rationing still exists. On the contrary, in developing countries, these instruments are not available. Instead, this problem may be solved or relaxed by an expansion of alternative banking scheme. Hence, adequate policies must be developed in order for the financial development to contribute more effectively to employment and growth in those countries. A variety of issues must be addressed by a variety of well-designed, targeted policies. Some examples are:-

- Policies which protect existing customers from moral hazard and non-competitive behavior by banks such as prudential regulations and competition policies;
- Policies that improve access to financial instruments by small or low-income customers who are credit worthy by lowering information as well as transaction costs;
- Policies that lower barriers to entry perceived by financial institutions in specific markets such as regulations that induce banks to offer credit and savings services to low income populations;
- Monetary policy which does not repress interest rates will allow flexibility in discount rate and compulsory reserve ratios, and will take into account the distributional consequences of changes in interest rates through credit market;
- Fiscal policy which does not crowd out private investments;

- Capital market policies that take into account the high degree of mobility of the capital (Gross, 2001).

1.3 What Is Volatility?

Why do stock prices fluctuate? Why does the price of an asset rise in a period, and decrease in another? The higher expected rate of return for the risk is the most attractive shares. The relationship between the expected rate of return and risk changes motivates investors to purchase or sell the share. This means that, stock price changes to reflect changes in expected rate of return and/or the risk in an attempt to find equilibrium. Rational expectation is parallel to the efficient market hypothesis (EMH). The efficient market hypothesis is just an application of rational expectation to the pricing of the stocks, and it is based on the assumptions that prices of securities in financial markets fully reflect all available information (Mishkin, 2004, p.150). In addition to that, the market has no transaction costs, or in other words, the market is perfect (Papachristou, 1999). So if the stock market is efficient, then the volatility of stock returns should be related to the volatility of the variables that affect asset prices (Krainer, 2002).

In the case that there is no transaction costs, the traders respond quickly and easily to any items of information relevant to stock prices that reach them, and if the market is efficient, this information will already be reflected (fully reflect) in the price.

The efficient market hypothesis can be classified into three main distinguishable classes;

1. The weak form, which the information subset of interest is just past price (or returns) histories.
2. The semi-strong form, which in addition considers publicly available information, such as annual reports and new security issues.
3. The strong form, which looks also at nonpublic ("inside") information (e.g. managements of mutual funds) (Fama, 1970).

Campbell (1991) tried to explain stock market movements over a long period of time. He argued that all unexpected movements in stock prices should be due to changes in rational expectations of future dividends and changes in rational expectations of future returns (Table 1.2).

The expected rate of returns should be an equal compensation for the risk. These relationships can be illustrated as follows:

(1) Expected Rate of Return (R) v. Risk. The expected rate of return must be equal compensation for the risk

(2) Expected Rate of Return (R) = Expected to be Received Benefits/Stock Price. So the relationship will immediately be restored if expected return to be received from the corporation and/or risk changed.

High levels (excess) of Volatility can affect the return on investment and growth by affecting average portfolio risk. This negative impact can occur through variety of channels:-

a) Volatility may cause great instability of financial system as a whole.

b) Volatility may discourage savings by raising the cost of access to capital, hence it can decrease financial funds supply.

c) High volatility in stock prices may cause inefficient allocation of resources because prices do not correctly indicate return on investment (Capasso, 2006). This result in upward pressure on interest rate causes the reduction of economic growth through hampering of the volume of investments and its productivity (Federer, 1993).

From these points mentioned above, volatility may hamper economic growth. On the other hand, Levine and Zervos (1998) argued that there is no significant relationship between volatility and economic growth.

The changes in the ex-ante volatility of market returns have important negative effects on risk-hesitant investors. Moreover, changes in the level of market volatility can have important effects on capital investment, consumption, and other business cycle variables (Schwert, 1989).

1.3.1 Stylized Facts about Volatility in Financial Markets

Financial time series exhibit certain patterns which are crucial for correct model specification, estimation and forecasting:

• Fat tails. The distribution of financial time series, e.g. stock returns, exhibit fatter tails than those of a normal distribution – kurtosis equal to the fourth cumulated divided by the square of variance, and normally compare it with the kurtosis factor of normal distribution which equal 3; so we deduct 3 from the outcome to make the kurtosis of normal distribution. But this correction number will be above 3 for many financial time series (Fama (1963, 1965).

• Volatility clustering. The second stylized fact is the clustering of periods of volatility, i.e. large changes followed by further large changes, and small changes followed by small changes, of either sign. This is an indication of shock persistence.

• Leverage effects. Bad news is usually followed by a decrease in the stock price, which in turn increases the financial leverage of the firm and makes its stock riskier. This was first suggested by Black (1976) for stock returns. Black argued, however, that the measured effect of stock price changes on volatility was too large to be explained solely by leverage effects.

• Long memory. Especially in high-frequency data, volatility is highly persistent, and there is evidence of near unit root behavior in the conditional variance process. This observation led to two propositions for modeling

persistence: the unit root or the long memory process. The autoregressive conditional heteroscedasticity (ARCH) and stochastic volatility (SV) models use the latter idea for modeling persistence (Knight and Satchell, 2007, p.3).

• Co-movements in volatility. When we look at financial time series across different markets, e.g. exchange rate returns for different currencies, we observe big movements in one currency being matched by big movements in another. This suggests the importance of multivariate models in modeling cross-correlations in different markets.

•Non linear correlation, in time of stress, the correlation among asset volatilities tends to increase.

The number of models that have been developed to predict volatility based on time series information is astronomical, but the models that incorporate economic variables are hard to find. Using various methodologies, links are found but they are generally much weaker than seem reasonable. For example, it is widely recognized that volatility is higher during recessions and following announcements, but these effects turn out to be a small part of measured volatility (Engle and Rangel, 2005).

In this thesis we will employ two different methods to capture stock market volatility; the first is the standard deviation as presented. And the second is GARCH to provide empirical evidence on the link between stock market volatility and macroeconomic variables.

In summary, the theory on finance and growth focuses on particular functions provided by the financial system – producing ex-ante information, monitoring investment, exerting corporate governance, facilitating trading, diversification and risk management and pooling savings - and how these impact on economic growth through resource allocation or capital accumulation decisions.

On the other hand, several investigations have been carried out to test the impact of financial development on economic growth and the causal relationship between them. However, this effect varies across countries and over time. Furthermore, as the Latin American experienced in the 1970s and 1980s, there may be instances where unregulated financial liberalization and expectations of government bailouts can lead to a negative relationship between the degree of financial intermediation and growth. Thus, the removal of financial repression requires an appropriate regulatory framework to avoid costly financial crisis. Our findings also strongly suggest that the main channel of transmission from financial development to growth is the effect on the efficiency of investment, rather than its level (De Gregorio and Guidotti, 1995).

Singh (1997) claimed that financial development may not be beneficial for growth for several reasons; He stated that: firstly, the inherent volatility and arbitrariness of the stock market pricing process under DC (developing countries) conditions make it a poor guide to an efficient investment allocation. Secondly, the interactions between the stock and currency markets in the wake of unfavorable

economic shocks may exacerbate macroeconomic instability and reduce long-term growth. Thirdly, stock market development is likely to undermine the existing group-banking systems in DC's, which, despite their many difficulties, have not been without merit in several countries, not at least, in the highly successful East Asian economies (Levine, 1997, pp. 779–780).

In his classic work, Frank Knight (1921) wrote in the meaning of risk and uncertainty, the probabilities may be attained either by deduction (using theoretical models) or induction (using the observed frequency of event). For example, economists can deduce the probabilities of the distributions of stock market returns based on theoretical models of investors' behavior, or they can induce the probability of distributions, for stock market returns from the history of past returns. Whereas risk is quantifiable randomness, uncertainty is not.

Knight also argued that this difference is important in the market. If risk were the only relevant feature of randomness, well-organized financial institutions should be able to price and market insurance contracts that only depend on risky phenomena. Uncertainty however, creates frictions that these institutions may not be able to accommodate (Rigotti & Shannon, 2004).

Since uncertainty, as distinct from risk, can exert a significant influence on individual behavior, it should also be a significant determinant of equilibrium outcomes. For example, risk is insurable through exchange while uncertainty is not. Uncertainty should arguably lead to two notable departures from standard

risk-sharing behavior in expected utility models. When uncertainty is prevalent, some insurance markets might break down, resulting in equilibrium with no trade. Moreover, indeterminacy may also arise in this setting. Without uncertainty, the probabilities of risky events are known and frictionless markets can precisely price contracts contingent on risky events, at least generically. Even well- functioning markets, however, may not be able to precisely price contracts conditional on uncertain events, since the probabilities of these events are unknown. Such indeterminacy in equilibrium outcomes can generate excess price volatility and predictions that are sensitive to small measurement errors.

The finance literature on stock market volatility has shown that the time series of market returns is not drawn from a single probability distribution, but rather from a mixture of conditional distributions with varying degrees of efficiency in generating the expected returns. King and Levine (1993) initiated a torrent of empirical studies documenting this impact, which also got support from theoretical models of endogenous growth. These models, most prominently by Greenwood and Jovanovic (1990) and Bencivenga and Smith (1991), showed that financial institutions can increase total factor productivity (TFP) and the marginal productivity of capital by stimulating savers to hold more of their wealth in productive assets and by funding riskier but more productive technologies. The end result is that financial development can have a permanent and continuous effect on the steady-state growth rate of income. (Bolbol et al., 2005).

Volatility cannot be directly observed but some of its features can often be found in the return ratio series. First, there is volatility cluster; volatility may be high in some time, and low in the other time. Second, volatility varies with time sequence, which means, jumping volatility is rare. Third, volatility does not diverge to infinite, which means volatility varies within a fixed scope, so in statistics volatility tends to be stationary. Fourth, the response of volatility to the significant increase in the price is different from that of a sharp drop.

Volatility has two components, one is generated by forces, which are outside the economy (exogenous), determined by the volatility of the exogenous fundamental conditions in the market , while the other propagated within the economy system (endogenous), caused by the distribution of beliefs of the agents (Kurz, 1997).

1.4 Problem Statement

1.4.1 Stock Market in Egypt: An Overview

The Egyptian Stock Exchange (ESE) is one of the oldest in the world, and comprises two exchanges; Alexandria Stock Exchange, officially established in 1888, and Cairo, established in 1903. It was the fifth most active stock exchange worldwide, prior to the nationalization of industry and choosing of the central planning policies in the early 1950s. These policies led to a considerable reduction in stock exchange activity, and the market remained largely dormant throughout the 1980s (Mecagni and Sourial, 1999).

The ESE began operating again as a market for capital only in 1990/1991, and became the darling of reforming Arab economies. Its financial reforms involved internal and external liberalizations before the completion of domestic and international-trade price liberalizations.

As would be expected, Egypt revitalized its capital market after a stagnation of almost 40 years since President Nasr's nationalization regime. Since then Egypt, which has been one of the emerging markets, is experiencing high performance.

The government enacted the Capital Market Law No. 95, June 1992, which replaced the multiplicity of laws previously regulated the securities market. A computer-based screen trading system is adopted, and the market has one 4-hour trading session which is a continuous order-driven market. Circuit breakers have been implemented since late February 1997 to dampen the increasing volatility in the market (Aly, Mehdian and Perry 2004).

Throughout the period of 1996 to 2000, the market was volatile due to sped up privatization program in the early 1996s, in which the government sold major stakes as IPOs (Initial Public Offering). This was followed by a sluggish market for a long period.

This was realized by the end of 1997, when Egypt found itself exposed to a series of economic shocks that revealed yet again its vulnerability to external circumstances: the Luxor terrorist attack which temporarily wiped out tourism, the

drop in oil prices (1998–2000), and the consecutive financial crises that hit many emerging markets. By investigating the time series, it is remarkable that, in the beginning of 1997, the ESE has been on a continued, gradual decline, and in 1998, activity turned sluggish, with a decline of 20 percent in daily trading value (Raaft, 1998), and a persistent weakness for many of the most actively traded shares, and, more recently, the events of September 11. Since these shocks undermined the key sources of foreign currency, exchange rate management came to dominate the political economy of Egypt. The government initially supported the pound, first by spending foreign reserves, and later by tightening credit and restricting imports — the result of which was a notable economic slowdown. It was not until May 2000 that the government let the pound slide in small increments, finally allowing a free float in January 2003 (Bolbol et al., 2005)

In 1997, the Presidential Decree No. 51 was issued, defining the shareholding and the governance structure of the Stock Exchange. As per the Decree, both exchanges are managed by the same Chairman, same Board of Directors and same rules.

On 9 June 2008, Law No. 123, amending certain provisions of the Capital Market Law No. 95 of 1992, was issued. According to the Law, there shall now be one entity called "The Egyptian Exchange", replacing both Cairo & Alexandria Stock Exchanges. In spite of the financial crises, international commodity prices hikes and volatility in energy prices, Egyptian economy maintains high annual growth rate turn of about 7 percent in the time between 2005 and 2008. At the

same time, it recorded a surplus in the balance of payment, and attracted more foreign direct investment (FDI). However, budget deficit still represents a significant percent, although it has decreased in 2008.

From Table 1.4, it can be seen that market capitalization increased from L.E.172 billion in 2003 to L.E. 474 billion in 2008 (see also Figure 1.4) where it began with only L.E. 8.8 billion in 1991. Since Egypt has successful economic reform, the number of list increases gradually and then decreased from 978 in 1991 to 373 by the end of June 2001. This decline is due to the many delisting cases. The Egyptian stock market decides to delist a company if it failed in its commitment to quarterly disclose its financial statements; and this step is a final stage to ensure that only professionally managed businesses are listed (Hadfield, 2008). The number of companies traded within 20 percent price limit has reached 182 companies at the end of 2008. Those companies captured 75 percent and 96 percent of the total value and volume traded (stocks only), respectively. They were also accounted for 99 percent of the total number of transactions. Furthermore, the market capitalization of these companies represented 66 percent of the total market capitalizations at the end of 2008, as illustrated in Table (9). The 182 companies registered were almost 90 percent of the total value traded (stocks only), excluding deals (EGX, 2008). This may mean that the Egyptian exchange still has limited depth. Volume and value of traded securities also increased dramatically as can be seen from Graph (1.4) and (1.5), which correspond to lines 2 and 5 of Table (1.4) respectively.

As mentioned before, Egyptian stock market was ranked the second best performing emerging market according to Morgan Stanley "Global Emerging Market" and one of the most profitable markets on their portfolio.

There are a number of factors or reasons which come into consideration when we compare the advantages of Egyptian stock market with other emerging markets namely, no dividends, capital gain taxes or stamp requirements (the longstanding law in Kuwait imposes a prohibitive tax on capital gain), no controls on foreign investment or investors (foreign investors cannot buy Saudi stocks) and low listing fees in relation to MENA. Well diversified sectors are listed in the main index, local presence of international investment banks & custodians such as Citygroup HSBC, American Express, and also the presence of large foreign institutional investors. International finance corporation (IFC) conduct risk-return analysis for 30 countries, and Egypt was ranked 6th with a return of 21.45 percent. With regards to the risk factor, Egypt was ranked 8th with a risk factor of 4.06 percent. By the end of December 2007; Standard and Poors indices, and IFCG for price earnings ratios and return on coupon, indicated that Egypt held an advanced position with a return on coupon of 5.1 percent (Figure 1.6 and 1.7). Price earnings ratios in Egypt are at a medium level which indicated that prices in the Egyptian market are relatively low if compared to other emerging markets (Yearbook, 2008).

In the early 2000s, the market has peaked, recording new highs for most indices due to the sale of four major cement companies to anchor investors.

However, the outstanding performance did not continue and the market sloped downwards to record new lows due to the deterioration in monetary indicators, and tension in the foreign exchange market (Sourial,2000).

A total number of listed companies reached 770 at the end of 1998, where it has continuously increased to 1070 at the end of 2002. In the same year, a delisting of about 500 stock companies occurred due to none trading. In early 2006, Egypt performed strong correction, where the CASE (Cairo and Alexandria Stock Market) Figures were among the best-performing stock markets worldwide over the last few years. At its highest point during the last nine years, in February 2006, the Egyptian stock market index was, on a U.S. dollar basis; almost 12 times as high as at the low point in March 2003.

The existing literature which selected Egypt as a case study is very few and limiting the testing for the weak form of the efficient market hypothesis (EMH) and in estimating the volatility of stock market returns, and its effect on economic growth. For instance, an early paper by El-Erian and Kumar (1995) provided a comparative analysis of equity markets in six Middle Eastern countries (Egypt, Iran, Jordan, Morocco, Tunisia and Turkey). They identified the principle characteristics of these markets and analyzed their informational efficiency. More recently, Shams El-Din (1998) detailed the institutional developments and its impact on the stock market performance and pricing efficiency since the stock market was revitalized in 1992.

Fahmy (1998) investigated the regulatory environment and legal aspects that govern the market. Both highlighted the weaknesses and deficiencies of current laws that played a role in hindering market efficiency. Empirically, Sourial (1997); using GARCH (p,q)-M model, provided evidence that there is volatility clustering in both daily and weekly returns and that there is a positive relation between risk and market returns, which implies that investors will be compensated with higher returns for bearing a higher level of risk. Morsy (1998), using Volatility-Switching GARCH model provided similar results recommending that excessive return volatility should not pose serious threats to the Egyptian Market. Moreover, Mecagni and Sourial (1999), using GARCH-M model, examined the impact of the +/-5% circuit breaker imposed on individual stock returns. The analysis showed a considerable downward shift in the risk-return parameter which appeared to have taken place after the introduction of symmetric limits on individual share price changes. Finally, Mohieldin and Sourial (2000) provided a detailed discussion on the institutional developments since the initiation. The evidence showed that the Egyptian Stock Market returns experienced high volatility during the speed-up of the privatization program in 1996 and the establishment of several mutual funds.

1.4.2 Problem Description

The emerging capital markets are characterized by having very high levels of volatility in their returns as compared to the other developed countries (Aggarwal et al., 1999). However, most of the studies on this subject (volatility in

stock markets) are often based on estimates of the volatility as the variance of market return index, with little attention given to the determinants of volatility and its effect on economic growth. This study investigates the role of Egyptian stock market in spurring economic growth and the long run relationship between them. Moreover, this study examines whether there are macroeconomic variables in Egyptian stock market which determine or cause stock return volatility to avoid disruptions in financial market. It also investigates the relationship between the stock market volatility and economic growth.

It is interesting to take Egypt as a case study for this subject for several reasons: firstly, in recent years Egypt achieves rapid economic growth, which exceeded 5% in 2005-2006 with World Bank expectations to reach 8% in approximately three years.

By observing Figure 1.2, the annual growth rate of the Egyptian economy has some fluctuations in the periods from 1982 to 2007; especially in 1997 and 2002. It is an objective of this study to see the volatility outlook of the stock market in these fluctuations in economic growth.

Secondly, Egypt has an ambitious program to reform financial sector. In 2005, Egyptian stock market has been among the most advanced markets according to Morgan Stanley index (MSCI) "Morgan Stanley Capital International" and Standard and Poor's IFCG "International Finance Corporation Global Index". All of these encouraged Newsweek magazine to choose Egypt

market to be among the best tenth in the world in 2005. Thirdly, Egypt represents a unique case to study because Egypt suffers from political changes and many terrorist attacks, which cause irregular fluctuations in stock market and Egyptian economy as a whole. Fourthly, most studies which studied volatility of stock return have been conducted on developed financial markets. Only recently have a few studies focused on emerging markets, and most of those studies do not include Arab markets in their group of emerging markets. The lack of detailed information on Arab markets may have been the main cause behind what appears to be a lack of interest on these markets. In addition, only a few empirical studies have been undertaken exclusively on Arab markets. They examined the issue of market efficiency, using a series of tests. However, these studies did not make volatility in Arab markets their main focus. Some of these studies mentioned Egypt, studied it using different countries as cross-section studies, but do not pay attention to the special nature for each country. Each country has different policies; different institutions and different environment surrounding it. Finally, there is no clear evidence that explain the impact of financial reforms and the relations between stock market and growth in Egypt.

From Figure 1.3, we will investigate whether Egyptian stock market is characterized by excessive volatility of returns. We will also determine the relationship between macroeconomic variables and stock excess return to evaluate the effects of macroeconomic variables on excess returns. We will assess market efficiency in Egypt after the revitalization (liberalization) of the stock market.

which had involved institutional and policy reforms (floating of the exchange rate, relaxation of capital control, trade liberalization, monetary and fiscal reforms), aimed at improving stock market performance, by way of reducing costs of trading and volatility, as well as increasing liquidity and efficiency.

1.5 Research Questions

1. What is the relationship between stock market development and economic growth in Egypt? And does the level of stock market volatility spur or hamper economic growth?, In other words, what is the relationship between volatility and economic growth?
2. What are the sources of stock prices volatility in Egypt as an emerging market? In other words, what causes or determines volatility?
3. What is the reaction of Egyptian market to unexpected or unforeseen events, for example the terrorist attacks?

1.6 Significance of the Study

Studying the relationship between macroeconomic variables and stock returns in emerging countries and its effects on economic growth is important for many reasons. From the policy maker point of view, it is believed that the study will be able to provide valuable information for decision – making. In addition, since excess volatility causes general erosion of investors' confidence and also

may cause a capital flight or a flow of capital away from the stock markets. knowing all information about the volatility of financial data is important.

Moreover, most empirical studies on the relationship between stock market volatility and economic growth have been conducted on developed financial markets, and more recently, on a few established emerging markets in Asia, Eastern Europe, and Latin America. Furthermore, the majority of these emerging market studies uses only aggregate (index) data and very few of them have concentrated on individual common stocks. Although these studies provide a useful guide on the stock market–growth relationship, it is difficult to see how the results can be generalized (Arestis and Demetriades, 1997; Demetriades and Andrianova, 2005).

In addition, there are a very limited number of studies which provide empirical applications to Egypt stock market. The other issues have not yet been examined for the Egyptian stock market, so this study attempts to fill this gap. The purpose of this study is to investigate whether Egyptian market is characterized by excessive volatility of returns.

Moreover, there is a very limited literature on the relationship between the stock market and the macroeconomic environment for emerging stock market, so the study will investigate the impact of macroeconomic variables on stock market volatility. Also we examine the relationship between macroeconomic variables volatility and stock market volatility.

As far as we know, there is no comprehensive study on the relationship between stock market and economic growth, and the determinants of volatility. Most of the previous studies have had a partial view. Moreover, there is a critical gap in the study of the relationship between government budget deficit and stock market volatility

1.7 Objectives of the Study

1. To provide an empirical analysis of the uncertainty associated with Egyptian capital market returns in the context of economic growth, and the long-run nature of the relationship between stock market volatility and economic growth. Furthermore, to study the causal direction in this relationship between the Egyptian stock market development and economic growth.

2. To investigate the relationship between stock market volatility and macroeconomic volatility. And to investigate the relationship between stock market prices and six macroeconomic variables like gross domestic product, exchange rate, inflation rate, money supply, fiscal policy, and interest rate in the Egypt environment.

3. To examine whether the terrorist attacks led to a significant change in volatility in stock market.

1.8 Hypotheses of the Study

1. The levels of stock market return volatility accompany the changes in economic growth. A low growth of economy tends to set excessive investors expectations

sensitivity to economic variables. A desirable or undesirable event prompts an inflow or outflow fund from the market, which results in volatility on large scale. High growth of economy, conversely, stabilizes the investors' expectations concerning risk premium return, which results in less volatility. Even undesirable news fails to cause capital flight from the stock market. Fama (1990) indicated that stock prices reflecting the value of cash flows at all future horizon stock returns are related to variation in all future production growth rates in 1953-1987. Moreover, the degree of correlation increases with the length of holding period. Schwert (1990) found that the relationship between stock prices and future industrial production growth rates is strong, and this finding may be explained by:

- Stock prices may be affected by the information about the real activity before it really occurs.
- Stock prices and real investment may be affected by changes in discount rates.
- Changes in stock prices affect changes in wealth, and that may affect the demand for consumption and investment.

The study examines the hypothesis that high volatility is associated with low growth and low volatility is associated with high growth of the economy. Similarly stock market volatility has a number of negative implications. (Campbellm, 1996, and Poterba, 2000).

- The impact of stock market volatility on consumption spending is related via the wealth effect. Increased wealth will drive up

consumer spending. However, a fall in stock market will weaken consumer confidence and thus drive down consumer spending. Stock market volatility may also affect business investment (Mala and Reddy, 2007 and Zuliu, 1995) and economic growth directly (Levine and Zervos, 1996 and Arestis et al., 2001).

2. There is a negative relationship between money supply and stock prices. Money supply may affect stock returns through at least three ways: first, changes in money supply may be related to unanticipated inflation and future uncertainty inflation and hence negatively related to the stock prices; second, money supply may positively impact through its impact on economic activity; finally, it influences credit position and investment level of the firm (Thorbeck, 1997) (Humpe & Macmillan, 2007). Restricted monetary policy will increase interest rates, thus cash flow will decrease. As a result, creditworthiness of the firm reduces constraints to obtain credit and reduces investments. All these events reduce the value of firm, making the firm's stocks no longer attractive. The increase in money supply leads to immediate increase in interest rates which in turn leads to a decrease in security prices. This result may be clarified by two explanations, the first is called the liquidity effect, if there is an unexpected expansion of money supply, it may lead to tightening policy from central bank in order to sterilize this increase, which will lead to an increase in real interest rate in the future. The second explanation is called the inflation expectation, when there is

an unforeseen increase in money supply, it will lead to higher nominal interest rates. These two reasons have a negative effect on stock prices although the quantity theory of money and the theory of efficient capital markets appear to be contradictory, Cooper (1974) and Rozeff (1974) suggested that changes in money supply alter the equilibrium position of money, thereby altering the composition and price of assets in an investor's portfolio. In addition, this increase may impact on other real economic variables, thereby having a lagged influence on stock returns (Rogalski and Vinso, 1977). Accordingly, there is a positive relationship between changes in money supply and stock returns.

Analysis of long-run relationships show mixed results, for example Habibuallah and Baharumshah (1996) rejected the hypothesis for the long-run relationship between stock prices and monetary aggregates. They used trivariate cointegration analysis and suggested that stock price indexes and macroeconomic variables, in particular money supply and national output, are not cointegrated. This suggests that stock price indexes in the Kuala Lumpur Stock Exchange has already incorporated all past information on both money supply (M1 and M2) and output

3. There is a negative relationship between interest rates and stock prices. Fisher (1930) claimed that the nominal interest rate fully reflects the available information, concerning the possible future values of the rate of inflation. The

relationship between real and nominal rates of return can be written as Irving Fisher (1867–1947):

Real rate of return = nominal rate of return - rate of inflation

The Fisher hypothesis or Fisher effect is commonly interpreted as the prediction that the real rate of interest is constant – in which fluctuations in the nominal rate and inflation tend to offset one another. In other words, the expected nominal interest rates on financial asset tend to move one-to-one with expected inflation (Bailey, 2005).

The behavior of asset prices with respect to movements in interest rates will be the opposite since a rise in the interest rate reduces the present value of future dividend incomes, which would depress stock prices. Alternatively, low interest rates result in a lower opportunity cost of borrowing. Lower interest rates stimulate investments and economic activities, which would cause stock prices to rise.

4. There is a negative relationship between inflation and stock prices. This relationship has two arguments; the first is that, there is a negative relationship between stock returns and inflation because the stock securities provide a hedge against unanticipated inflation. The second is that, if expected real asset returns are assumed to be independent of inflationary expectations, then a positive relationship between stock returns and expected inflation is predicted; this

relationship is known as "Fisher effect". However, there are empirical studies which rejected Fisher effect, indicating a negative relationship between stock returns and inflation (Ngugi, 2005). A problem in estimating the long-run Fisher effect is that stock rates of return and inflation rates are calculated using first differences of stock prices and goods prices, respectively, which eliminates long-run information crucial to its measurement (Anari and Kolari, 2001). The negative relationship between unanticipated inflation and stock prices may emerge if agents' response to positive surprise in announced inflation is by raising their level of expected inflation (Fama and Schwert, 1977). Moreover, this may lead to the expectation of more tightening of monetary policy, which in turn leads to the reduced cash flow and lower stock prices. From another point of view, unexpected inflation may induce agents to adjust their savings, resulting in higher interest rates and lower stock prices. This negative relationship could reflect: (i) a correlation between inflation and expected real economic growth; (ii) the use of nominal interest rates to discount real cash flows by irrational investors or (iii) a subjective inflation risk premium (Boucher, 2006).

5. There is a positive relation between the exchange rate and stock prices. A depreciation of currency will lead to an increase in country's exports and thereby increasing cash flows to the country, assuming that the demand for exports is sufficiently elastic. Alternatively, if the currency is expected to appreciate, the market will have to attract investments. This rise in demand will push the stock

market level up, suggesting that stock market returns will be positively correlated to the changes in the exchange rates. Mukherjee and Naka (1995) and Aggarwal (1981) indicated that exchange rates and stock prices positively correlated, for example, if US dollar depreciates, stock prices decline. Pan et al., (2000) noted that exchange rates had significant effects on stock prices in seven Asian countries during 1988-98. They reported much stronger interaction during and after financial crisis in 1997.

Bodnar and Gentry (1993) found insignificant effect; the results indicate that for Canada, Japan and USA, 20-35 percent industries have significant foreign exchange exposure; non-traded goods industries indicated a gain with appreciation of local currency. Industry's export and import ratios are associated with negative and positive exposures respectively. For USA and Japan, foreign-dominated assets showed a significant negative exposure to exchange rate changes.

Ma and Kao (1990) showed the same negative relationship between exchange rate and stock prices They illustrated that while currency appreciation reduces the competitiveness of export markets, it has a negative effect on the domestic stock market; high exchange rate levels are associated with favorable stock price movements. The impact of exchange rate changes on the economy will depend to a large extent on the level of international trade and the trade balance. Hence, the impact will be determined by the relative dominance of import and export sectors of the economy (Maysami, 2004).

However, there are some studies which indicate that there is a negative relationship between stock prices and exchange rate. Solnik (1987) showed a negative relationship which implies that a real appreciation of US dollar is bad for domestic firms because it reduces competitiveness, while real exchange rate depreciation stimulates the economy in the short run. The exchange rate may affect the stock prices through two mechanisms: first, real interest rate; when it rises, capital inflow increases and the exchange rate falls. Moreover higher interest rate reduces the present value of future cash flows, thus the stock prices will decline. Second, inflation; when inflation increases, the exchange rate moves in the same direction because of the investors' expectations, and they demand higher risk premium and high rate of return. As a result stock prices will decrease (Wu, 2000) (Aydemir & Demirhan, 2009).

6. Large budget deficit depress the stock prices. In addition it undermines investor confidence; thus firms lose the desire to raise capital to favorable terms. As a result, falling current investment reduces future competitiveness of the economy. Large budget deficits imply either increases in future inflation or future tax. Sargent and Wallace (1981) argue that large deficits risk higher inflation because large deficit will finally have to be monetized. So if we want to reduce inflationary expectations we have to reduce deficits (Greenspan, 1995)

Budget deficits also affect stock prices through expected future taxes. Large budget deficits imply increase in future tax, which may depress current

consumption and reduce stock prices. Hall and Taylor (1993) and Ball and Mankiw (1995) argue that deficit reduction will reduce expected future taxes.

7. The terrorist attacks increase the volatility of stock market returns. It is axiom that capital markets react quickly and simultaneously to major events such as the crash in 1987, Asian crises in 1997, and recently the September 11 attacks (Nikkinen et al., 2008). The global or local events are more important in causing major shifts in emerging markets' volatility. The large changes in volatility seem to be related to important country-specific political, social, and economic events. Aggaewal (1999) examined shifts in volatility of emerging stock market returns and the events that are associated with the increased volatility. These events included the Mexican peso crisis, periods of hyperinflation in Latin America, the Marcos-Aquino conflict in the Philippines, and the stock market scandal in India. The October 1987 crash is the global event that caused a significant jump in the volatility of several emerging stock markets. The number of changes in variance differs from country to country, and also depends on the frequency of the data: more change points are found with daily returns than with weekly or monthly returns. Periods of high variance in local returns overlap considerably with periods of high volatility in dollar-adjusted returns. Kim and Singal (2000) argued that opening up to foreign investors exposes the domestic market to external shocks and this could increase stock price volatility, and consequently raise the cost of capital, as shareholders demand a higher risk premium. In a very interesting study by Glaser and Weber (2004), the returns forecasted on the investors in the sample

are significantly higher after September 11, suggesting a belief in mean reversion. The results showed that investors interpreted the large drop in share prices during the ten day period after September 11 was mainly temporary rather than permanent. After the terror attacks, volatility forecasts were higher than before September 11. In two out of four cases, historical volatilities were overestimated. It proved that investors were not generally overconfident in the way that they underestimated the variance of stock returns. Differences of opinion with regard to return forecasts are lower after the terror attacks whereas differences of opinion concerning volatility forecasts are mainly unaffected. However, the degree of the stock market reactions to shocks differs from one region to another, depending on the level of integration with the international markets (Nikkinen et al., 2008).

1.9 Organization of Research

Chapter one has introduced the problem and the basics of the research. Chapter 2 will review the related literature to provide more determination regarding the determinants of high stock market volatility and its effect on economic growth.

Next, in Chapter 3, the conceptual framework will be presented and discussed in detail. Then, it will be followed by a detailed discussion of the methodology used to estimate volatility and to determine which macroeconomic variables have effects on it by using more than one technique. It will also

determine the variables that affect economic growth. In this chapter, data and the sources of this data will be presented. In chapter 4, interpretations and results will be discussed. Lastly, chapter 5 will present the conclusion and recommendations of the study.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The main purpose of this study is to examine the relationship between stock market performance and economic growth and the causality between them in the context of the Capital Asset Pricing Model (CAPM). In section 2.2 presents conceptual framework on informational efficiency, and present for CAPM theory.

In addition, this chapter provides a chronological survey of the evolution of the different years and thoughts revolving around the area of interest of this thesis. The flow of the literature reviews is presented in Figure 2.1.

The following review of literature provides a representative sample of studies conducted into the relationship between stock market returns and macroeconomic factors, and is intended to reveal the common factors, methodology, and statistical testing of the various studies conducted in this area of research. It begins by describing the research conducted on the relationship between:

- Financial development and economic growth.
- Macroeconomic variables and the returns volatility of stock markets.
- Important events and movements in stock returns.

2.2 Conceptual Framework on Efficiency

Financial markets have been susceptible to extreme price fluctuations. The concept of efficiency has several varieties in this context. The main types are as follows:

1. Allocative efficiency refers to the basic concept in economics which is also known as Pareto efficiency. Briefly, a Pareto inefficient allocation is where we can find a way to make some people better off without hurting anybody else. The first fundamental theorem of welfare economics states that, a competitive market will exhaust all of the gains from the trade: equilibrium of allocation achieved by a set of competitive markets will necessarily be Pareto efficient (Varian, 1996, p.511).

2. Operational efficiency mainly concerns the industrial organization of capital markets. That is to say that, the study of operational efficiency examines whether the services supplied by financial organizations (e.g. brokers, dealers, banks and other financial intermediaries) are provided according to the usual criteria of industrial efficiency. Hence, studies of operational efficiency investigate the determination of commission fees, competition among financial service providers, even competition among different financial institutions. The second fundamental theorem

asserts that, under certain conditions (essentially, convex preferences and production technologies), any Pareto efficient allocation can be sustained as a competitive equilibrium in conjunction with an appropriate redistribution of initial resource endowments among households (Bailey, 2005, p.22).

3. Informational efficiency refers to the extent the asset prices reflect the information available to investors. To be more precise, markets are said to be informational efficient if the market prices fully reflect available information. The so-called efficient market hypothesis is intended to provide a benchmark for assessing the performance of financial markets in reflecting information (Bailey, 2005, p.23).

4. Portfolio efficiency is the narrowest concept among the others. An efficient portfolio is such that, the variance of the return on the portfolio is as small as possible for any given level of expected return. Efficiency in this context emerges from the mean-variance theory of portfolio selection.

The most important aspect of rates of return for decision making is that, they are forward-looking; they depend on future payoffs. For almost all assets, the payoff is, at least in part, uncertain when viewed from the present. The current,

observed market price for an asset plays two distinct roles in financial economics, namely,

1. The price represents an opportunity cost. An asset's price appears in the wealth constraint as the amount that has to be paid, or is received; per unit of the asset. This is the conventional role for prices in economic analysis.
2. The price conveys information. Today's asset price reveals information about prices in the future.

The information conveyed by prices affect investors' beliefs, hence their actions (portfolios selected). Investors' actions determine the demand to hold assets in the aggregate, therefore influencing the assets' market prices.

The fair value of the stock is the discounted present value (DPV) of future expected dividends. Therefore when future dividends are uncertain; the discount rates R should reflect the risk of the dividends payments.

$$V = E\left[\frac{D_1}{(1+R_1)} + \frac{D_2}{(1+R_2)} \dots \dots\right] \tag{2.1}$$

where "D" is the dividend payments in periods *1, 2…t.*

R is the risk adjusted discount rate for year *1, 2….t.*

E is the expected value.

Investors use all available information to forecast future dividends and discount rates to reach the fair value. If new (relevant) information becomes available, this may be reflected in the market price. This is called efficient markets hypothesis. From the economists' point of view when they describe markets as being efficient, they mean that the prices and returns are determined by rational agents in a competitive market. From this side, traders rapidly assimilate any relevant information to determine asset prices or returns. This is a rational expectation element of the efficient markets hypothesis. Hence, individuals do not have different comparative advantages in the acquisition of information (Cuthbertson and Nitzsche, 2001, p.403).

In addition, those rational agents instantaneously move market prices to equal fair value. In other words, there are no opportunities for making a return on a stock that is in excess of a fair payment for the risk of that stock and any transaction cost. This means that, efficient market hypothesis contends that investors cannot make money trading on news reports and public information, because the information is reflected in the share prices as soon as it is known (Levinson, 2006, p.144).

A capital market is said to be efficient if it fully and correctly reflects all relevant information in determining security prices (Bailey, 2005, p.64), or the residuals of rates of return should be zero, except for those times when investors learn new information. In this case, the residuals should be large enough so that

the price of the security can adjust instantaneously and fully to the new information.

The residual rate of return is the excess of return for that year over the equilibrium (according the CAPM) rate of return. So the excess rate of return will be:

$$X_t = RR_t - RR_t^e \tag{2.2}$$

where RR_t is the rate of return for year t, and RR_t^e is the equilibrium rate of return for year t according to the CAPM which is presented as follow:

$$RR_t^e = R_f + (R_{m,t} - R_f)\beta_0 \tag{2.3}$$

where R_f is the rate of returns on the risk free asset, $R_{m,t}$ is the rate of return on market portfolio for year t, and β_0 is the slope of the characteristic line for the security. And RR_t will be written as follows:

$$RR_t = \frac{P_{t+1} + D_{t+1} - P_t}{P_t} \tag{2.4}$$

where P_t is the price of a share at time t, and D_t is the dividend per share paid at time t.

In Figure 2.2 if the residuals for the rate of return for the stock i is plotted on the vertical axis. Horizontal axis will measure the event time which indicates the first appearance of the new information.

If there is a new information that the earnings per share will increase; the reaction will appear at event time zero. If the market is efficient, before investors learn at event time zero that earnings will increase, the equilibrium price of a share

will not change and the residuals are zero. At event time zero, the new information arrives. Competition among investors forces the price to immediately increase, and residuals or excess returns will increase as well. Since the price of the stock is fully adjusted at event time zero to the new information, there is no further adjustment to that price in subsequent periods. Consequently, the residuals return to zero beginning in event time +1 and will remain at zero, unless an additional piece of new information arrives (Bradfield, 2007, p268).

A financial market is informationally efficient if it adjusts prices immediately to new information. Consequently, the market is efficient if the price of each security is always equals to the risk-adjusted net present value of the sequence of payments associated with that security. Figure 2.3 *(a)* and *(b)* depict the reaction of financial market if it is efficient or not when bad and good information arrives. In Figure 2.3 *(a)* is when good information arrives and if the market is efficient; then security price will increase immediately to reach the actual value. In contrast, if the market is inefficient, then there is a period to analyze the information and decide what the value of the security that the price should have reached. This means that there is a gap or a time between information to arrive and the increase of the price to reach the actual value. There are two scenarios to illustrate the reaction; (Figure 2.3*b*) the first is overreaction, then the security price goes up over the actual value. However, after a short time, the agents will know that this price is overestimating, thus, the results decline the price to actual value. The second scenario is that, agents quickly buy the security before it reaches any conclusion from the analyzed information, leading to a slight

increase in security price. After a few days of analyzing the news, agents will know that the price is still below the actual price. As such, the demand for the security will increase and the price for each actual value will also go up.

However, the point that should have been paid the attention is the statements about whether asset markets are efficient, or inefficient, which invariably rely on the criteria chosen to characterize efficiency. This may cause confusion because market may be efficient under some criteria while inefficient under other criteria.

These criteria come from models of asset prices and associated information sets; which together, provide criteria for efficiency. Testable hypotheses about the patterns of prices compatible with efficiency are then derived from each model and information set. These hypotheses depend on the chosen model and information set – hence, on the criteria for efficiency (Bailey, 2005, p.88).

Given a sample of data, statistical tests can be made from the hypotheses. If the hypotheses are rejected, the evidence favors inefficiency, if the hypotheses are accepted, the evidence favors efficiency. This program, formulated for assessing market efficiency is summarized in Figure 2.4.

The efficient markets hypothesis was partitioned into three concatenated forms: the weak, the semi-strong, and the strong. Each form was defined for a specific set of information.

The weak form of the efficient markets hypothesis was limited to historical information about the prices of securities and the volumes at which those securities were traded. It stated that, the current prices of securities fully reflected all information contained in the history of the prices and the volumes of trading. Consequently, the net marginal benefit to an investor collecting information from past prices and volumes of trading for the purpose of predicting the future prices of securities is zero (Bradfield, 2007, p.258).

The semi-strong form means efficient market theory. In this form, it views stock prices and responds rapidly to the receipt by the market of new information bearing on the future returns that the stock is expected to earn. Nowadays, new information arrives randomly over time (otherwise it would be predictable, hence not really new). Since stock prices are responding to a random sequence of events, they themselves will again follow a random walk, as under the weak form (Houthakker and Williamson, 1996, p.137).

Meanwhile, for strong form, economists include the strong form of the hypothesis for logical completeness. The strong form states that the current prices of securities fully reflect all information about the future values of those securities.

The set of information for the strong form includes all private, as well as all public, information.

2.3 The Relationship between Stock Market and Economic Growth

There are many studies which have tried to explore the relationship between financial market development and economic growth, from Shumpeter (1934) who highlighted the role played by financial intermediaries in transforming resources to the more productive sectors: passing by Solow (1956) who argued that if we followed Harrod-Domar model in that if capital is the only constraint on production and the economy have a surplus, then investors have incentives to substitute labor for capital, where Solow (1956) assumed that production is a function in both labor and capital, as well as technology (Barro and Sala-i-Martin, 1995). In addition, McKinnon, (1973) and Shaw (1973) argued that financial repression (such as interest rate ceilings or directed credit policies) exerts an adverse impact on savings, investment and the rate of economic growth. These constraints distort the economy in different ways: first, the low level of interest rate encourages the present consumption, which reduces savings, and the future consumption will be lower. Second, the agents who have the money prefer to invest this money directly in lower-yielding investments rather than to deposit it at banks. Third, investors will invest in more capital-intensive projects, where later, the price of capital funds is lower than that which would exist with market determined interest rate. Fourth, investors who invest in lower-yielding investments are forced to proceed with investments they do not want, or they could

not afford to proceed with it at market clearing interest rate. Fifth, spreading situation between financial institution, (which we call soft institutions) which means that financial institutions do not spend money to collect information about borrowers or projects, happens because of the low level income, resulted from low lending rate. Finally, financial institutions which are facing external interest rates have not the chance to invest in high risk premia associated with high return investments (Fry, 1995, p.26).

Friend (1972) stated that "the stock market affects the functioning of the economy in two principle ways. First, market development may affect the national income through their influence on the aggregate propensities to consume, to save, and to invest. Second, even with a given level of saving and investment, market arrangements can result in a more or less efficient allocation of investment funds" (p.212).

Townsend's (1979) study was motivated in part by questions of optimal regulation of financial institutions such as intermediaries. It suggests a simple theory of intermediation and avoid the difficulties associated with non-convex technologies using a game theoretic approach known as "non-cooperative game theoretic model", where it is described as an exchange motivated by risk sharing considerations. Through liberalization of interest rates and other restrictive; equity markets may improve allocation efficiency. On the other hand, if the economy does not include equity market, then more government invention is necessary for financial system, and advanced approaches are required (Cho, 1986).

Tauchen and Pitts (1983) were concerned about the relationship between the volatility of daily price change and the daily volume of trading on the speculative markets. They used Full Information Maximum Likelihood (FIML) model by using daily data from 90-day T-bill futures market, where they described the possibility of a negative relationship between volume and volatility of stock returns. The authors suggested that both volatility and trading volume are determined by new information flow rates to the market, traders' response to new information arrival, and the number of active traders. As a result, in thinly traded and highly volatile markets, infrequent trading can cause prices to deviate substantially from fundamentals. An increase in the number of traders and speculative trading activity will realign prices with fundamentals, leading to more efficient prices and lower volatility.

In addition, Fama (1990) claimed that there are three links between stock market and real economic activity; where "first, information about future real activity may be reflected in stock prices well before it occurs; second, changes in discount rates may affect stock prices and real investment; and third, changes in stock prices are changes in wealth, and this can affect the demand for consumption and investment goods.

Levine (1991) argued that stock markets affect growth in two ways. The first involves firm efficiency and depends on the externality in human capital production. Stock markets will increase firms' efficiency by eliminating the premature withdrawal of capital from firms. This accelerates the growth rate of

human capital and per capita output. The second way stock markets can affect growth is to raise the fraction of resources devoted to firms. This does not necessarily depend on externalities, but by increasing the liquidity* of the firm's investment, reducing productivity risk, and improving firm efficiency, stock markets encourage firm investment. This stimulates human capital production and growth. Holmstrom and Tirole (1993) emphasized that a firm's ownership structure influences the value of market monitoring through its effect on market liquidity. For example, consider that an agent holds some fraction of the firm as a long-term investment. If he decides to decrease his ownership, there will be more shares actively traded and the liquidity of the market will go up. With more liquidity traders, it becomes easier for an informed party (a speculator) to disguise his private information and make money.

Pagano (1992), Atje and Jovanovic (1993), Levine and Zervos (1998), and Beck and Levine (2004) investigated the strong and significant correlation between stock market development and growth rates of real GDP per capita. They found that both, stock market liquidity and banking development, can predict future economic growth rate. These studies are consistent with the studies of Levine and Zervos (1995), and Demirgue (1995) in that, the stock market can give a big push to economic development.

Bengt and Jean (1993) pointed out that there are two main ways that stock markets can affect economic growth: (a) The development of stock markets may

* Market liquidity refers to the ease of carrying out financial transactions.

affect national income by attracting capital from consumption to savings, and then the investment will go up. (b) The arrangements of stock markets may influence the allocation of investment funds.

Levine and Zervos (1996) found a significant positive relationship between stock market development and long-run economic growth (real per capita growth rate) when using this model

$$Growth = \beta X + \lambda(stock) + \mu$$

where X is a set of controlled variables including initial income (log of initial real per capita GDP), initial education, (log of initial secondary school enrolment rate), a measure of political instability (number of revolutions and coups), ratio of government consumption expenditure to GDP, inflation rate and the black market exchange rate premium; "stock" is the index for growth of the stock market (Levine and Zervos, 1996).

Using cross section data for 80 countries over the period 1960-1980, King and Levine (1993) showed a highly significant positive relationship between the initial value of the ratio of liquid liabilities to GDP in 1960 and real per capita income. However he confirmed that, in a long run, what is spurring economic growth is banking sector.

Bencivenga, Smith, and Starr (1995) addressed this question: How does the efficiency of an economy's equity market - as measured by transaction costs -

affect its efficiency in producing physical capital and, through this channel, final goods and services? A reduction in transaction costs will typically alter the composition of savings and investment, depending on the capital structure, and any analysis of the consequences of such changes must take those effects into account

Demtreriads and Hussin (1996) confirmed this (King's and Levine's) positive linkage between growth and initial financial development, but they argued that these results only represent a simultaneous relationship and not of a long term. Bencevinga, Smith and Starr (1996) emphasized the role of equity markets in providing liquidity to holders of long-lived and inherently illiquid capital. As the efficiency of an economy's capital markets increases (that is, as transactions costs fall), the general affect is to cause agents to make longer term, hence more transactions intensive investments. They also investigated whether the liquidity of financial markets affect the choice of capital production technology, per capita income and per capita capital stock, the level of financial market activity, the real return on saving, and welfare of steady state equilibrium.

By pooling and diversifying risks, by increasing liquidity or by reducing monitoring costs, financial markets and institutions are believed to have a positive impact on growth because they divert investments towards more productive activities or increase the flow of savings (Blacburn and Hung, 1998).

Levine (1997) illustrated the role of finance in the growth by comparing between German bank-based system and United States securities market-based system which is called the "Functional Approach ". Levine argued that financial system

- Facilitate the trading hedging, diversifying, pooling of risk,
- Allocate resources,
- Monitor managers and exert corporate control,
- Mobilizing savings, and
- Facilitate the exchange of goods and services.

Mecagni and Sourial (1999) examined some issues concerning the efficiency of the market and the relationship between returns and volatility, and try to find the answers for these questions:

- Whether the stylized fact characteristics to the choice of market index.
- What degree is the ESE efficient in pricing securities?
- What has been the impact of conditional volatility on stock returns, and do shocks to volatility tend to persist over time?
- Is there evidence of significant changes in the impact of volatility on stock market returns as a result of shifts in policies or regulations affecting the trading environment?

Using the four best known daily indices, the study investigates an empirical assessment of the relationship between risk and returns in a setting that is consistent with the characteristics of leptokurtosis and volatility clustering observed in the time series of ESE stock returns. To estimate, they used a variant of the GARCH framework known as GARCH –in mean (GARCH-M) , this framework uses the conditional variability of returns as a measure of time-varying risk, and captures the interdependence between expected returns and changing volatility of asset holdings postulated by portfolio theory.

The ESE stock returns are characterized by a distribution departing from the normal one, and by the volatility that tends to change over time and to be serially correlated. Furthermore, the study supports the existence of the significant link between conditional volatility measures and ESE stock returns. In addition, it indicates that investors become significantly less rewarded for bearing risk during this prolonged period of sluggish market performance.

Arestis et al., (2001) examined the relative impact of stock markets and banks on long-run economic growth in Germany, USA, Japan, UK and France. They found that both stock markets and banks have important contributions on output growth in France, Germany and Japan, with contribution of stock markets ranging from about one-seventh to one-third of the contribution of banks. Rousseau and Wachtel (2000) and Beck and Levine (2004) showed that stock market development is strongly correlated with growth rates of real GDP per capita. More importantly, they found that stock market liquidity and banking

development both predict the future growth rate of economy when they both enter the growth regression. Nevertheless, these studies suffer from various statistical weaknesses.

Law (2006) examined whether stock market volatility in the Kuala Lumpur Stock Exchange " KLSE" has returned to pre-financial crises levels and if it had studied the possible impact of crises events (liberalization in Dec. 1988, financial crises 1997) in the behavior of the stock market. It also estimated the number of changes in variance and the point in time of each time shift. In addition, it investigated whether stock return volatility in the KLSE has come down to pre-crises levels by using the exponential GARCH model with unforeseen changes of unconditional variance in stock market. It found that volatility asymmetries are present in the KLSE and EMAS price indices and needed to be incorporated in the model, and most of all, the unforeseen changes of variance for both indices occurred around similar break positions .The events that have caused unforeseen changes are both, domestic and international, political and economic events. The domestic events included huge portfolio capital inflow in 1993, massive capital flight in 1994, and the East Asian financial crises; while Iraq invasion of Kuwait in 1990 was regarded as international events.

Apergis and Eleftherieu (2002) examined volatility in the Athens Stock Exchange market (ASE) through the utilization of specific conditional volatility symmetric models that capture volatility characteristics. This study was carried out using volatility models that capture the asymmetric behavior of a series, EGARCH

and quadratic GARCH (QGARCH) models, using also a different time period which coincided with the extreme boom of the ASE. The results of the study show that the presence of persistence in volatility clustering implies the inefficiency of the ASE market despite the large improvements in great market over the recent years. The determinants of this inefficiency could be due to the lack of technical organization, resulting in the gradual spread of information reflected in stock prices.

Gaytan & Ranciere (2004) presented empirical support for the existence of wealth effects in the contribution of financial intermediation to economic growth, and offered a theoretical explanation for these effects.

They used the data on real per capita income growth initial and final per capita income, as well as two proxies for financial intermediary development – domestic credit to private sector and liquid liabilities.

Antonios (2010) investigated the causal relationship between stock market development and economic growth for German economy for the periods of 1965-2007. He indicated that there is a unidirectional causality between stock market development and economic growth with direction from stock market development to economic growth. These results differ from the Vazakidis' and Adamopoulos' (2009) study. They used vector error correction model (VECM) to investigate the causal relationship between financial development (which is estimated by credit and stock markets) and economic growth, for Greece for the periods of 1978-2007.

They found that both, credit and stock market have a positive effect on economic growth in short and long-run, while the results of Granger causality tests indicated that economic growth directly causes stock market development.

Michelfelder (2005) analyzed the volatility of stock market returns and predictability for seven emerging markets for six countries and compared them with mature markets. This study applied EGARCH model with the SGED (skewed generalized error distribution) and the stock market returns are calculated as the log of daily difference of the market index value.

The study found that the emerging market returns do not follow a random walk and may not be efficient in the weak sense, and the volatility shock of the emerging market stock returns persists for shorter periods than mature markets. Non trading days have lesser effect on volatility in mature markets than that of emerging stock exchange. Shocks in the U.S. stock exchange are rapidly transmitted to the rest of the world, even though the innovations in other national markets do not have much effect on U.S market.

They found that the exogenous contribution of financial development on economic growth has different effects for different levels of income per capita. It is generally increasing with the level of income per capita of that economy: this effect varies from negative in low-income countries to positive in above a certain wealth threshold; where it reaches maximum in middle-income economies before declining in richer countries.

Michelfolder (2005) analyzed the volatility of stock returns and predictability for seven emerging markets for six countries and compared them with mature markets. And it estimates EGARCH model with the SGED (Skewed Generalized Error Distribution), and the stock market returns are calculated as the log daily difference the market index value. He found that the emerging market returns do not follow a random walk and may not be efficient in the weak sense, and the volatility shock of emerging market stock returns persist for shorter periods than mature markets. Non trading days have lesser effect on volatility in matured markets than that of emerging stock exchange.

Moreover, shocks in the U.S. stock exchange are rapidly transmitted to the rest of the world, although the innovations in other national markets do not have much effect on the U.S. market.

Ferson & Harvey (1994) investigated the source of risk and the average returns in 18 national equity markets. The monthly risk measures include the returns on a world equity market's portfolio and on measures of global inflation, real interest rates and industrial production growth.

The study applied factor model regression for equity market index for 18 countries, where most of the empirical models are estimated using generalized method of moments (GMM) which is valid under mild statistical assumptions. In order to apply a beta pricing mode in global setting, the national equity markets are assumed to be perfectly integrated in a global economy.

The study found significant premium associated with the world equity index and a measure of exchange rate fluctuations, but found no significant average premium associated with other variables.

Pagan and Soydemir (2001) investigated whether the stock markets of Argentina, Brazil, and Chile react differently to positive as opposed to negative shocks in the returns of the Mexico equity market.

The study used a bivariate vector autoregressive (VAR) model to investigate the possibilities of response anomalies in equity market dynamics for Argentina, Brazil, Chile and Mexico. They argue that one advantage of the VAR model is that it does not impose a priori restrictions on the system of equations allows for artificial shocks to be introduced in the system and they construct impulse response functions to investigate the postulated response of the dependent variable to a one standard deviation shock to another variable in the system .

The study establishes statistically significant asymmetries in the response of the three markets (Argentina, Brazil, and Chile) to the change in the Mexico equity market. They argued that a better understanding of such causal relationship can have important implications at the time of conducting monetary policy to achieve stability in financial markets or implementing regulatory reforms.

Bekeart and Harvey (1997) used liberalization dates to examine the behavior of volatility in emerging countries, and analyzed the reasons that volatility is different across emerging markets, particularly with respect to the

timing of capital market returns. They estimated a world factor model of conditional variances using the generalized autoregressive conditional hetroscedasticity (GARCH (1,1)), and they used the conditional variance estimates to analyze the cross-section of the volatility. They also used the cross-sectional framework to investigate whether capital market liberalization policies affect volatility of to controlling for other factors that might affect volatility.

The study found that capital market liberalization often increase the correlation between local market returns and the world market, but do not push local market volatility up.

From literature review, some simple and general stylized facts can be drawn:-

- In the early stage of economic development, stock markets are completely absent, or their role is negligible; if they exist in any form.
- When capital accumulates, the financial intermediaries develop, and an increase in financial instrument will happen, as well as the flow of resources and funds. All that accrues increase in the financial market size.
- As the economy continues to grow, equity markets develop further and so do banks and other financial intermediaries.

- In economies where stock markets are relatively small, capital accumulation seems to be followed by a relative increase in banks' share in financial system. In economies where the stock market has already reached a reasonable size, further development of the market causes an increase in the equity markets' share (Capasso, 2006).

From these studies, we can classify it to three distinct main groups:-

1. The first group is interested to study the impact of overall financial structure* on economic growth (Goldsmith, 1969). These studies investigated a significant relationship between financial development and economic growth, and they also used data from the firm-level (Deminrgue et al., 1998), industry- level (Rajan and Zingales, 1998), and cross-country level (Beck, Levine and Loayza, 2000).
2. The second group studies whether both stock market development and banks have independent effects on growth. King and Levine (1992) and Loayza et al., (2000) found a positive effect on measure of private credit and liquid liabilities on per capita GDP growth.
3. The third group studies the balance between bank-based and market-based, and its effects on economic growth. Some investigate that markets-based is more effective at providing financial services,

* financial structure means a mixture of many institutions and financial instruments that work in an economy

while other intermediaries play the main role at providing it. Recently there is a subgroup debate about the role of environment where the needs to have co-existence of banks and markets providing financial services, which will in turn spur the economic growth.

Financial development and economic growth are clearly related, and this relationship has occupied the minds of economists from Smith to Schumpeter; although the channels and even the direction of causality have remained unresolved in both theory and empirics. Moreover, stock market development is an important ingredient for economic growth since the stock market gives a general idea of an economic health (Nowbutsing, 2009).

While progress in the literature on financial intermediation and economic growth has been quite substantial, the literature on the specific role of stock markets in the process of economic growth is still thin while many aspects of this matter remain to be explored. There are not much empirical research investigations about the causal relationship between stock market and economic growth. Perhaps, one study worth mentioning is Levine and Zervos (1988), who reported a very strong and positive correlation between stock market development and economic growth. Caporale et al., (2004) examined the linkages between stock market, financial development and economic growth for seven countries. The empirical study uses VARs technique developed by Toda and Yamamoto (1995) in order to

test for the causality, and they tried to avoid omitting important variables. This study investigates that a well developed stock market can hasten economic growth in the long run. This result is supported by Padhan (2007) where he suggested that there is a bi-directional causality between stock price and economic activity during the post-liberalization period, implying that a well-developed stock market could enhance economic activity and vice-versa.

In addition, most of the studies that examined the relationship between stock market development and economic growth ignored to examine the direct effect of stock market volatility on the rate of economic growth. This gap is what this research will try to fill. We will also provide a documented comprehensive framework of the role of stock market in economic growth.

2.4 The Relationship between Stock Markets and Macroeconomics Variables

The stock market is one of the important financial sectors in economy, and it can affect the whole economy in different ways. Because most of projects need long-run investments, but on the contrary investors are unwilling to invest their savings for a long time. Therefore, without a liquid market, there is less investment in these projects (Levine, 1991).

Macroeconomic models attempt to explain the direction of causality between the development of the stock market and macroeconomic variables. Gavin (1989) found no relationship, but on the other hand there are studies that

found a significant relationship, for example Atje and Jovanovic (1993), while there were also studies which have found both, as Pagano (1993).

The interaction between the stock market and real economic activities involves two hypotheses:-

1. The stock market contains information that is helpful in forecasting real economic activities.

2. The stock market has an impact on aggregate demand, particularly through aggregate consumption and investment.

Many studies have empirically studied the link between a range of macroeconomic variables and stock market volatility. The literature has documented that there is a negative relation between aggregate stock returns and both inflation and money growth (Fama, (1981). Unexpected changes may happen in the price level leading to negative change in the real stock prices. Unanticipated inflation may also reduce the present value of future firms' cash flows. Defina (1991) argued that when inflation is increasing the firms response, thus increasing their costs. This will lead to a decrease in firms' income and profits, therefore the shares prices. Generally, investors believe that macroeconomic change and published reports have a large influence on the volatility of the stock prices (Gan, Lee, Young and Zhang, 2006). Furthermore, money supply fluctuations can also affect the stock market through at least three mechanisms: First, increase in money supply may lead to unanticipated increase in inflation and affect the expectations

about future inflation, hence negatively related to the stock price. Second, increase in money supply may motivate economic growth, hence positively related to the stock price. Finally, when money supply increases, it may stimulate a shift from non-interest bearing money to financial assets, hence increasing stock prices. (Humpe and Macmillan, 2007)

Kaul (1987) provided evidence of a positive relationship between stock returns and inflation during the period of the Great Depression when monetary policy was pro-cyclical, and evidence of a negative relationship in the post World War II period when monetary policy was counter-cyclical (Du, 2006).

The impact of real macroeconomic variables on stock returns is much more difficult to establish:

> *"A rather embarrassing gap exists between the theoretically exclusive importance of systematic "state variables" and our complete ignorance of their identity. The co-movements of asset prices suggest the presence of underlying exogenous influences, but we have not yet determined which economic variables, if any, are responsible" (Chen et al.,1986).*

However, Chen et al. (1986) instigated that the default and term premia are priced risk factors; industrial production is a strong candidate for being a risk factor, and that weaker evidence support inflation's claim to that status (Flannery and Protopapadakis, 2002).

Schwert (1989) investigated that stock market volatility tends to rise in the periods of business cycle downturns. For investors, this finding raises the question of whether macroeconomic variables that capture business cycle fluctuations help to forecast stock market volatility. Finding an answer to this question may help investors to solve problems of refine theories of derivative pricing, to compute more exact solutions to problems of optimal portfolio selection, and to efficiently monitor and manage financial risk.

This is useful for macroeconomists, politicians, and central bankers to develop a better understanding of potential macroeconomic determinants of systematic financial-sector risk (Dopke, 2006).

There are several theoretical frameworks to study the relationship between stock market behavior and macroeconomic variables. First, some studies use equilibrium asset pricing models, such as the arbitrage pricing model theory (APT), to study the relationship between stock returns and economic risk factors. Second, other studies use the discounted cash flow valuation model. Third, some researchers embed stock market behavior within a broad macroeconomic framework, i.e. in the context of a modified IS-LM framework or a simple AK model.

However, a common theoretical framework connecting stock prices to macroeconomic variables is the dividends discount model. According to this model, new macroeconomic information will affect stock prices if it impacts on

either expectations on future dividends, discount rates, or both (Levine et al., 2005).

Investors are more sensitive to news during periods of high uncertainty, which in turn increase asset price volatility, yet establishing the empirical link between the second-moment. According to Fama, there is a negative relationship between stock excess returns and inflation. De Santis & Imrohoroglu (1997) found evidence of time- varying volatility which exhibits clustering, high persistence and predictability. They also found that there is no relation between expected returns and country-specific volatility in the legally segmented markets.

Additionally, they found that the estimated kurtosis of the conditional distribution is not affected by liberalization. However, this study has main critique: they suppose that when a country switches from being fully segmented to being fully integrated, this process is irreversible, but the economies can switch between varying levels of segmentation and integration (Bekaert and Harvey, 1995).

Cutler et al. (1989) investigated that there is a significant and positive relation between industrial production growth and real stock returns over the periods of 1926-1986, but not in 1946-1985. There is also no evidence that inflation, money supply and long term interest rate affect stock returns.

In 1998, Aggarwal and Schirm investigated the effect of economic news on asset prices and asymmetrical impact of information macroeconomics variables on

stock markets; it also documents the sensitivity of markets in equities, currencies and debt instrument, including information in trade balance announcement.

They found a strong impact of asymmetric and non-linear market response in stock prices; and foreign exchange rates to new information. These results are in line with market recognition of central bank policy commitment for foreign exchange intervention policy.

Atje and Jovanovic (1993) examined the effect of the development of the stock market on economic growth by using a sample of 39 countries for the periods of 1980 to 1989. They suggested that the relative size of a country's stock market helps to explain subsequent growth in per capita gross domestic product. Atje and Jovanovic assumed that both investment and stock market activity are endogenous, thus use the lagged or initial value rather than the value of these variables. Harris (1997) argued that these study's results may be misleading, because the use of lagged investment is inadequate as a solution to the endogeneity issue since it is not highly correlated with current investment, hence not a good proxy for this variables. This gives rise to omitted variables bias in the remaining variables. In particular, the level of stock market activity is correlated with subsequent investment and so its coefficient is biased upwards. Harris (1997) estimated the same model of Atje and Jovanovic by using current investment instead of lagged investment. He suggested that the stock market effect is much weaker than has been proposed.

Moreover, most empirical studies that study the relationship between monetary policy and stock prices tend to use simple equation consisting of the stock price index as well as expected and unexpected changes in monetary policy variables. The empirical results are ambiguous specially when regarding the direction of causality and significance of anticipated and unanticipated changes in monetary policy variables. Most results (Abdalla and Murinde, (1997) and Qiao, 1996) showed that there is unidirectional causality from monetary policy variables to stock prices, while the latest of studies (Moorkerjee (1988); Cornelius (1991); and Moorkerjee and Yu, (1997) showed bidirectional causality.

Elsewhere, some of the studies showed the long-run relationship between monetary policy and stock prices, while others (Habibullah and Baharumshah, 1996 and serletis, 1993) rejected the long-run relationship.

According to Levine (1997), the relationship between finance and growth is a connection between real and financial sector activity called "functional approach ", by pooling and diversifying risks, increasing liquidity or reducing monitoring costs. Financial markets and institutions are believed to have a positive impact on growth because they divert investments towards more productivity or increase the flow of savings (Blackburn et al., 2005).

In 1999, Veronesi showed that investors become more sensitive to news during periods of high volatility.

Pagen and Soydemir (2001) and Soydemir (2000) examined the interaction between different stock markets or the response to change in another market. They found significant links between stock markets of the USA and Mexico, but weaker with the rest of the market sample.

Moreover, there is a significant asymmetric in response of Argentine, Brazil and Chile to the changes in the Mexican equity market. As such, a better understanding of such casual relationship can have important implications at the time of conducting monetary policy to achieve stability in financial market.

Mohammed et al., (2009) used multiple regression analysis to find relationship between stock prices and macroeconomics variables on Karachi stock market. They considered several economic variables such as; foreign exchange rate, foreign exchange reserve, industrial production index, whole sale price index, gross fixed capital formation, and the broad money M2. They found that, after the reforms in 1991, the influence of foreign exchange rate and reserve have significant affects on stock market, while other variables do not have significant affect on stock prices.

On the other hand, Büyükşalvarcı (2010) investigated the effect of seven macroeconomic variables on stock returns in Turkey. He found that interest rate, industrial production index, oil price and foreign exchange rate have negative effects on Istanbul Stock Exchange returns while money supply positively

influences Istanbul Stock Exchange Index returns. On the other hand, inflation rate and gold price do not appear to have any significant effect on stock returns.

From theoretical and empirical literature, there is a strong interaction between stock market and macroeconomic variables in the developing, as well as developed economies.

However there are two observations:-

- This relationship is portrayed as ambiguous.
- The transmission channels are not clearly identified.

From previous studies, there is a lacking in studying the relationship between stock prices and fiscal policy, although there is an early theoretical background. Tobin (1969); as an example, stressed the existence of the relationship between both monetary and fiscal policy and the price of stocks. Fiscal policy can affect the stock market through new taxes or, other government fees may increase the transaction costs, which may result in a constraint when facing new issues. Furthermore, Amihud and Murgia (1997) when examining dividend informative in Germany argued that, tax regime does not disfavor dividends: corporate earnings allocated to dividends instead of retention, do not subject investors to higher taxes, and for many investors, the tax burden due to the dividends is even lower, and the changes in dividend generate stock-price reaction.

Prior studies indicated a very limited literature on the relationship between the stock market and the macroeconomic activities for emerging stock markets. So, further research is necessary to shed light on the impact of macroeconomic activity on stock market, specially the impact of monetary and fiscal policies. Moreover, there is no general agreement on the direction of the relationship between exchange rate and stock prices. Most of the studies showed negative relationship, which implies bad effect on domestic firms because it reduces their competitiveness; through effects on the firms' net foreign monetary and real domestic assets or through effects on aggregate and industry demand. However, some studies have uncovered a positive relationship. The studies applied on emerging stock markets tend to show bidirectional causality, and are therefore inconclusive.

2.5 The Effect of Unforeseen Events on Stock Returns

To interpret the great depression, Robert Merton inferred that there was significant uncertainty whether the economic system as a whole would survive, while actual stock prices appear to be more volatile compared to the smooth patterns in ex-post dividends (Schwert, 1989).

The high volatility of emerging markets is marked by frequent unforeseen changes in variance, where the period with high volatility are found to be

associated with important events in each country, rather than global events (aggrawal et al.,1999).

However, the timing and magnitude of changes in stock returns and volatility differ across markets around the world (Roll, 1988).

As an instance, only developed and European countries exhibit similar stock returns and volatility behavior in the pre-September 11 period. In contrast, the middle east and north Africa (MENA), Latin America, and to a lesser extent, the transition economies and Asian, tend to have a significant different behaviors compared with developed and European countries (Nikkinen et al.,2008).

Because both developed and European markets provide investors with lower returns compared with the rest of the world, they have lower volatility compared with Asian and transition countries.

This difference depends on the level of integration with the international economy (Nikkinen et al., 2008).

These results are also consistent with Bekaert and Harvey (1997) who found that only a small amount of variance is being driven by world factors, but the degree of importance increased after the liberalization of capital market or more integration. In addition, they explore four sources of volatility differences:

1. Asset concentration, the number of stocks included in the index.

2. Stock market development & economic integration, stock market capitalization to GDP, the size of trade sector.
3. Microstructure effects, institutional framework that defines the return-generating process.
4. Macroeconomic influences and political risks.

2.6 Conclusion

More studies had to be done to determine what causes stock market volatility; most of these studies have concern on microstructure effects. Even though most of the study tried to estimate the effect of economic growth fluctuations on stock market, the studies had done so as isolated islands.

The ongoing studies on stock market volatility are still lacking in the studies of the relationship between stock market and economic environment, especially after liberalization process in ESMs. On the other hand, studies on bidirectional relationship between stock market volatility and economic growth are contrary with most studies that study the effect of volatility in economic growth on the performance in stock market.

CHAPTER 3

METHODOLOGY

3.1 Introduction

The previous chapter covered existing theoretical and empirical studies which emphasize the relationship between stock market development and economic growth, stock prices volatility and fundamental economic activity, and the effect of crises on stock market volatility. Many studies have focused on these relationships using different techniques, including different variables, examining different sample size, as well as testing across countries. Generally, the results of these studies do not substantiate these relationships.

In this chapter, we are motivated by three main objectives: First, to study the relationships between stock market volatility, stock market development and economic growth. The empirical investigations in this chapter show the direction of causality between stock market indicators and economic growth. Second, we need to investigate the relationship between stock market and macroeconomic environment, especially after liberalization process. Finally, to analyze how crisis influences the expected returns.

3.2 Sources of Data and Definition of Variables

This section will provide discussion on the sample used for this study and its source as well as the definition of variables. The economic variables which will be examined are: Gross domestic product (GDP), Money Supply (M2), Interest Rate

(INT), Inflation (INF), Exchange Rate (EXCH) and Government budget deficit (GOV).

3.2.1 Sources of Data

The study covers the period from 1993:1 to 2008:4, with a total of 64 data points. The data are obtained from different sources as out lined in Table 3.1, and its behaviors are showed in Figure 3.1. All data except GDP and CMAI are annual data and disaggregated into quarterly by the method proposed by Gandolfo (1981) (Appendix 1.1). GDP was obtained in quarterly form; nevertheless CMAI was obtained in daily form and transformed into quarterly data by using *PROC EXPAND* program using SAS (Appendix 1.2). Data for all variables are transformed into natural logarithm except for GOV, VOL and DEV because most of their observations are negative. The advantage of using series in the form of natural logarithm is because it is easier when taking the differences of the variables (Holden, 1997). Nevertheless, the variables that are not in log (GOV, VOL, and DEV) do not affect the results but the interpretation will change. For example, equation 3.1 is a semi-log equation portrays a relationship between Y in logarithm, as the dependent variable and X, the independent variable, in level.

$$\ln Y = \beta_0 + \beta_1 X \tag{3.1}$$

The slope coefficient "β_1" is the ratio of the proportionate change in Y to the absolute change in X. In other words, the slope coefficient measures the

relative change in Y for a given absolute change in the value of the explanatory variable (X). The rest of this section will outline the importance of the variables

3.2.2 Definition of Variables

Gross Domestic Product (GDP)

In this study we use gross domestic product as a proxy of economic growth. It is the broadest measure of aggregate economic activity, which is also the best known and most often used. According to Odedokun (1996), Waite (1980) evaluated the effect of real value domestic credit on real GDP by employing time series data for each of 13 developing countries and found significant positive impacts virtually in all the countries.

Furthermore, Lanyi and Saracoglo (1983) found that the growth of real money stock has a significant positive impact on the economic growth of real GDP in their cross country study covering 21 countries over the 1971-1980.

Stock Market Development (DEV)

To measure stock market development, we use four indicators, which are commonly adopted in the literature:

1. The turnover ratio (TR), which is equal to the total value of shares traded, is expressed as a percentage of market capitalization. According to Laurenceson and Chai (2003, p.84), although it is not a direct measure of theoretical definitions of liquidity, high turnover is often used as an indicator of low transaction costs.

The turnover ratio complements the market capitalization ratio. A large but inactive market will have a large market capitalization ratio, but a small turnover ratio. Turnover also complements the total value-traded ratio. While the total value-traded ratio captures trading relative to the size of the economy, turnover measures trading relative to the size of the stock market. A small liquid market will have a high turnover ratio, but a small total value-traded ratio.

Illiquid markets indicate that there are disincentives to long run investment because it is comparatively difficult to sell one's stake in the firm; on the other hand, if there are liquid stock markets, since liquid markets provide a ready exit-option for investors.

2. The value traded (STR) refers to total value of shares traded on the stock market exchange divided by GDP (Laurenceson, and Chai (2003,p.85)).The total value-traded ratio measures the organized trading of firm equity as a share of national output, therefore should positively reflect liquidity on an economy-wide basis. The total value-traded ratio complements the market capitalization ratio: although a market may be large, there may be little trading. When using this ratio, attention is warranted due to:-

a. It does not measure the liquidity of the market, but it measures trading relative to the size of the economy.

b. Since markets are forward looking, they will anticipate higher economic growth by high share prices (Levin and Beck, 2004).

3. Market capitalization (MCR), which is the total value of outstanding shares (market capitalization), is expressed as a percentage of GDP (Laurenceson, and Chai, 2003, p.85), and will be deflated by the deflator for the whole period. The assumption behind this measure is that, the overall market size is positively correlated with the ability to mobilize capital and diversify risk on an economy-wide basis. It is therefore, a good measure of the relative size of the stock market in the economy.

4. Concentration refers to the average size of firms listed in the stock market. A very high degree of concentration signals a heavy and illiquid market. In such cases, the benefits of diversification in market are very low. The degree of market concentration is important to show how well market really works (Capasso, 2006). If only a few companies dominate the market, they can manipulate the price formation process. Thus, a high concentration ratio is not desirable.

Choe and Moosa (1999) define a number of indices for stock market development (DEV). The first is the stock market size which is measured by the value of listed shares (market capitalization) divided by GDP. However, larger market capitalization may not necessarily imply stock market development. They

further define two other variables which reflect the market liquidity. First, the value-traded ratio that is the total value of shares traded on domestic exchanges divided by market capitalization. Second: The turnover ratio (TR), which is equal to the total value of shares traded, is expressed as a percentage of market capitalization. In this study we use a composite index of stock markets development (DEV) using a formula, which is similar to the algorithm developed by Demirguc¸-Kunt and Levine (1996) as shown in Equation 3.6 below.

$$X_i = \frac{X_t - \bar{X}}{|\bar{X}|} \tag{3.2}$$

where Xi is the transformed values, $\bar{X}$ is the average value of variable X. Specifically, construction of DEV composite index follows a two-step procedure. First, we compute the means-removed values for market capitalization (MCR) (as a proxy of the size of the stock market relative to the size of the economy), total value traded (STR), and turnover ratio (TR) (as a proxy of liquidity) over the relevant study period. Second, we compute a simple mean of these three means-removed values in order to obtain an overall index of stock market development called DEV.

Interest Rate (INT)

Interest rate is another economic variable. There are many different interest rates in the economy; interest rates vary according to who is doing the borrowing, how long the funds are borrowed for and other factors (Abel and Bernanke, 1995). The relationship between interest rates and stock prices is not direct and

consistent. The reason is that the cash flow stocks can changes along with interest rates and we cannot be certain whether these changes in cash flow will augment or offset the change in interest rate.

Inflation (INF)

The relationship between inflation, interest rate and stock prices is not as direct or consistent as the relationship between interest rate and bonds. Moreover, the actual relationship between inflation, interest rates and stock prices is an empirical question and the effect varies over time. Therefore, although there has generally been a significant negative relationship between inflation, interest rates and stock prices this is not always true. In addition, even when it is true for the overall market, certain industries or segments of the economy may have earnings and dividends which react positively to inflation and interest changes.

Government Budget Deficit (GOV)

The new fiscal policy in Egypt, which began to be implemented from 1st May 1991, aimed at reducing the deficit in the state budget through increasing resources from the state and decreasing the level of growth in public expenditures. However, in view of increasing rate of the deficit in the state budget to gross domestic product, it was not possible that this new policy would result in total reduction of deficit. This situation led the Egyptian government to enter the capital market with its various savings institutions to borrow as does the private sector (Zaki, 1994).

The entrance of government as borrower through treasury bills with high interest rates has resulted in the increase of the general level of prices in response to the increase in the cost of both current and capital investment. The high interest rate caused by the treasury bills in addition to the huge volume of treasury bills issued by the government has resulted in government being the only borrower in the capital market. Consequently, there is a situation of crowding around the locally available finance facilities. The main problem is that the government used these funds to finance its current deficit and not to finance public investment. In other words, these finances were liquidated for the benefit of government consumption rather than investment and development.

Money Supply (M2)

The money supply could influence stock prices via many ways. First, an increase in money supply will increase cash flow. This will result in rising demand for stocks and other financial assets, or shifting from non-bearing money to financial assets. Hence, stock prices are likely to go up. Second, an increase in money supply may increase interest rate thereby increasing the opportunity cost of holding cash as well as stocks (if the money demand remains constant). Hence, people like to convert their stock holdings to interest-bearing deposits. And hence the money supply may negatively relate to stock prices. Third, an increase in money supply is positively related to inflation, hence an increase in money supply may lower the demand for stocks and assets resulting in higher discount rates and lower stock prices Fourth: nonetheless, stock possession will be less attractive as a

consequence of the rising interest rate and inflation. Because of the rising interest rates and inflation will adversely affect corporate profits leading to lower stock return. Finally, according to Chaudhuri and Smile (2004), changes in the money supply may positively relate to the stock prices through its impact on economic activity. Moreover, many researchers believe that positive effects will outweigh the negative effects and stock prices will eventually rise due to growth of money supply.

Exchange Rate (EXCH)

Exchange rate is the price of one currency expressed in terms of another currency. Exchange rate is considered an important variable in this study because it affects the economic stability and the stock market performance as well. The exchange rate also has significant influence on imports, exports, consumption, investment, and foreign direct investment flow. As for the return from investment abroad it comprises the actual return of the stock and the return resulting from changes in the exchange rate.

Exchange rate changes also affect the competitiveness of firms through their impact on input and output price (Joseph, 2002). For the exporters, appreciation in the exchange rate causes them to lose their competitiveness in international market. The sales and profits of the exporters will shrink and the stock prices will decline. On the other hand, importers will increase their competitiveness in domestic markets. Therefore, their profit and stock prices will increase. The reverse is true when the exchange rate depreciates. The depreciation

of exchange rate will have adverse effects on importers and positive effects to the exporters (Wu, 2000). Exporters will have advantage against other countries' exporters and the increase in sales and their stock prices will be higher (Yau and Nieh, 2006). Thus the currency appreciation has both a negative and a positive effect on the domestic stock market for an export-dominant and an import-dominated country, respectively (Ma and Kao, 1990).

In discussing exchange rate we have to distinguish between nominal and real exchange rates. The real exchange rate can be defined in the long run as the nominal exchange rate that is adjusted by the ratio of the foreign price level to the domestic price level . This can be expressed as:

$$REXCH = \frac{NEXCH * CPI_{US}}{CPI_{EGY}} \tag{3.3}$$

where *REXCH* is real exchange rate, *NEXCH* is nominal exchange rate which is the Egyptian pound per *USA* dollar, CPI_{US} is *USA* consumer price index, CPI_{EGY} Egyptian consumer price.

In terms of this definition, the decline in the *REXCH* can be interpreted as the real appreciation of the exchange rate.

3.3 Volatility and Economic Growth

To explore the effect of stock market development and economic growth in the Egyptian economy, we followed the growth model by Odedokun (1996). It is

based on the conventional neo-classical one-sector aggregate production function in which financial development constitutes an input.

$$Y_t = F(D_t, Z_t) \tag{3.4}$$

where Y= real output or real GDP; D = a measure of the level of stock market development; and Z = vector of other factors such as: money supply, inflation rate, exchange rate, interest rate, budget deficit and stock market volatility. The subscript "t"denotes the time period.

In comprehensive studies like this, it is usually subject to criticism when you select the variables. But this problem is unavoidable (Fama, 1991). In this case, the selection of a wide range of variables that is important to study. However, previous studies and literature review showed that there are some variables that are relevant to the study, while others are not.

However, this study will omit measures of bank development in identifying the separate impact of stock market on economic growth; even though it is difficult to assess whether banks and stock market has its own independent impact on economic growth.

3.3.1 Measuring Stock Market Volatility

Modeling and forecasting stock market volatility is the subject of vast empirical and theoretical investigation over the past decade. In order to study the relationship between financial markets volatility and economic activity, one must construct a measure of that volatility. There are three types of volatility:

1. Historical volatility is the simplest model and it involves calculating the variance of returns in the usual way over some historical period, and this then becomes the volatility forecast for all future periods.
2. Implied Volatility: All pricing models for financial options require a volatility estimate or forecast as an input. Given the price of a traded option obtained from transactions data, it is possible to determine the volatility forecast over the lifetime of the option implied by the option's valuation. The implied volatility of an option is the volatility that is used in an option valuation model which equates the theoretical value and the market value. If option pricing models are valid, implied volatilities will express the market expectation about future volatility.
3. Future Volatility is the observed volatility of the stock price from the current date until the option's maturity. When future volatility is used to address the topic of forecasting ability, it is usually computed according to one single estimator.

Although implied volatility provides an alternative estimate of future volatility and theoretically better, it suffers from an obvious chicken and egg problem, in that, to calculate implied volatility requires the option price, and to calculate the option price requires a volatility estimate (Ederington and Guan, 2006).

The historical volatility is defined as the standard deviations of the logarithm price changes measured at regular intervals of time. There are many ways to estimate historical volatility,

(1) The standard deviation of the daily prices returns for a period of time.

$$HV_{daily} = \sqrt{\frac{1}{n-1}\sum_{1}^{n}(x_t - X)^2} \tag{3.5}$$

$$HV_{1year} = HV_{current} * \sqrt{252} \tag{3.6}$$

$$Return \quad x_t = log_e(P_t - P_{t-1}) \tag{3.7}$$

where p_t : the close price of t day. And X is the mean of x_t.

The historical standard deviation has several shortcomings:-

1. Only the information in the past returns is considered, ignoring any other possible information sets.
2. All past squared returns deviations, beginning to an arbitrary date, are weighted equally in calculating the standard deviation, and all other observations before that date are ignored.
3. Since the historical standard deviation and variance are functions of squared return deviations, they could be unduly sensitive to outliers (Ederington and Guan, 2006).

4. It is unable to differentiate between volatility when returns are positive, as opposed to when returns are negative (Chow, 2005).

In this study, we follow the approach of Schwert (1989) in estimating monthly standard deviation of stock returns using the daily returns to the Capital Market Authority Index (CMAI) from 1993 to 2008.

$$\sigma_{CMAI,t} = \sqrt{\sum_{i=1}^{N\,t}(r_{CMAI,i} - \mu_t)^2} \tag{3.8}$$

where N_t is the number of daily returns in month t, r_{it} is the return of the *CMAI* on day i; and μ_t is the average daily return during month t.

In order to study the relationship between macroeconomic activity and stock market volatility, we consider other variables which may affect the economic growth. These variables are as follows; Inflation rate (calculated as log difference of consumer price index (CPI)). Money supply (defined as broad money (M2)), Interest rates, exchange rates, governmental budget deficit and economic output.

3.4 Relationship between Stock Volatility and Macroeconomic Variables

This study also examines the effect of macroeconomic uncertainty (volatility) on stock market volatility.

This can be done by applying the following model:

$$\sigma_{CMAI,t} = \alpha + \beta\sigma_t^Y + \gamma\sigma_{CMAI,t-1} + \varepsilon_T \tag{3.9}$$

where $\sigma_{CMAI,t}$ and $\sigma_{CMAI,t-1}$ are respectively stock market volatility in quarters *t* and *t-1*, and σ_t^Y is macroeconomic volatility for variable *Y*. For each macroeconomic variable, *Y* will be estimated as an AR(1) and will collect the residuals as Bansal, Khatchatrian, Yaron (2005). Volatility is then calculated as follows:

$$\sigma_{t-1,g}^{Y} = \log\left(\sum_{g=1}^{g}\left|\varepsilon_{t-g}^{Y}\right|\right) \tag{3.10}$$

We consider lag values for g = 1 to 4. This specification is more informative about ex-ante volatility than chosen different weights (Andersen, Bollerslev and Diebold, 2002).

Finally, due to changes that may have occurred in the Egyptian economy during the study period, as a result of political crisis, three dummy variables are introduced to capture the changes in both stock market and economic growth. The first dummy variable will equal one, for terrorist attacks* from November 1997:11 to 1998:1, and zero when otherwise. On the contrary; the second dummy is regional and not a local event like the first one; this dummy will equal one for Iraq invasion periods in 2003:3 - 2003:5, and international crises; and zero when otherwise. The last dummy variable will equal one for the World Trade Center attacks period in 2001:9-2001:10, and will equal zero when otherwise. It will be

* Terrorists armed with automatic weapons ambushed, shot & killed 62 tourists at Luxor. All of the gunmen were shot dead by military police or apprehended immediately.

considered as an interactive term between the dummy variables and the exchange rate.

$$\sigma_{CMAI,t} = \alpha + \beta\sigma_t^Y + \gamma\sigma_{CMAI,t-1} + D_{97} + D_{01} + D_{03} + \varepsilon_T \qquad (3.11)$$

where D_{97}, D_{01}, and D_{03} are Luxor terrorist attacks, September 11, and Iraqi war respectively.

3.5 GARCH Model

This test was performed to find the impact of the macroeconomic indicators (interest rate, inflation, government deficit, exchange rate, money supply and gross domestic product) on stock market prices.

The GARCH model allows the conditional variance to be dependent upon previous own lags, so the representation of GARCH (p,q) variance is :

$$\sigma_t^2 = \alpha_0 + \sum_{j=1}^{q} \beta_j \sigma_{t-j}^2 + \sum_{j=1}^{q} \alpha_i \epsilon_{t-i}^2 \qquad (3.12)$$

where $\alpha_0 > 0, \alpha_i \geq 0$ and $i > 0$.

Using the GARCH model, it is possible to interpret the current fitted variance, σ_t^2, as a weighted function of a long-term average value (dependent on α_0), information about volatility during the previous period and the fitted variance from the model during the previous period. In addition, to enable GARCH to capture additional volatility, the conditional variance should enter into conditional

variance equation. After adding the conditional variance, the GARCH models are now GARCH-M.

$$y_t = \alpha_0 + \beta' X_t + \theta h_t + u_t$$

$$u_t | \Omega \sim \text{iid } N(0, h_t)$$

$$h_t = \gamma_0 + \sum_{i=1}^{p} \delta_i h_{t-1} + \sum_{j=1}^{p} \gamma_j u_{t-j}^2 \tag{3.13}$$

The uncertainty as a result of the terrorist attacks and political instability could have a devastating effect on the economic growth. According to Asteriou and Price (2001), it is more efficient to allow uncertainty to affect growth directly. In this study, the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) represents the volatility.

GARCH models allow us to add explanatory variables in the specification of the conditional variance and mean equations. The augmented GARCH(p,q) specification can be written as the following:

$$\sigma_t^2 = \gamma_0 + \sum_{i=1}^{p} \delta_i \sigma_{t-i}^2 + \sum_{j=1}^{q} \gamma_j u_{t-j}^2 + \sum_{k=1}^{m} u_k X_k \tag{3.14}$$

where X_k is a set of explanatory variables that might help to explain the variance σ_t^2. u is the residual from mean equation estimating. This means that the value of the variance scaling parameter σ_t^2 depends on: First, past values of the shocks which are captured by the lagged squared residual terms. Second, past

value of itself which are captured by lagged σ_t^2 term. Finally, explanatory variables X_k.

In order to test a direct impact of macroeconomic variables on stock prices, and to capture the effect of unforeseen events on volatility of stock prices we estimate GARCH-M. We estimate GARCH-M specifications, first, including macroeconomic variables in the mean equation to enable us to to test the direct impact on stock prices. Second, include the three unforeseen events in variance equation to capture the impact on volatility of stock prices. The model which is tested in this section is GARCH-M (1, 1), and it is as follows. Let $CMAI_t$ be the stock market price index.

$$\Delta \ln(CMAI_t) = \gamma_0 + \delta_{1i} \sum_{i=1}^{n} \ln(CMAI_{t-i}) + + \sum_{j=1}^{n} \delta_{2i}(GDP_{t-i}) + \sum_{j=1}^{n} \delta_{3i}(GOV_{t-i}) + \sum_{j=1}^{n} \delta_{4i}(INF_{t-i}) + \sum_{j=1}^{n} \delta_{5i}(INT_{t-i}) + \sum_{j=1}^{n} \delta_{6i}(M2_{t-i}) + \sum_{j=1}^{n} \delta_{7i}(EXCH_{t-i}) + \boldsymbol{D_{tj}} + \tau h_t + e_t \quad (3.15)$$

$e_t \sim N(0, h)$,

$$h_t = b_1 e_{t-1}^2 + b_2 h_{t-1} + \sum_{i=1}^{6} b_{3i} X_{it}$$

D_{tj} reresents the three dummies of terrorist and instability events. These events are as presented to domestic event (Luxor terrorist attacks (1997)), regional event (Iraq invasion (2003)), and abroad event (September 11, 2001 attack).

3.6 Cointegration Analysis

Economic time series are said to be cointegrated if these series are integrated of order one, I (1) before differencing but are stationary, I (0) after differencing, and a linear combination of the I (1) series is stationary. Therefore, there is a long run relationship between these series because they do not drift too far apart from each other over time.

The augmented Dickey Fuller is used to test for the stationarity of variables. The Johansen cointegration approach is used to investigate the long run relationship between stock prices and macroeconomic variables for the Egyptian economy. We will analyze the short run dynamic and interaction between stock prices, and the macroeconomic variables, based on the vector error correction model (VECM) using Granger causality tests and the variance decomposition analysis (VDC).

3.6.1 Unit Root Test

The empirical investigations commence with an analysis of the time series properties and determine the order of integration for multivariate series. There are several variations of the unit root test: The augmented Dickey-Fuller test (ADF) (1979, 1981) , Phillips-Perron (PP) (1988) and Kwiatkowski, Schmidt and Shin

(1992). Stationarity means that when we consider two different time intervals, the sample mean and sample covariance of the time series over the two time intervals will be almost the same. In other words, a time series is called stationary if its statistical properties remain constant over time.

The augmented Dickey-Fuller test (ADF) has been the most popular test used to check data stationary in empirical research. This test is applied in higher order and models where the error terms are serially correlated. The augmented Dickey-Fuller test (ADF) can be represented by the following equation:

$$\Delta y_t = \gamma y_{t-1} + x_t'\delta + \sum_{i=1}^{k} \beta_i \Delta y_{t-i} + \varepsilon_t \qquad (3.16)$$

where $\gamma_0 > 0$, and $\gamma_i \geq 0, i > 0$.

The unit root test is carried out under the hypotheses

H_0: series contains a unit root.

Versus H_1: series is stationary.

So if we reject the null hypothesis (if the coefficient of the lag of γ is significantly different from zero) then the series is stationary. But if we accept it (reject the alternative hypothesis), then the series is non-stationary.

The PP tests are based on the following equations:

$$Y_t = \mu + \alpha^* Y_{t-1} + v_t \qquad (3.17)$$

$$Y_t = \mu + \beta\left(1 - \frac{T}{2}\right) + \alpha^{\sim} Y_{t-1} + v_t \qquad (3.18)$$

where Y_t represents: gross domestic product (GDP), inflation interest rate (INF), money supply (M2), exchange rate (EXCH), interest rate (INT), stock market development (DEV), volatility of stock returns (VOL), and government budget (GOV)., T is the number of observations, μ is non-zero mean term, β linear trend term. In (3.25) the null hypothesis where H_0: $\alpha^* = 1$ is tested by using the $Z(\alpha^*)$ and $Z(t_{\alpha^*})$ test statistics and H_0: $\mu = 0$ and $\alpha^* = 1$ is tested using $Z(\Phi_1)$ test statistics. In equation (3.26) the null hypothesis where H0: $\alpha^{\sim} = 1$ is tested by the test statistics $Z(\alpha^{\sim})$ and $Z(t_{\alpha^{\sim}})$, and where H0: $\beta = 0$ and $\alpha^{\sim} = 1$ is tested by using test statistics $Z(\Phi_3)$ and where H0: $\beta = 0$ and $\mu = 0$ and $\alpha^{\sim} = 1$ is tested by using test statistics $Z(\Phi_2)$. The adjusted Z test statistics are given in Perron (1988, 308-309).

However, recent researchers have pointed out that the standard ADF test is not appropriate for variables that may have undergone structural changes. Perron (1989) has shown the existence of structural changes biases of the standard ADF tests towards non-rejection of the null of unit root.

Perron (1989) demonstrated that if the observations corresponding to unique events (great depression (1929) and first oil crises (1973)) isolated from Nelson' and Ploser's (1982) data, the results derived by Nelson and Ploser could be reversed for most of the variables.

3.6.2 Structural Shift and Unit Root Test

Perron (1989) and Balke and Fomby (1991) showed that if a series is stationary around a determined time trend; which has undergone a permanent shift sometimes during the period under consideration, is failed to be noted, this change in the slope will be mistaken by the usual ADF unit root test as a persistent innovation to a stochastic trend. A limitation on the Augmented Dickey Fuller (ADF) type endogenous break unit root tests is that, the critical values are derived while assuming no break(s) under the null. Hence, ADF will have low power if there has been a shift in the intercept or in the determined time trend (Campbell and Perron, (1991).

Perron (1989) and Zivot and Andrews (1992) provided an extension to the standard ADF test that takes into account, possible structural break(s) in the series and the intercept.

Saikkonen and Lütkepohl (2002) and Lanne, Lütkepohl and Saikkonen (2002) proposed unit root tests that are based on estimating the deterministic term first by a generalized least squares (GLS) procedure under the unit root null hypothesis and then, subtracting it from the original series. Then, an ADF-type test is performed on the adjusted series, which also includes terms to correct estimation errors in the parameters of the deterministic part. It seems appropriate to test for unit root following the model proposed by Saikkonen and Lütkepohl (2002) and Lanne et al., (2002). The following equations present the structural break-oriented ADF test:

$$\Delta Y_t = \alpha_0 + \beta_t + \theta DU_t + \delta DTB_t + (\rho - 1)Y_{t-1} + \sum_{i=1}^{N} \Psi_i \Delta Y_{t-i} + u_t \qquad (3.19)$$

$u_t \sim i.i.d.(0, \Theta)$

$$\Delta Y_t = \alpha_0 + \beta_t + \theta DU_t + \delta DTB_t + \gamma DT_t$$

$$+(\rho - 1)Y_{t-1} + \sum_{i=1}^{N} \Psi_i \Delta Y_{t-i} + u_t \qquad u_t \sim i.i.d.(0, \Theta) \qquad (3.20)$$

where, two structural breaks are allowed in both, the time trend and the intercept, which occur at T_B. Dummies DTB, DU, and DT, allow for a break in the level of the trend function, a break in the slope and breaks in both the level and the slope, respectively. DTB_t=1 if t =T_B+1 (otherwise it is equal to zero), DU_t = 1 if t > T_B and DT_t= t-T_B if t >T_B, zero when otherwise.

Saikkonen and Lütkepohl (2002) put forward that structural breaks may occur over a number of periods and display smooth transition to a new level. For example, when a level shift function, which is here denoted by a general nonlinear form $f_t(\theta)\gamma$, is added to the deterministic term, μ_t of the data generating process, the model of

$$Y_t = \alpha_0 + \alpha_1 t + f_t(\theta)'\gamma + v_t \qquad (3.21)$$

is shown, where θ and γ are unknown parameters, whereas v_t are residual errors generated by an AR(p) process with possible unit root. In this study, we consider the shift function based on the exponential distribution function, which allows for a nonlinear gradual to shift to a new level starting at time T_B,

$$f(\theta) = \begin{cases} 0 & , \quad t < T_B \\ 1 - exp\{-\theta(t - T_B + 1)\}, & t \geq T_B \end{cases} \tag{3.22}$$

In the shift term $f_t(\theta)'\gamma$, both θ and γ are scalar parameters. The first one is confined to the positive real line ($\theta > 0$), whereas the second one may assume any value. The Saikkonen and Lütkepohl test in model 3.21 is based on the estimation of the deterministic term, first by a generalized least squares (GLS) de-trending procedure under the unit root null hypothesis and then, subtracting it from the original series. An ADF-type test is then performed on the adjusted series which also includes terms to correct estimation errors in the parameters of the deterministic part. The asymptotic null distribution is nonstandard, and the critical values are tabulated in Lanne et al., (2002).

3.6.3 Vector Autoregressive Model (VAR)

Time series analysis require data to be covariance stationary, and that most macroeconomic series display significant trends has led to first difference time series before estimating economic models. If the economic series are stationary only after differencing but a linear combination of their levels is stationary, then the series are said to be cointegrated. Although it can be using non-stationary

series for regression analysis after differencing the series successively until stationary is achieved, this is not recommended two main reasons; first, when we difference variables then we are also differencing the error term in the regression, and this produce a non-invertible moving average error in the regression. Second, if we difference the variables; the model can no longer give a unique a long run solution (Asteriou & Hall, 2007).

In this study we use vector autoregressive (VAR) to investigate the interactions of economic growth, stock market volatility and stock market development. The VAR technique, as applied to a simultaneous equation system, estimates unrestricted reduced form equations with uniform sets of the lagged dependent variables of each equation as regressors. Because this approach sets no restrictions on the structural relationships of the economic variables, it avoids mis-specification problems. According to Sims (1980) a VAR is a system of regression model, or it is a multiple time series generalization of AR model. Focusing on the distinction between exogenous and endogenous variables, the results of this model will be re-specified with shorter lists of exogenous variables. Many of the exogenous variables are treated as exogenous by default rather than there being good reason to believe them strictly exogenous. Because some variables require an extensive modeling effort some variables are treated as exogenous. Also some variables are treated as exogenous because they are policy variables even though they evidently have a substantial endogenous component. So if we have a list of exogenous variables in case endogeneity is doubtful, the identification of the

model might well fail, and would at best be weak. Therefore it is useful to use a VAR approach which all variables are treated as endogenous, and we do not have to worry about which variables are endogenous or exogenous.

To test the interrelationship between variables, the VAR is a good starting point. The VAR model with only one lag in each variable would be:

$$y_t = \beta_{10} - \beta_{12}x_t + \gamma_{11}y_{t-1} + \gamma_{12}x_{t-1} + u_{yt} \qquad (3.23a)$$

where Y_t is a time series that is affected by current and past values of X_t.

$$x_t = \beta_{20} - \beta_{21}y_t + \gamma_{21}y_{t-1} + \gamma_{22}x_{t-1} + u_{xt} \qquad (3.23b)$$

where x_t is a time series that is affected by current and past values of y_t. And we assume both y_t and x_t are stationary, and the errors (u_{yt} *and* u_{xt}) are not correlated. The equations (3.30a and 3.30b) are not reduced form since y_t has a contemporaneous impact on x_t (given by$-\beta_{21}$), and x_t has a contemporaneous impact on y_t (given by$-\beta_{12}$).

Rewriting the system with the use of matrix algebra:

$$\begin{bmatrix} 1 & \beta_{12} \\ \beta_{21} & 1 \end{bmatrix} \begin{bmatrix} y_t \\ x_t \end{bmatrix} = \begin{bmatrix} \beta_{10} \\ \beta_{20} \end{bmatrix} + \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix} \begin{bmatrix} y_{t-1} \\ x_{t-1} \end{bmatrix} + \begin{bmatrix} u_{yt} \\ u_{xt} \end{bmatrix} \qquad (3.23c)$$

Or

$$\beta z_t = \Gamma_0 + \sum_{i=1}^{k} \Gamma_1 z_{t-i} + u_t \qquad (3.23d)$$

where $\Gamma_0$is *(p x 1)* deterministic vector, Γ_1 are *(p x p)* coefficients matrices and u_t is i.i.d *N(0,Λ)*, *k* is the lag order included in the system.

The model employed in this study is a finite order VAR which is a multivariate modeling which each endogenous variable is regressed on its own lags and lags of all other variables in the system; the number of lags determines the order of the VAR" (Kakes, 2000, 36).

The baseline VAR model proposed in this chapter includes the endogenous variables' vector (i.e. Z vector), as follows:

$$Z_t = \gamma_1 Z_{t-1} + \cdots + \gamma_j Z_{t-j} + c + \varepsilon_t \qquad (3.24)$$

where z_t= (GDP, INF, INT, GOV, EXCH, VOL, M2, DEV)$^{\backslash}$ is a (8 X 1) vector, γ_j is a (8 X 8) parametric matrix, c is a (8 X 1) constant vector, ε_t is the (8 X 1) vector of random error terms with zero mean and constant variance, and j is the lag length.

3.6.4 Lag Length Selection

In order to embark on the cointegration analysis, it is imperative to determine of the optimal lag length for a VAR. Lag length selection is important for VAR specification because choosing too few lags result in misspecification and choosing too many lags result in unnecessary loss of degrees of freedom. To avoid this, lag lengths are selected using statistical tests, which include the modified Likelihood Ratio (LR) test, Akaike Information Criterion (AIC),

Schwarz Information Criterion (SC) and Hannan-Quinn Information Criterion (HQ).

The Akaike Information Criterion (AIC) was developed by Akaike (1974) and given by:

$$AIC = T \log L + 2N \tag{3.25}$$

the Schwarz Bayesian Criterion was developed by Schwarz (1978) and is given by:

$$SC = T \log L + N \log T \tag{3.26}$$

where L denotes the likelihood or the sum of squared errors, N is the number of parameters in the estimated model, T is the number of observations in the series.

3.6.5 Johansen Cointegration Approach

The second step is Johansen cointegration approach, used to test the long run relationship between stock market development and economic growth. To fulfill this goal we use the maximum likelihood based cointegration approach introduced by Johansen (1988, 1991), only after examining whether there is unit root or not for each time series individually. If the time series are found to be integrated of the same order after the unit root tests, then these variables may be

cointegrated. Cointegration deals with the relationships among a group of variables, where unconditionally, each has a unit root (Kogar, 1995).

The procedure begins by expressing the stochastic variables in a (nx1) vector Y_t as the unrestricted vector autoregressive (VAR) involving up to k-lags of Y_t:

$$Y_t = A_1 Y_{t-1} + \cdots + A_k Y_{t-k} + C + u_t \tag{3.27}$$

$$Y_t = C + \sum_{i=1}^{k} A_1 Y_{t-i} + u_t \qquad u_t \sim IN(0, \sum) \tag{3.28}$$

If the variables under consideration are cointegrated, the cointegration vector is normalized with respect to GDP, interest rate, budget deficit, stock market development, inflation rate, stock prices volatility, exchange rate and money supply. Also, if the variables are cointegrated, it is feasible to verify the short run dynamic through vector error correction model. In order to use Johansen test, the VAR above needs to be turned into a vector error correction model (VECM) that can be written in its first difference form;

$$\Delta Y_t = \prod Y_{t-k} + \Gamma_1 \Delta Y_{t-1} + \Gamma_2 \Delta Y_{t-2} + \cdots + \Gamma_{k-1} \Delta Y_{t-(k-1)} + u_t \tag{3.29}$$

$$\Delta Y_t = \sum_{i=1}^{k-1} \Gamma_i \Delta Y_{t-i} + \prod Y_{t-k} + u_t \tag{3.30}$$

where $\Pi = \left(\sum_{j=1}^{k} A_i\right) - I_g$ and $\Gamma_i = \left(\sum_{j=1}^{i} A_j\right) - I_g$, I_g is an identity matrix, and ΠY_{t-k} contains information regarding the long run equilibrium relationship between variables in Y_t.

The long run relationship between stock prices indices and macroeconomic activity is suggested by the rank of Π matrix, r, where r is $0<r<n$. and the two matrices α and β with dimension (n x r) are such that $\alpha\beta' = \Pi$. The matrix β contains the r cointegrating vectors and has the property where $\beta' Y_t$ is stationary, and it is a matrix of long run coefficient. α is the matrix of the error correction presentation that measures the speed of adjustment in ΔY_t, or it represents the speed of adjustment to disequilibrium.

There are two test statistics for cointegration under the Johansen approach:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{g} \ln(1-\lambda) \quad (3.31)$$

$$\lambda_{max} = (r, r+1) = -T \ln(1-\lambda_{r+1}) \quad (3.32)$$

Where r is the number of cointegrating vectors under the null hypothesis and λ1 is the estimated value for the i^{th} ordered eigen value from the Π matrix. It is self-evident that the larger λ_i, the large and negative will $\ln(1-\lambda_i)$ be, hence the larger the test statistics will be where T is the number of observations. The λ-trace test statistics, tests the existence of at least r cointegration vectors against a general alternative, while the null hypothesis of r against r+1 cointegrating vectors is tested by λ-max.

3.6.6 Vector Error Correction Model

If the series are cointegrated, then the possibility of the estimated regression being spurious due to tribulations such as omitted variable bias, autocorrelation, and endogeneity is ruled out. Since our series are cointegrated, we can further proceed to determine the direction of causality, among the variables.

The Johansen's multivariate cointegration test involved testing the long-run relationships between the variables. The relationships among the variables are based on unrestricted vector autoregression (VAR) which presented in equation (3.32), and it can be written in its first difference form:

$$\Delta Z_t = \Gamma_1 \Delta Z_{t-1} + \Gamma_2 \Delta Z_{t-2} + \cdots + \Gamma_{j-1} \Delta Z_{t-j+1} + \Pi Z_{t-j} + \varepsilon_t$$

$$= \sum_{i=1}^{j-1} \Gamma_i \, \Delta Z_{t-i} + \Pi Z_{t-j} + \varepsilon_t \qquad (3.33)$$

where $\Delta Z_t = Z_t - Z_{t-1}$, $\Gamma_i = -\left[I - \sum_{i=1}^{j-1} \gamma_i\right]$, and $\Pi = -\left[I - \sum_{i=1}^{j} \gamma_i\right]$, the Π matrix is a (8 X 8) matrix (the matrix Π is 8 X 8 due to the fact we use eight variables), ΠZ_{t-j} contains information regarding the long run equilibrium relationship between variables in Z_t, and the matrix Γ_i comprises the short run adjustment parameters. The Π could be decomposed into the product for two n by r matrix α and β so that $\Pi=\alpha\beta$ where β matrix contains r cointegration vectors and a matrix of long run coefficients, and α represent the speed of adjustment parameters to disequilibrium (Gan, Lee, Yong and Zhang, 2006)

It is imperative to determine the order of the VAR system before running Johansen cointegration. This is done by using the likelihood ratio tests, and these

procedures yields two lags of the VAR as shown before. In addition it is important to need to specify the deterministic components, whether these are restricted or unrestricted. Because the asymptotic distribution for the rank test depend on the deterministic components in the model (Jusélius, 2006: 139)

It will be convenient to distinguish between five different cases (models) often encountered in practice. If the following is the general vector error correction model (VECM):

$$\Delta y_t = \alpha_{0_y} + \alpha_{1_y} t - \Pi_y Z_{t-1} + \sum_{i=1}^{p-1} \Gamma_{iy} \Delta Z_{t-i} + \psi_y W_t + \varepsilon_t, \; t = 1,2, \ldots, n \quad (3.34)$$

where:

$Z_t = (y_t', x_t')$, y_t' is an m_y x 1 vector of jointly detrmined (endogenous) I(1) variables,

$x_t = \alpha_{0_x} + \sum_{i=1}^{p-1} \Gamma_{ix} \Delta Z_{t-i} + \psi_x W_t + v_t$, , x is an m x 1 vector of exogenous I(1) variables.

$W = q$ x1 vector of exogenous /deterministic I(0) variables, excluding the intercepts and /or trends.

Accordingly, the cointegration analysis distinguishes between five cases of interest ordered according to the importance of the trends:

Case I : $\alpha_{0_y} = \alpha_{1_y} = 0$ (no intercepts and no trends). However, this is quite unlikely to occur in practice.

Case II: $\alpha_{1_y} = 0$, and $\alpha_{0_y} = \Pi_y \mu_y$ (restricted intercepts and no trends),

Case III: $\alpha_{1_y} = 0$, and $\alpha_{0_y} \neq 0$ (unrestricted intercepts and no trends),

Case IV: $\alpha_{0_y} \neq 0$ and $\alpha_{1_y} = \Pi_y \gamma_y$(unrestricted intercepts and restricted trends),

Case V:$\alpha_{0_y} \neq 0$, and $\alpha_{1_y} \neq 0$ (unrestricted intercepts and trends). However this model is difficult to interpret from an economic point of view. (Mcalee &Oxley. 1999)

For this purpose various vector error correction models can be specified. Observing the short-run properties of the series, by utilizing such models, may provide very useful insights especially for policy makers. Relying on the presence of a cointegrating vector, the subsequent vector error correction model (VECM) can be written as follows:

$$\Delta LGDP_t = \mu_1 + \Psi_1 ECT_{t-1} + \sum_{j=1}^{j} \gamma_{1i} \Delta LGDP_{t-i} + \sum_{j=1}^{j} \varphi_{1i} \Delta LINF_{t-i} \sum_{j=1}^{j} \theta_{1i} \Delta LINT_{t-i} + \sum_{j=1}^{j} \varrho_{1i} \Delta LM2_{t-i} + \sum_{j=1}^{j} \vartheta_{1i} \Delta GOV_{t-i} + \sum_{j=1}^{j} \tau_{1i} \Delta EXCH_{t-1} + \sum_{j=1}^{j} \delta_{1i} \Delta DEV_{t-1} + \sum_{j=1}^{j} \phi_{1i} \Delta VOL_{t-1} + \varepsilon_t \quad (3.35)$$

where ECT_{t-1} is the error correction term obtained from the cointegration equation. Ψ, $\gamma, \varphi, \theta, \varrho, \vartheta, \tau, \delta,$ and ϕ are the estimated parameters, j is the lag length, and ε_t are stationary random shocks with zero mean and constant variance.

The long-run equilibrium relationship is attained by using two test statistics the trace statistics (λ_{trace}), and the maxeigen value (λ_{max}). The trace statistics tests the null hypothesis that the number of the cointegrating vectors is less than or equal to r against a general alternative. The maxeigen value tests the null hypothesis that the number of cointegrating vector is against the alternative of r+1 cointegrating vectors.

Although there is no major differences between corresponding maximum eigenvalue and trace tests, in some situation trace value tests tend to have more heavily distorted sizes whereas this power performance is superior to the maximum eigenvalue competitors. The trace tests are advantages if there are at least two more cointegating relations in the process than are specified under the null hypothesis (Lüutkepohl, Saikkonen, & Trenkler, 2002).

Although the λ_{trace} statistics take into account all (p-r) of the smallest eigenvalue, and thus have more power than λ_{max} statistics where the eigenvalues are evenly distributed (Dahalan, Subhash & sylwester, 2005). On the other hand, the trace test seems to be more robust to excess kurtosis in innovations than the maximal eigenvalue test (Cheung & Lai, 1993). So if the there is a conflict

between the λ_{trace} and λ_{max} , it is recommendable to use λ_{trace} (Johansen and Juselius, 1990).

Monte Carlo study by Gregory (1994) argues that both tests display some size distortion and size is better for max eigenvalue test (which uses just one eigenvalue) than for the trace test (which uses all eigenvalues). Gregory (1994) corrected λ_{max} test statistic for the number of estimated parameters to obtain satisfactory size prosperities in finite samples by multiplying the test statistic by a factor $(T\text{-}np)/T$. where T is the number of observations, n the number of variables in the VAR system, and p is the lag length of the VAR (Maddala, 2002).

According to Harris (1996) the decision regarding the deterministic components in the model is not easy to determine. Hence, next step is to choose the model. In order to do this we will apply Pantula principle (Johansen, 1992). The Pantula principle involves the estimation of all three models and the presentation of the results from the most restrictive hypothesis through the least restrictive hypothesis (Asteriou & Hall, 2007). We start from the smaller number of cointegrating vectors and see if we can reject the null hypothesis or not. If we can reject it we move to the second model (to the right) and so on. We stop when we reach the point that the null hypothesis cannot be rejected. In another words, we start from the most restrictive model (model 2) and at each stage compare the eigenvalue statistic with the critical value until we reach a specification for which we do not reject the null hypothesis (Meeusen, 1999). Table 4.9 presents the statistics for the three models together.

3.6.7 Granger Causality Test

After determining the relationship between stock market development, macroeconomic variables and economic growth, each variable will be tested for Granger (1969) causality test.

Granger causality test is used to test the exogeneity or independence of variables in a system or model, where each variable is regressed on the current and lagged values of the other variables, expressed as

$$Y_t = \sum \beta_j X_{t-j} + \mu_t \tag{3.36}$$

with β_j=0 for all j<0 if and only if Y_t fails to Granger-cause X_t. Given two time dependent variables, Y_t and X_t, nonsignificant regression coefficients of the regression of X_t on the current and lagged values of Y_t suggest a lack of feedback from Y_t to X_t, and Granger causality from X_t to Y_t, which is called the Granger noncausality of Y_t to X_t. In terms of market efficiency, Granger *F*-statistics tests whether or not the null hypothesis of X_t not Granger causing Y_t in the equation, with the null hypothesis being rejected if the coefficients are significantly different from zero. Rejection of the null hypothesis indicates an existence of a relationship between stock price and the underlying macroeconomic variable, or the weak-form of market efficiency. The concept of causality is based upon the prediction error with X_t to Granger-cause Y_t, if Y_t can be forecasted better using past values of Y and X than with Y alone. Granger causality testing allows (1) the testing of the theory which predicts the absence of causality from one variable to another, which

can be rejected if causality is found, (2) the specification testing of distributed lagged models, since the coefficients on future X are non-zero, then a one-sided Y on X regression is a poorly specified dynamic relationship, with attempts to correct serial correlation in estimating such a one-sided distributed lag, which more than likely to produce inconsistent estimates, and (3) the relationship to prediction, which is important in building good, small forecasting models.

Therefore, the empirical work begins by identifying the stochastic properties of the variables used in the study. The (ADF) and the Phillips and Perron (PP) unit root tests are used to test for the stationary of variables. The Johansen cointegration approach is used to investigate the long run relationship between stock market volatility, the macroeconomic variables and economic growth for Egyptian economy. If there are variables cointegrated, we will analyze the short run dynamic and interaction between stock market development and the other variables based on the vector error correction model (VECM) by Granger causality tests and the variance decomposition analysis (VDC).

3.6.8 Impulse Response Function and Variance Decomposition

In general, if there is more than one cointegrating equations in multivariate systems, the interpretation of individual coefficients in the error correction model would be difficult. The impulse response function is used to depict the adjustment dynamics among variables by indicating the dynamic response of one standard deviation shock variable to another variable.

In other words, impulse responses investigate the dynamic interaction between variables and it traces out the responsiveness of the dependent variables in the VAR to shocks to each of the variables. The impulse response function informs us of the sign and time path of the impact of one standard deviations shock (or some other chosen unit) on other variables in the system (Hamilton, 1994). Hence, for each variable from each equation separately, a unit shock is applied to the error, and the effects upon the VAR system over time are noted (Brooks, 2008).

$$Y_t = A_1 Y_{t-1} + \cdots + A_p Y_{t-p} + U_t$$

$$= \varphi(B) U_t = \sum_{i=0}^{\infty} \varphi_i \, U_{t-i} \tag{3.37}$$

$$I = \left(I - A_1 B - A_2 B - \cdots - A_p \varphi_p\right) \varphi(B) \tag{3.38}$$

$\varphi_{jk,i}$ represents the response of variable j to an unit impulse in variable k occurring *i-th* period ago. IRF are used to evaluate the effectiveness of a policy change, say increasing rediscount rate.

Variance decompositions analysis provides information about the dynamic behavior of the model and the relative importance of each random disturbances or innovation in the VAR. It also shows the proportion of the movements in the dependent variables that are due to their own shocks versus shocks to other variables.

For random variables Y and X

$$V[Y] = E_X\left[V_{(Y|X)}(Y|X)\right] + V_X\left[E_{(Y|X)}(Y|X)\right] \quad (3.39)$$

where $V[Y]$ denotes the unconditional variance of Y, $E_X[\cdot]$ denotes unconditional expectation with respect to the marginal cumulative distribution function (cdf) of X, $V_{Y|X}[Y|X]$ denotes the conditional variance of Y given X, $V_X[\cdot]$ denotes variance with respect to the unconditional distribution of X, and $E_{Y|X}[\cdot|X]$ denotes conditional expectation with respect to the conditional distribution of Y given X.

In other words, the unconditional variance of Y equals the sum of (1) the expected value (over X) of the conditional variance and (2) the variance (over X) of the conditional mean. A simple way to remember this, is to recognize that the unconditional variance equals EV plus VE

3.7 Wilcoxon Signed Rank Test

Having computed daily returns and volatility for Egyptian stock market, we test it over several intervals; five days, ten days, and three months before and after each crisis. We then test the null hypothesis that the volatility of each pair of data (before and after) is equals to unknown median (M) zero. Under the null hypothesis, these test statistics follow a student's t-distribution if the sample is normally distributed. Since most returns and volatility series are not normally distributed, we employ the non-parametric test: Wilcoxon signed rank test to determine if there is a significant difference between the return median before and after each interval.

Wilcoxon signed rank test may be used:

- For each observation, calculate the difference between the value and the hypothesized median.
- Rank values according to the distance from the median, dropping zero differences.
- The test statistic, W = the sum of the ranks of the positive differences (Salvator and Reagle, 2002).

If two groups come from the same distribution, but you've just randomly assigned labels to them, values in the two different groups should have values somewhat equally distributed between the two.

Group A: $X_1, \ldots, X_{n1} \sim F_A$,

Group B: $Y_1, \ldots, Y_{n2} \sim F_B$.

Null Hypothesis $H_0 : F_A = F_B$

The generic form of wilcoxon signed rank test can be shown as follow:

$$z = \frac{T - \frac{n-(n+1)}{n}}{\sqrt{\frac{n(n+1)(2n+1)}{24}}} \qquad (3.40)$$

where: n= the number of pairs of observations with a nonzero difference.

T_+= the sum of the positive ranks; if there is no positive rank T=0.

T_-= the sum of the negative ranks; if there is no negative rank T=0.

T= the smaller of T_+ and T_-.

3.8 Conclusion

Generally, this chapter looks at the basic concept of stock market volatility and its determinants. In addition, it also presents the methods used in analyzing the relationship between stock market volatility and economic growth in Egypt. The Johansen cointegration procedure will be applied to our model to answer the question of whether or not there is a long-run relationship between stock market development and economic growth, whether or not they are cointegrated.

CHAPTER 4

EMPIRICAL ANALYSIS AND RESULTS

4.1 Introduction

This chapter presents and analyzes the impact of stock market development and selected macroeconomic variables on economic growth in Egypt. Additionally, we examine whether the selected macroeconomic variables influence the stock market performance. We also investigate the impact of unforeseen events on Egyptian market's returns and volatility.

The data used in the study are described in section 4.2 introduces descriptive statistics for the variables. Section 4.4 provides an investigation of stationary of the variables using the Augmented Dickey-Fuller (ADF) and The Phillips-Perron (PP) tests. In addition we also consider structural break in the series to take into account the permanent effect caused by shocks. Section 4.6 provides the estimation of the long run relationship among variables by applying the Johansen cointegrating approach. Section 4.7 reports the next stage in the process of constructing the Error Correction Model which captures the behavior of the economic growth in the short run. After determining the relationship between stock prices and macroeconomic variables, each variable will be tested for the Granger (1969) causality test in section 4.8. Variance decomposition and impulse response results are given in section 4.9. Next, discussion on the effect of unforeseen events or crises on stock market performance is presented in section 4.10. In this section we examine the relationship between macroeconomic

volatility and stock returns volatility by applying the approach of Bansal et al. (2005) in measuring macroeconomic volatility. Moreover, we investigate the relationship between stock market index price and macroeconomic variables using generalized autoregressive conditional heteroskedasticity (GARCH). Also in this section 4.11 we examine the short term impact of crises on market volatility. This chapter is then concluded in section 4.12.

4.2 Data

Table 4.1 presents a summary of descriptive statistics of the variables, which include sample mean, standard deviation, skewness and kurtosis, Jarque-Bera statistics and *p*-value.

Except for GOV and DEV, the mean and the median of all the variables are close together. It indicates that the variables are normally distributed, which are symmetric about their means. In addition, the Jerque-Bera test also indicates the variables follow normal distribution. From the computed values of Jerque-Bera[1] for all the variables are less than the critical value = 9.21, at 1 percent significance level. Hence the null hypothesis of normality is not rejected for all the variables.

[1] The Jarque-Bera test is based on the result that a normal distribution random variable has skewness equal to zero and kurtosis equal to three. The Jarque-Bera test statistic is: $JB = \left[\frac{n}{6}skew^2 + \frac{n}{24}(kurt-3)^2\right]$, where skew denotes the sample skewness and kurt denotes the sample kurtosis. Under the null hypothesis that is normally distributed $JB \sim \chi^2$ (2). So the critical values at the 1%, 5%, and 10% levels are, respectively, 9.21, 5.99, and 4.61

As shown, data on GOV is close to non-normality. Nevertheless, the Jarque-Bera (JB) test is based on the classical measures of skewness and kurtosis. As these measures are based on moments of the data, this test has a zero breakdown value, which mean a single outlier can make the test worthless (Öztuna, et al., 2006). Hence, we can treat data on GOV as a normal distribution.

According to Maysami et al. (2004), the Johansen cointegration test is based on a full information maximum likelihood estimation model, which allows for testing cointegration in a whole system of equations in one step, without requiring a specific variable to be normalized (Maysami et al., 2004). Therefore, the inclusion of the non-normality variables such as GOV in the Johansen cointegration test is still valid in this study.

4.3 Multicollinearity

Multicollinearity is a statistical term for the existence of a high order of linear correlation amongst two or more explanatory variables in a regression model. In any practical context, the correlation between explanatory variables will be non-zero, although this will generally be relatively benign in the sense that a small degree of association between explanatory variables will almost always occur but will not cause too much loss of precision (Chris, 2008).

The presence of multicollinearity usually results in an overstatement of the standard error, i.e. the standard error tends to be large, leading to small "*t*" value and a high coefficient of determination. The usual procedure when

multicollinearity exists is to drop the offending variable or alternatively to drop the variable that provides lesser contribution towards model improvements. A simple procedure to determine which variable to drop is to calculate the correlation matrix. The correlation matrix on Table 4.2 represents the correlation coefficient for the variables used in this study.

On another hand, the VIF is the reciprocal of the tolerance (1/ Tolerance). Larger VIF values indicate a greater variance of the regression weight of the predictor. So if the VIF value is greater than 10, this indicates multicollinearity. The VIF and Tolerance are expressed as below:

$$VIF_J = \frac{1}{(1-R_J^2)} \tag{4.1a}$$

$$Tolerance = \frac{1}{VIF} \tag{4.1b}$$

where VIF_J is the variance inflation factor for the variable X_J, and R^2 is the coefficient of determination.

For the Egyptian data the highest Pearson correlation coefficient was 0.819 between stock market development and exchange rate. The second highest correlation coefficient was 0.767 between Egyptian gross domestic product and the interest rate. To ensure the robustness of our analysis on correlation among the variables, we further analyze the issue on multicolinearity using the tolerance and variance inflation factor (VIF) statistics. The tolerance values range from 0 to 1,

where value of 0.01 or less will indicate multicollinearity among variables. A tolerance close to 1 means there is a little multicollinearity, whereas value close to 0 suggests that multicollinearity may be a threat.

Thus, VIF indicates whether an independent variable is strongly correlated with other independent variable(s). In summary, the multicollinearity exists when the VIF is greater than 10, and the tolerance statistic is below 0.1. The result of the computed VIF for the series in this study is given in Table 4.2. All VIF are lower than 10 as evidence of the absence of multicollinearity between series in this study.

4.4 Unit Root Tests

In order to avoid spurious regression, we begin with an investigation of the properties of the time series that we are dealing with to determine if the variables are stationary or nonstationary in levels. The procedures used here are the augmented Dickey Fuller (ADF) and Phillip-Perron unit root tests for testing the stationarity of the time series.

4.4.1 Augmented Dickey Fuller and Phillip-Perron Tests

Using time series in econometrics analysis has introductory steps. First we should determine the form in which the series can be used for any subsequent estimation. Using macroeconomic series in level could lead to serious econometric problems. For instance, the use of non-stationary data can lead to spurious regressions. The time series data may contain a trend showing growth or decline

over time which must be removed prior to undertaking any estimation. Many macroeconomics time series variables are having such characteristic and difference stationary. The series are said to contain unit roots and nonstationary at level. A series is difference stationary or covariance stationary when it has the following three characteristics: (a) exhibits mean reversion in that fluctuates around a constant long run mean; (b) has a finite variance that is time invariant; and (c) has a theoretical correlogram (a scatter plot) that diminishes as the lag length increases (Asteriou and G., 2007).

If ordinary least squares (OLS) estimation techniques are applied to non-stationary series, the result will produce spurious regression. This renders any subsequent hypothesis tests unreliable.

In this study the augmented Dickey Fuller (ADF) (1981) and Phillip-Perron (PP) unit root tests are used to examine the stationarity of the time series used and the integration order of non-stationary time series.

Table 4.3 shows results of the unit root tests applied to the variables (*GOV, VOL, INT, GDP, INF, DEV, M2, EXCH*). The Table reports results for ADF and PP unit root tests based on a standard regression with constant, and with constant and time trend. The results showed that, the computed ADF tests statistic for all the variables are smaller than the critical values (in absolute values) at the 1%, 5% and 10% significance levels. Thus, we cannot reject the present of unit root in the variables (null hypothesis). We conclude that all variables in this study (*GOV,*

VOL, INT, GDP, INF, DEV, M2, EXCH) are nonstationary. However, the same null hypothesis for the first difference of all variables is overwhelmingly rejected. Therefore, we conclude that all the variables in this study have a unit root in the levels and are stationary in the first differences. Results show that all the variables are each integrated of order one or I(1). In other words, we find all series to be non-stationary in levels and stationary after first differencing.

4.4.2 Structural Shift and Unit Root Test

A unit root test which does not take account of the break in the series will have very low power. There is a similar loss of power if there has been a shift in the intercept (possibly in conjunction with a shift in the slope of the deterministic trend) (Assaf, 2008). Because if a series is stationary around a deterministic time trend which has undergone a permanent shift sometime during the period under consideration, failure to take account of this change in the slope will wrongly identify as a persistent innovation to a stochastic (non-stationary) trend by the usual Augmented Dickey-Fuller (Fuller, 1979) unit root test (Perron, 1989;Balke and Fomby, 1991). There is also similar loss of power if there has been a shift in the intercept (possibly in conjunction with a shift in the slope of the deterministic trend).

The results of the Saikkonen and Lütkepohl (2002) unit root test with one structural break are presented in Table 4.4, and in graphs in Appendix 2.

Table 4.4 includes the results of applying the unit root tests of Saikkonen and Lütkepohl (2002) with the three specified shifts functions *f1*, *f2* and *f3*. The *f1*, *f2* and *f3* represent a shift dummy variable, an exponential distribution function, and a rational function, respectively. In each case, the break date is estimated by a grid search instead of setting it a priori. We also considered a large number of lags (10 lags), but then looked at Akaike Information (1974), Hannan and Quinn (1979), and Schwarz (1978) criteria. We were able to determine the following lags for each series: 6 lags for DEV, 1 lag for EXCH, 8 lags for VOL and 5 lags for GDP,GOV, INF, INT and M2.

Saikkonen and Lütkepohl tests show that all eight series are non-stationary in levels despite the presence of structural breaks under the three forms of shift functions providing the exact level of a break. Thus, results from these unit root tests show that, despite the changes in the variables in break dates, the stochastic structure of the variables stayed the same, i.e. I(1).

In summary, both the standard unit root tests and the unit root allowing structure breaks tests indicate that all eight series are non stationary in levels and stationary after first differencing. Given these results, we proceed with the cointegration tests based on assumption that all variables contain a unit root.

4.5 Vector Autoregressive Model (VAR)

Vector autoregressive (VAR) models are widely used in forecasting and in analysis of the effects of structural shocks. A critical element in the specification of VAR models is the determination of the lag length of the VAR. The importance of lag length determination is demonstrated by Braun and Mittnik (1993) who show that estimates of a VAR whose lag length differs from the true lag length are inconsistent as are the impulse response functions and variance decompositions derived from the estimated VAR.

The results for various selection criteria are listed in Table 4.5. The Schwarz Bayesian criterion (SC), likelihood-ratio (LR), Final prediction error (FPE) and Hannan-Quinn information criterion (HQ) suggest a VAR of order two. Akaike information criterion (AIC) suggests a VAR of order four. Given the fact that the sample is relatively small (only 64 quarters) we cannot take the risk of over-parameterization if we select longer lags. Therefore, the model with 2 lags appears to be more appropriate for the small sample. Hurvich, Shumway, and Tsai (1990) argue that these statistics (AIC & SC) were based on tests without adjusting for the relatively small sample size. Moreover, models with fewer lags explained the data without loss of power.

In next section we apply the residual diagnostic tests of the unrestricted VAR specified in equation 4.2 for lags 1 through 2.

$$\Delta GDP_t = \alpha_t + \sum_{a=1}^{a} \gamma_{1i}\, GDP_{t-i} + \sum_{a=1}^{a} \varphi_{1i}\, INF_{t-i} \sum_{a=1}^{a} \theta_{1i}\, INT_{t-i} + \sum_{a=1}^{a} \varrho_{1i} M2_{t-i}$$

$$+ \sum_{a=1}^{a} \vartheta_{1i} GOV_{t-i} + \sum_{a=1}^{a} \tau_{1i}\, EXCH_{t-1} + \sum_{a=1}^{a} \delta_{1i}\, DEV_{t-1}$$

$$+ \sum_{a=1}^{a} \phi_{1i} VOL_{t-1} + \mu_t \qquad (4.2)$$

4.5.1 Heteroscedasticity

The efficiency of the VAR model is examined from residual analysis for autocorrelation and Heteroscedasticity. Heteroscedasticity (Table 4. 6) is examined by using White's test which is known as a general test for model specification.

In White test, the regression model of standard linear as below is estimated:

$$Y_t = \beta_1 + \beta_2 X_{2t} + \beta_3 X_{3t} + \mu_t \qquad (4.3)$$

The residuals from the estimation of the regression model, μ_t , are obtained and used for the auxiliary regression as in equation 4.4.

$$\hat{\mu}_t^2 = \alpha_1 + \alpha_2 X_{2t} + \alpha_3 X_{3t} + \alpha_4 X_{2t}^2 + \alpha_5 X_{3t}^2 + \alpha_6 X_{2t} X_{3t} + v_t \qquad (4.4)$$

The null hypothesis of homoscedasticity is that:

$$H_0 : \alpha_{1=} \alpha_2 = \cdots = \alpha_6 = 0$$

where α's are parameters excluded from auxiliary regression. While the alternative hypothesis is that at least one of the α's is different from zero.

From the Table 4.6 it is clear that there is no heteroscedasticity and the null hypothesis for homoscedasticity cannot be rejected because the p-value (0.1159) is greater than 0.05. Therefore the VAR model is not suffering from heteroscedasticity probelm and the model is satisfactory in terms of specification.

4.5.2 The Breusch-Godfrey LM Test for Autocorrelation

In addition, Lagrange Multiplier (LM) approach is employed to test for serial correlation. This test gives us a conclusive results and it is powerful when a lagged dependent variable is used. For this test, the null hypothesis is no autocorrelation. The results appear in Table 4.7 suggests that there is no autocorrelation in the residuals. Serial correlation or autocorrelation is not a problem in our model. The null hypothesis cannot be rejected due to the fact that the p-values are higher than 0.05 for a 95% confidence interval.

4.5.3 Stability Condition

The stability condition holds, if the roots of the reverse characteristic polynomial of the VAR process lie in or on the complex unit circle. As can be seen in Figure 4.1, all reported inverse roots of the AR polynomial have roots with modulus less than one and lie inside the unit circle, indicating that the estimated VAR is sTable (stationary). This is a very favorable result because if the VAR were not sTable, certain results, such as impulse response standard errors, would not be valid making the model results and conclusions suspect.

4.6 Cointegration and Error Correction Model

In this study, the long run relationships between stock market development and its volatility and the other macroeconomics variables is analyzed using Johansen cointegration analysis. Johansen cointegration test produce explicitly test for number of cointegration vectors by depending on maximum likelihood estimator.

The statistical test regarding the number of cointegration vector is presented in Table 4.8(a, b and c) for the three models: restricted intercepts and no trends, unrestricted intercepts and no trends and unrestricted intercepts and restricted trends respectively. The rank is dependent on the eigenvalue tests results, which implies that there are at least one cointegrating vector in both model 2 and model 3, but two cointegrating equation in model 4. So the results support the presence of one cointegrating vector that is stationary with the estimated and actual value fairly highly correlated. I interpret the vector as explaining real GDP and the cointegrating vector is normalized on GDP.

In summary, the λ_{max} and λ_{trace} statistics yield different results. In particular, the λ_{max} statistics tend suggest a smaller number of cointegrating vectors than the λ_{trace} statistics. As shown in Table 4.8a, under model 2 the null hypothesis of rank = 0 test is rejected at the 5 percent significance level by λ_{max}. This implies there may be one cointegrating vector. However, with λ_{trace} the null hypothesis of rank = 2 test is rejected which implies there may be three cointegarting vectors.

As for model with unrestricted intercepts and no trends (Table 4.8b), both of the λ_{max} and the λ_{trace} suggest one cointegrating vector. Finally, as for model with unrestricted intercepts and no trends (Table 4.8c), the results show that the λ_{max} statistic rejects the null hypothesis of rank = 1 suggesting there may be two cointegrating vector. while λ_{trace} statistic rejects the null hypothesis of rank = 2 which implies there may be three cointegarting vectors.

The results of these models are presented in Table 4.9. We collect the max eigenvalue statistics for all three models together to choose which model is appropriate by using Pantula principle. From the Table 4.9 for rank = 0, and under the Model 2 the eigenvalue statistics (57.60992) is greater than 5 percent critical value (47.07897), meaning we reject the null hypothesis of rank = 0. The next step is to move in the same row (r = 0) to Model 3, Here we also found that the eigenvalue statistics (57.2498) is greater than the critical value (46.231). With this result we continue to move to the last model, Model 4, which also produces the same result as previous models. The whole process is repeated on the second row with r =1 starting with Model 2. Under Model 2, the eigenvalue statistic (38.367) is smaller than 5 percent critical value (40.95680). The process ends at Model 2 and we conclude that Model 2 is the cointegration model in this study where the linear trend is not included in the cointegration space (no deterministic trend, restricted constant).

In this study the analysis on the cointegration relationship is based on the first cointegration vector. Dahalan (2003) states that the first cointegration vector corresponds to the largest eigenvalue and it is the most correlated with the stationary part of the model. From the previous tests (trace and eigenvalue) we found a cointegtating relationship between the variables at 1 percent significance level. This can be interpreted as defining the long-run for economic growth in Egypt. This cointegration relationship can be written as follow:

$$GDP = 5.527 - 0.031INF - 0.881INT + 0.029M2 - 0.0004GOV - 0.015VOL + 0.182DEV - 0.213EXCH \quad (4.5)$$

The results are statistically significant, and all variables have the correct sign. Moreover, according to equation (4.5), it appears that there is a long-run relationship between GDP, INF, INT, GOV, EXCH, DEV, VOL and M2. As seen from Table 4.10, the diagnostic tests fail to show that there is a significant serial correlation and heteroscedasticity (at 1 percent level). In addition, results indicate the presence of non-normal residuals. But the Johansen cointegration method is not affected when the errors are non-normal and still robust (Gonzalo, 1994).

We will compute the series of residuals from the long-run equilibrium relationship and test the resulting series for stationarity. As we can see from Figure 4.2, the residuals plot from long run equilibrium tends to be a stationary and it does not have a specific trend. This supports the residuals from the cointegrating vector is stationary. And Table 4.11 shows the summary tests for the presence of

unit root. Both of the ADF statistics (259.441) and the Phillip – Perron (PP) (322.002) are greater than the critical values (in absolute term). So we can reject the null hypothesis of unit root in the series of residuals even at 1% significance level which means that represents indeed a long run cointegration relationship between the specified variables. From the results of the cointegration test there is great evidence of the existence of cointegration relationship between the time series considered (GDP, INT, INF, M2, GOV, EXCH, VOL and DEV). This leads us to conclude that there is a cointegration between stock market development (and the other variables) and economic growth in Egypt.

In other words, an increase in money supply and the level of stock market development has a positive impact on the economic growth. Otherwise, an increase in inflation rate, government budget deficit, stock market volatility and the interest rate has a negative impact on the economic growth.

4.7 Vector Error Correction Model (VECM)

If the series are cointegrated, then the possibility of the estimated regression being spurious due to tribulations such as omitted variable bias, autocorrelation, and endogeneity is ruled out. Since our series are cointegrated, we can further proceed to determine the direction of causality, among the variables. For this purpose various vector error correction models can be specified. Observing the short-run properties of the series, by utilizing such models, may provide very useful insights especially for policy makers. Relying on the presence

of a cointegrating vector, the subsequent vector error correction model (VECM) can be written as follows:

$$\Delta LGDP_t = \mu_1 + \Psi_1 ECT_{t-1} + \sum_{j=1}^{j} \gamma_{1i}\, \Delta LGDP_{t-i} + \sum_{j=1}^{j} \varphi_{1i}\, \Delta LINF_{t-i} \sum_{j=1}^{j} \theta_{1i}\, \Delta LINT_{t-i} + \sum_{j=1}^{j} \varrho_{1i} \Delta LM2_{t-i} + \sum_{j=1}^{j} \vartheta_{1i} \Delta GOV_{t-i} + \sum_{j=1}^{j} \tau_{1i}\, \Delta EXCH_{t-1} + \sum_{j=1}^{j} \delta_{1i}\, \Delta DEV_{t-1} + \sum_{j=1}^{j} \phi_{1i} \Delta VOL_{t-1} + \varepsilon_t \quad (4.6)$$

where ECT_{t-1} is the error correction term obtained from the cointegration equation. Ψ, $\gamma, \varphi, \theta, \varrho, \vartheta, \tau, \delta,$ and ϕ are the estimated parameters, j is the lag length, and ε_t are stationary random shocks with zero mean and constant variance.

From the diagnostic tests in Table 4.12, the model seems sufficient and adequate. The results presented in Table 4.12 show that the ECT coefficients of equations (4.6) is significant and has negative signs implying that the series cannot drift too far apart and convergence is achieved in the long run. More specifically, ECT coefficient indicates that a deviation from the long run equilibrium value in one period is corrected in next period by the size of that coefficient. For equation (4.6) the correction is around eighteen percent (0.189443). Further, almost all adjustments take place within the same or following time periods, implying that

the system settles down quickly. The residuals from the error correction model are free from autocorrelation as well as misspecification problems.

In addition, the stability of the parameters of the model is examined using the plot of cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMSQ) of residuals. "The CUSUM test is used primarily with recursive residuals, because OLS residuals suffer from the constraint that the residuals finally sum to zero. The CUSUM is the estimated standard error of the recursive residuals times the summation of them. Thus, if there is any a structural change or mis-specification of the model, the residuals will show up to have same signs" (Nwaobi, 2001). In other words, the CUSUMSQ test is based on a plot of the ratio of the squares of the residuals of the test period against the squares of the residuals of the whole sample. Two lines are drawn above and below to provide a means of stressing the significance of departures. We reject the null hypothesis of no structural change, if either of the two lines is crossed and vice versa. The cumulative sum (CUSUM) of squares stability test fall inside the five percent critical lines indicating that the estimated model is sTable within the period of study (Nwaobi, 2001).

Figures 4.3a (CUSUM plot) and Figure 4.3b (CUCUMSQ plot) show the stability tests for the estimated dynamic economic growth equation. So from these graphical plots, we conclude that our equation is sTable throughout the period under analysis.

4.8 Granger Causality Tests Results

We say that X Granger causes Y if lagged values of X help to predict current and future values of Y better than just lagged values of Y alone. Hence Granger causality merely refers to a lead-lag relationship between variables, and it may be that both variables are actually 'caused' by a third variable that is not in the model. The issue of causality between a financial development and economic growth is by far theoretically controversial. In this study, the Granger causality test is used to determine the direction of causality between economic growth and stock market performance in Egypt. It is a testing whether economic growth precedes the stock market performance or the reverse. Or may happen at the same time "contemporaneous".

Table 4.13 present the short run causality test or Granger causality results from the error correction model among GDP, stock market development(DEV), inflation rate (INF), interest rate (INT), governmental surplus(deficit) (GOV), money supply (M2), exchange rate (EXCH), and volatility. The short run causality test can be conducted by applying the F-test of overall significance in the Wald test context to test the joint significance of the sum of the lags of each explanatory. The results show that four variables, namely, GOV, VOL, INT, and DEV are found to be the most important variables in determining the GDP. And also show that one variable, namely, EXCH is found to be the most important variable in determining DEV. The results also indicate that the stock market development

(DEV) does not Granger cause many macroeconomic variables (INF, INT, and VOL) except GDP and GOV in Egyptian economy in the sample period.

As shown in panel 2, Table 4.13 the stock market development appears to be Granger-caused by economic growth and vice versa. This means a unidirectional relationship from Egyptian stock market and economic growth. This result may push us toward adoption the supply-leading phenomenon which means that the Egyptian policy makers support development of financial institutions in order to stimulate economic growth. Financial development Granger causes economic growth either through increasing investment efficiency or more efficient allocation of investment funds or through affecting the national income through its influences on the aggregate propensities to consume, to save, and to invest (Friend, 1972).

4.9 Innovation Accounting Analysis

The analysis of dynamic interaction in the post sample period is investigated through innovation accounting analysis. This analysis comprises impulse response function (IRF) and variance decomposition (VDC).

4.9.1 Impulse Response Function

Impulse response functions enable us to analyze reactions of the whole system to shocks (structural or reduced form shocks). Although the cointegration analysis captures the long run relationship between variables, it cannot provide any information about the response of variables in the system to shocks or innovation

in other variables. The variance decomposition analysis allows us to determine the relative importance of each variable in generating fluctuations in other variables (Dahalan, 2003).

Therefore, to find how the economic growth in Egypt responds to shocks or innovation in other macroeconomic variables and stock market development in the post sample period we evaluate variance decomposition and impulse response based on vector error correction model (VECM).

From Figure 4.4 we observe that inflation seems to have an immediate negative effect on economic growth. This negative response begins from first quarter and continues after that in the same direction but it may have less impact in the long run. The results imply high rates of inflation have a significantly negative effect on growth, and these rates may exceed the critical values (Bruno and Easterly, 1998). The high rates of inflation may occur because Egypt depends on importing food products especially wheat with high density of population. Rising food and energy prices push consumer prices inflation up. Also this occurs aftermath of the floatation of Egyptian pound.

The response of economic growth to money supply is immediate but starts to be negative after eight quarters. This may support the previous result of the effect of inflation. The tight monetary policy in Egypt only has an effect on inflation rate (Moursi, 2007). In addition, interest rate shocks are associated with

relatively stronger real variation of output in shorter runs. The low interest rate does not encourage people to invest and this may hinder the economic growth.

From Figure 4.4 we also can observe that a shock in stock market or volatility in stock market decrease economic growth. This result support the Capasso (2006) claim that high levels of volatility can significantly affect the return to investment and economic growth. This occurs by several channels such as (a) volatility may cause instability of the financial system, (b) it discourage savings from risk averse individuals and (c) it cause misallocation of resources because prices do not correctly indicate return on investment.

From Figure 4.4 also we can observe that the expansion of the Egyptian stock market leads to economic growth (after 5 quarters period) and it plays a vital role for economic growth and it is necessary for achieving a high rate of economic growth (Change, 2002). Furthermore this result support supply-leading hypothesis (Patrick, 1966). The causal relationship moves from financial development to economic growth. This result supports Levine and Zervos (1998) study, they investigate that there is a linkage from stock markets and economic growth.

4.9.2 Variance Decomposition

From Table 4.14 we observe that the variations in GDP are mainly attributing to its own variations after four quarters accounting for over 87 percent, with INF and GOV explaining only about 2.7% and 4% respectively. After eight quarters; the variation in GDP due to innovations in its own reduced through to

end of 16 quarters. While the variation in GDP due to exchange rate, government deficit, stock market development and prices volatility increased accounting for 9%, 11% , 7% and 2% respectively. The most significant factor that explains the movement in economic growth remains the feedback from its own and the budget deficit. And stock market development remains a vital factor in the long run especially if we gather the volatility in stock market.

4.10 Macroeconomic Volatility and Stock Market Volatility

This section provides the analysis on macroeconomic volatility and the stock market volatility. We test whether the macroeconomic volatility captures the behavior of stock market volatility during the period from 1994 to 2008 as well as the explanatory power of macroeconomic volatility on stock market volatility. This is a crucial part in examining the response of Egyptian stock market volatility to some macroeconomic variables and selected crises.

The result of the regression is given as below:

$$\sigma_{CMAI,t} = \underset{(7.405)}{0.0152} + \underset{(3.405)}{0.432\,\sigma^{INF}} + \underset{(1.777)}{136.7\,\sigma^{INT}} + \underset{(3.193)}{1.602\,\sigma^{GOV}} - \underset{(-3.198)}{85.423\,\sigma^{GDP}} + \underset{(0.409)}{11.432\,\sigma^{M2}} + \underset{(4.306)}{226.176\,\sigma^{EXCH}} + \underset{(3.693)}{0.023\,D_{97}} + \underset{(18.190)}{0.012\,D_{01}} + \underset{(2.665)}{0.001\,D_{03}} \qquad (4.7)$$

Table 4.15 gives results of the regression output. Results shows that all variables are significant even at 5% level at least with the exception of money supply and interest rate coefficients. The insignificance of the money supply and interest rate illustrates the effect of taking into account small sample properties. Furthermore, this model has R^2 equal 74% as evidence to prove these variables individually account for a significant part of the variation in stock market volatility. Volatility of gross domestic product, exchange rate, government deficit, and inflation are related to stock market volatility. Hence, we can conclude that the Egyptian stock market volatility is more closely related to macroeconomic volatility.

In addition, it appears that the unforeseen events have affected the Egyptian stock market, and we observe that the events are highly significant and with expected positive sign. But the degree of this impact is different. Results show Luxor attack had the highest impact on stock market. This result may be due to exposure to many crises in years before and during 1997. These crises are:

- The first was Far East crisis of June 1997, which boosted imports from the affected far eastern countries and;
- The second shock was the sharp decline in the oil prices (1997-1999).
- The last shock was Luxor massacre November 1997, which negatively affected tourism.

This results show also that the Egyptian stock market sensitive to both international and local crises. This is may be due to that both types of crises (international and regional) affect all economy. The Egyptian stock market opened in 1991 and the participation ratio of foreign investors in equity market was a about (17%). So we can conclude that the response toward "outside" crises increase with the increases in the degree of integration with the international markets.

4.10.1 GARCH-M

In order to examine the impact of macroeconomic variables on stock prices, we use Generalized Autoregressive Conditional Heteroskedasticity (GARCH). The advantage of GARCH is that it does not assume that volatility and correlation is constant. And avoid over fitting. The conditional variance is changing, but the unconditional variance is constant. Lehar, Scheicher, and Schittenkopf, (2002) observe that the choice of the volatility model is crucial for achieving a satisfying pricing performance.

Estimation of the GARCH-M model with explanatory and dummies variables in the mean and variance regression gave the results shown in Table 4.16. To test the impact of macroeconomic variables on stock prices, we estimated model including variables in mean equation without inclusion unforeseen events in variance equation. The results presented in the first two columns of Table 4.16 show that where we can see that GDP, GOV, INF, INT are significant. So that we

can accept the hypothesis that the GDP, GOV, INF, INT variables affected directly to the Egyptian stock prices.

After the inclusion of the unforeseen events in the variance equation, the model is improved. And the dummy variables are significant and positive, indicating that the unforeseen events increase the variance of prices. And thus, the effect on stock prices comes from the unforeseen events that are included in variance equation, and from macroeconomic variables that are included in mean equation. The in mean term (*SQR(GARCH)*) is negative but insignificant.

The budget deficit has many channels to affect stock returns. For example, (1) an increase in expected future taxes to cover the spending shortfalls, (2) an increase in expected inflation due to expected debt monetization, (3) an expected increase in the interest rate as a result of an expected increase in government borrowing, (4) an increase in various risk premia associated with deficit induced market uncertainty (Darrat and Brocato,1994).

The idea that budget deficit place an upward pressure on interest rate is well established and, consequently, higher deficit may lead to higher interest rate and lower stock prices. Moreover, the effect of GDP releases on stock prices is difficult to predict in part because there are two potentially offsetting effects. Stronger than expected GDP growth implies potentially stronger dividend growth and higher stock prices, however, the accompanying inflation and interest rate concerns tend to have a negative effect on stock prices.

In addition the negative effect of the abroad event (September 11, 2001 attack shows that the stock price indices in the U.S might have a long impact on the stock price index of Egypt and this result supported by Marashdeh, (2005). According to Marashdeh , all stock markets in the MENA region are integrated with each other, but not with the developed countries, except for Egypt.

4.11 Wilcoxon Signed Rank Test

In this section, we examine whether the three of the unforeseen events have an impact on the behavior of the stock market returns. Additionally, to investigate the extent to which the effects of events are continuing. In order for doing this examination we will compare returns before and after each event.

Because the sample size is relatively small, and most returns and volatility series are not normally distributed, the non parametric tests are often used as counting technique for calculating both ordinal and quantitative data. We then test the null hypothesis that the median difference between pairs of observations (before and after each event occurs) is zero.

In addition Wilcoxon test designed for statistical analysis in which primary interest is centered on the location "median" of the population. We encounter two types of data for which such analysis are important; the first type represents pairs of "pretreatment" and the other type is "post treatment". Here we concern about the move of location (median) due to any unforeseen events that may affect the stock market return path (Hollander & Wolfe, 1973).

The advantages of Wilcoxon signed rank test are it neither depends on the form of the parent distribution nor on its parameters. In addition, the symmetric assumption does not assume normality and it does not require any assumptions about the shape of the distribution.

As seen from Table 4.17, there is a significant difference shortly after the crises or attacks (5 and 10 days). Regarding to Luxor terrorist attack the difference between stock returns ten days before the crisis date and ten days after it is statistically significant. However this effect vanished shortly after the attacks, over 3-month period after the attacks the stock returns exhibit no significant differences between before and after 3-month period.

On another hand, Iraq war is also significant for ten days and three months. And hence the impact of Iraq war on stock prices takes about three months to vanish. This might due to the long war period that affected the stock returns for long time. Also the large number of military came from many counties caused the fear that spreads to all countries in this region.

As seen from Table, the September 11 attack shows a significance changes after 5 days from the crisis (0.027), and vanish very shortly after 5 days period. That means the return behavior is not the same prior and after the crisis, but this effect does not remain for long time. This might be due to the investors inside Egyptian market believed that this attack occurred external and far from our borders.

The results prove that the behavior of returns and volatility are not the same before and after the event which tends to be not consistent with Nikkinen et al., (2007) who indicate that the stock returns in MENA (Middle East and North Africa) region tends to behave after September 11 similarly to its behavior before September 11 .

From the previous results we conclude that the Egyptian stock market is more sensitive to the "outside" crises than local ones. However, the market can deal efficiently with these crises because we can see the effect of crisis vanish after ten days of Luxor crisis, and after the first fifth days of September 11 attack. But in the case of Iraq war crisis the volatility behavior is continued for three months. This may due to, first, the long period of war and it is known that the tourism sector in Egypt is one of the important tributaries of the national income. And the crises led to a decline of Egyptian tourism revenues. Second, the high rate of unemployment, which is inherently high, whether as a result of business interruption in the tourism sector or as a result of the return of Egyptian workers in the Gulf for fear of a widening war. Directly more than 200 thousand worker came back to Egypt and this increased the pressure on the Egyptian economy.

In summary, although it appears that all the events have affected the Egyptian stock market's behavior, the degree of this impact is deferent. Although the differences are negatively significant in all cases, the response of Luxor attacks and Iraq invasion starts only after 10 days, and 5 days after September 11 attack. On another hand, the 11 September and Iraq invasion events had the highest

impact on Egyptian stock market, while the impact of Luxor attacks is minimal. We could then argue that the response of Egyptian stock market to international and regional events relates to the degree of integration with these markets.

4.12 Concluding Remarks

In this study we examined the relation between stock market development and economic growth in the case of Egypt. The cointegration analysis shows that there exist long-run relationship between the economic growth and its determinants. In our innovation accounting analysis, we can observe from the variance decomposition analysis that the gross domestic respond to innovations in stock market development, budget desicit, and the exchange rate. The result is also supported by results from impulse response function (IRF).

In linking stock market volatility to macroeconomic factors, the gross domestic product, budget deficit, interest rate, and the three crises individually account for a significant part of the variation in stock market volatility. In addition, volatility of inflation rate, money supply and exchange rate are insignificantly related to stock market volatility.

In addition, our empirical findings indicate that the impact of the three crises resulted in significant increase in volatility and stock returns experienced significant negative returns in the short-run (5 and 10 days) but recovered quickly afterwards except Iraq invasion.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter presents the conclusions and main recommendations for the whole study on the relationship between economic growth and Egyptian stock market development. This study stresses on the relationship between macroeconomic variables, especially gross domestic product, interest rate, inflation, money supply and government deficit, and the performance of stock market, as well as the causality between them. Moreover, this study attempts to identify the relationship between crises and unforeseen events, as well as the stock market volatility.

Section 5.2 summarizes the whole study on the relationship between macroeconomic variables and stock market volatility, and whether developing Egyptian stock market spurs economic growth or not. Section 5.3 gives a general overview of the achievement of this research. The objectives of this study are highlighted together with the results obtained from various estimations in order to provide general achievement of this research. Section 5.4 presents the implications that can be useful for policy makers. Section 5.5 provides general suggestions to various limitations of the study. Finally, section 5.6 concludes with recommendations for future research.

5.2 Summary

The study begins with testing all variables for stationarity. The augmented Dicky Fuller (ADF) and Phillips-Perron test (PP) were employed for testing unit root test. The ADF and PP suggest that all series are not stationary because all of them have unit roots. However, we rejected unit roots for the series of all variables in first difference. As a result, this indicates that all variables are integrated of order one, I (1).

Thereafter, the study employ Johansen Cointegrating approach to determine the relationship between economic growth and the stock market development as well as other macroeconomic variables (interest rate, money supply, inflation, exchange rate, and government budget deficit) for Egyptian economy. The results of the cointegration test show that there is evidence of the existence of cointegrating relationship between the time series considered (GDP, INT, INF, M2, GOV, EXCH, VOL, and DEV). This leads us to conclude that there is a cointegration between stock market development (and the other variables) and economic growth in Egypt. Using Granger causality test, this study clarify the impact of stock market on economic growth in Egypt. In addition, a negative relationship between stock market volatility and economic growth.

Moreover, this study aims to investigate the relationship between the volatility of macroeconomic variables and the volatility in stock returns. We investigated that volatility of gross domestic product; exchange rate, government deficit, and inflation are related to stock market volatility. Hence, we can conclude

that the Egyptian stock market volatility is more closely related to macroeconomic volatility. In addition, it appears that the unforeseen events have affected the Egyptian stock market volatility. But the degree of this impact is different.

In order to capture the effects of macroeconomic variables on Egyptian stock index prices, we used GARCH-M (1, 1). The result indicates that only the gross domestic product and exchange rate, inflation, and budget deficit and exchange rate are related with the stock market prices making them more volatile. On the other hand, inflation, interest rate and government budget deficit and money supply are negatively related with the performance of stock prices. Moreover, Luxor attacks, September 11, and Iraq war increase the volatility of stock market.

In the last part, the study examines the short term reaction of Egyptian stock market returns to three unforeseen events namely, Luxor attacks (1997), September 11 (2001), and Iraq invasion (2003). The results indicate that Egyptian stock market is more sensitive in both regional and global events than in local ones. However, stock prices experienced significant negative returns in the short term but recovered quickly afterwards.

5.3 Discussion

Equity markets play a vital role in spurring economic growth. There are many studies which examined the relationship between equity market and economic growth. However, there are theoretical disagreement among economists

about the importance and the impact of the stock market on economic growth. In addition, some empirical studies have examined this relationship and found positive impact on the economic growth; however, other studies investigated found negative impact.

We have argued that earlier studies do not include stock market development as a variable, which might have produced misleading results; as the omission of a relevant variable from a system might invalidate causality inference (Caporale et al. (2004)). The noTable finding of the study is that both the stock price and economic activity are integrated of order one, i.e. I (1). The Johansen-Juselius co-integration tests suggest the existence of one co-integrating vector. This rules out spurious relations and suggests the presence of at least one direction of causality. The Granger causality suggests that there is unidirectional causality between stock market development and economic activity during post-liberalization period, implying that a growth in economic activity could be enhanced by stock market. This result agrees with the supply-leading relationships which posit a causal relationship move from real economy to financial development. In addition, there is a negative relationship between stock market volatility and economic growth.

Using gross domestic product, inflation, interest rates, money supply, governmental deficit, exchange rate, volatility of stock returns, and stock market development index variables to appraise the impact of the stock market on the growth of the Egyptian economy, the results show that only money supply and

stock market development variables affect positively on the Egyptian economic growth.

The objectives of this study are achieved with the following results, obtained from the estimation of the economic growth model in Egypt in relation to the stock market development and some selected variables from 1993 to 2008.

5.3.1 Objective 1

To provide an empirical analysis of the uncertainty associated with Egyptian capital market returns in the context of economic growth, and the long-run nature of the relationship between stock market volatility and economic growth. Furthermore, to study the causal direction in this relationship between the Egyptian stock market development and economic growth.

Results

From previous studies, the stock market plays a vital role in supporting economic growth. Stock market might play this role via many channels. First, the positive role of liquidity provided by stock exchanges encourages the investors to invest in common stocks. This in turn motivates corporation to go to public when they need more finance. Second, stock market can diversify the global risks. Obstfeld (1994) argued that opportunities for risk reduction through global diversification make high-risk - high return domestic and international projects viable, consequently allocating savings between investment opportunities more efficiently.

In this study, the results of estimation showed that there is a long-run relationship between Egyptian stock market and economic growth. The error correction term coefficient of (-0.18944), (see Table 4.12), suggest that convergence towards equilibrium is rather fast. Thus, in the case of disequilibrium, these two variables (stock market development and gross domestic product) will adjust to the long-run equilibrium.

On the other hand, Granger causality test between stock market development and economic growth was applied. It shows that there is a unidirectional between stock market developments and economic growth. This results support the role of the Egyptian stock market as a source of investment financing in spurring economic growth.

Nevertheless, the development of the stock market in Egypt is needed to increase its participations in the economy. Consequently, more funds become available for companies to raise capital through the stock market. Additionally, the stock market changes sectoral investment shares among sectors; hence, the profiTable sectors attract more funds. Thereby, there is need for further development of the financial sector in order to make the economy more productive.

Moreover, the study investigated the negative relationship between the stock market volatility and the economic growth. Thus the investors' expectations

become more sensitive to economic variables and unforeseen events. Undesirable events prompt investors to outflow fund from market.

5.3.2 Objective 2

To investigate the relationship between stock market and macroeconomic volatility, and to investigate the relationship between stock market prices and six macroeconomic variables like gross domestic product, exchange rate, inflation rate, money supply, fiscal policy, and interest rate in the Egypt environment.

Results

In linking stock market volatility to macroeconomic volatility, the results show that volatility of gross domestic product, exchange rate, government deficit, and inflation are related to stock market volatility. Hence, we can conclude that the Egyptian stock market volatility is closely related to macroeconomic volatility, and it is sensitive for unforeseen events too.

The results of estimation show that the Egyptian stock prices are influenced by different macroeconomic factors and this is supported by Choudhry (1998), Omran and Pointon (2001), Maysami (2004) and Aydemir and Demirhan (2009) who studied various macroeconomics variables in influencing the stock prices in both developed and developing economies.

For money supply variable, there is a negative relationship between money supply and the performance of stock market. This result might depend on what is known as the "policy anticipation effect". In particular, market investors believe that the authorities will follow or adapt tight policy to sterilize the unexpected increases in money supply. And this, as a result, will lead to lower stock prices. These declines in prices may happen for two reasons: First, the expectation of higher rates will push the discount rate to rise. Second, expected cash flow will decrease if market investors believed that an increase in rates depress economic activity. As well, this may be because an increase in money supply would lead to inflation, and may also increase discount rates and therefore reduce stock prices (Fama, 1981).

Inflation rate in Egypt is negatively related to stock prices. The actual relationship between inflation rate and stock prices is an empirical question and the effect varies over time. Friedman (1973) reported that "historically, all possible combinations have occurred: inflation with and without development, no inflation with and without development". In fact, the inverse relationship between a higher inflation rate and lower common stock prices according to Feldstein (1980) resulted from basic features of US tax laws, particularly, historic cost depreciation and the taxation of nominal capital gains, or wealth-effect hypothesis. The results of many studies indicated that a negative relationship between the level of expected inflation and the expected real stock market returns. (Feldstein and

Summers, 1979; Feldstein, 1980b, 1982; Summers, 1981a,b; Pindyck, 1984; Fama, 1981; Dokko and Edelstein, 1987), and tax-effect hypothesis (Darby, 1975).

However, there are studies which have shown positive relationship between inflation and stock prices, and most of these studies are based on "Fisher effect" (Fisher, 1930). Fisher effect indicates that there is a positive relationship between inflation and stock prices. The expected rate of return on common stocks consists of a real return plus the expected rate of inflation. In theory, stocks should be inflation neutral, and there is a positive relationship between stock returns and anticipated inflation. Dulan (1948) concludes a positive relationship between stock returns and inflation. Cagan (1974) was able to find a positive relationship between common stock returns and inflation for several countries between 1939 and 1969. Choudhry (1998) studied the relationship between stock prices and inflation in four high inflation countries (Argentina, Chile, Mexico, and Venezuela) and found a positive relationship. This may refer to the role of stock markets in hedging against inflation.

Hess and Lee (1999) argue that the sign of the relation between stock prices and inflation depends on the cause of creating inflation. If inflation arose from money supply shock, it will lead to positive effect on stock prices. And this result is compatible with Omran and Pointon's (2001) study about Egyptian stock market which has employed cointegration analysis to investigate the effect of inflation on Egyptian stock market. Our results indicated that there is a negative relationship between inflation and stock market prices. The results revealed an

expected behavior for the stock market response to the decrease in the inflation rate, and the results regarding overall performance seem to be consistent with the literature review, which stated that there is an inverse relationship between the inflation rate and both stock returns and prices.

From our results, the interest rate has a significant negative relationship with stock prices. This negative relationship between interest rates and stock prices may due to two reasons: (1) interest rates may push down the level of corporate profits which in turn influence the price that investors are willing to pay for the stock through expectations of higher future dividends payment. Most companies finance their capital equipments and inventories through borrowings. A reduction in interest rates reduces the costs of borrowing, thus serves as an incentive for expansion. This will have a positive effect on future expected returns for the firm; (2) because the most amount of stocks are purchased with borrowed money, hence an increase in interest rates would make stock transactions more costly. Investors will require a higher rate of return before investing. This will reduce demand and lead to price depreciation (Maysami, 2004).

Moreover, this result may due to uncertain market viewpoint after increasing the interest rate as the policy makers attempted to rescue the falling market by lowering prime interest rate (Mok, 1993). Nevertheless, the relation between interest rate and stock prices is not direct and consistent. The reason is that the cash flow from stocks can change along with interest rate and we cannot

be certain weather this change in cash flow will augment or offset the change in interest rate.

Indicating to gross domestic product, the results show the positive and significant impact on stock prices. According to Fama (1981), he found that the growth rate of industrial production had a strong contemporaneous relation with stock returns. Fama (1990) hypothesized a similar positive relationship through the effects of industrial production on expected future cash flows. The productive capacity of an economy indeed depends directly on the accumulation of real assets, which in turn contributes to the ability of firms to generate cash flow. Chen, Roll and Ross' (1986) findings based on US stock portfolio, indicated that future growth in industrial production was a significant factor in explaining stock returns. Hence, suggesting a positive relationship between real economic activities and stock prices.

The result of relationship between exchange rate and stock prices in this study is negative and it is consistent with most of the empirical studies done. In recent years, the relationship between exchange rate and stock market prices has preoccupied the minds of economists because the exchange rate is an important indicator which affects the economic stability and the stock market performance as well. The exchange rate may affect the stock prices through two mechanisms: First, when interest rate rises, capital inflow increases and the exchange rate falls. Moreover, higher interest rate reduces the present value of future cash flows and stock prices will decline. Second, in regard to inflation, when inflation increases,

the exchange rate moves in the same direction because of investors' expectations, and also because they demand higher risk premium and high rate of return (Wu, 2000) (Aydemir & Demirhan, 2009).

As expected, the effect of governmental budget deficit on stock prices is negative as shown in our results. A large budget deficit implies either increases in future inflation or future tax. Budget deficit place an upward pressure on inflation and interest rate. Consequently, higher deficit may lead to lower stock prices.

In addition, large budget deficits imply increase in future tax, which may depress current consumption and reduce stock prices. There are many channels that the budget deficit affects stock prices. For example, (1) an increase in expected future taxes to cover the spending shortfalls, (2) an increase in expected inflation due to expected debt monetization, (3) an expected increase in the interest rate as a result of an expected increase in government borrowing, (4) an increase in various risk premia associated with deficit induced market uncertainty.

5.3.3 Objective 3

To examine whether the terrorist attacks led to a significant change in volatility in stock market. And investigate the short-term impact of unforeseen events on stock returns.

Results

As discussed in Chapter 4, we employed GARCH-M including unforeseen events in variance equation, and we obtain clear eveidence that all the three unforeseen events increase the volatility of stock prices. Moreover, the results of Wilcoxon signed rank test show clearly that in all three unforeseen events, the Egyptian stock market exhibited statistically significant increases in its volatility in the post events period. In order to investigate the impact of each event on stock prices, we employed the t-test (the Wilcoxon signed-rank test) to compare the returns (volatility) before and after each event.

When we compare returns and volatility before and after the three unforeseen events (Luxor terrorist attacks, September 11 and Iraq invasion) based on Wilcoxon signed rank test, there are significant differences in each event in terms of response of stock returns shortly after the event, and of this response no longer exist after the attacks (5 days, 10 days, and 3 months).

From the aforementioned results we conclude that returns and volatility behaviors are different prior to and after, the considered events.

In the September 11 attack, the Egyptian stock market responded quickly only after five days after the event. However, it vanished as quickly. This result is consistent with Hon, Strauss, and Yong (2004) who indicated that the stock markets responded more closely to the U.S stock market after September 11 attacks.

The same goes with the other two events where the stock prices responded after ten days. In local events however, it vanished shortly after that. Iraq invasion recorded the longest affect which was up to three months. The implication here is that Iraq invasion has a major effect on Egyptian stock market compared with the other two events.

5.4 Policy Implications

As highlighted before, the analysis of stock market development in relation with economic growth, and analyze the determinants stock prices in Egyptian economy is believed to benefits the policy makers, economics researchers and investors. From the policy maker point of view, it is believed that the study will be able to provide valuable information in helping them to implement optimal policies.

The positive long run relationship between the stock market development and economic growth stimulate to develop stock market development to meet the need of entrepreneurs. This development can encourage private sector-led growth and sustainable development.

Policy makers should recognize the relationship between macroeconomic variables and stock market performance. The results of this study show that there is a relationship between macroeconomic variables and the Egyptian stock market, which means that the investors can use this information to predict movements in the market prices. According to Fama (1970), in an efficient market, past

information is of no use in predicting future prices and the market reacts only to new information.

On the other hand, if the stock market is efficient, it would have already incorporated all the current and anticipated changes in macroeconomic variables. Consequently, there is no relationship between changes in macroeconomic variables and stock prices.

In case of the Egyptian stock market, it is not informational efficient, and these macroeconomic variables could be used to predict movements in the stock market prices. The possible reason for this informational inefficient is the availability of data, and the lack of developing information technology. In order to maintain the efficiency of Egyptian stock market, it is important to implement certain policy, such as: (a) the stock market authority may develop ways to make information available to market investors. Consequently, the stock prices may reflect the condition of the economy at the time. (b) it should remove obstacles faced by foreign investors to access Egyptian stock market. (c) Policy makers must consider the changes in stock prices as a factor of monetary policy. However, they do not give the appropriate attention to budget deficit in Egypt, even though it is a dominant variable. There is a channel through which the fiscal policy can affect the volatility of stock prices.

Another issue with Egyptian economy is that it is characterized by persistency and the largeness of the government's budget deficit, which leads to

negative impact on savings, investment and exports. This deficit can be seen as a direct transfer from now to future generations, thus reducing consumption in the future. In most cases, in order to close the budget gap, the financial authorities finance this gap from inflationary finance sources. Additionally, the new emission of money was mostly utilized to finance the deficit. A large fiscal deficit encourages financial institutions to invest predominantly in risk and tax free government securities.

The budget deficit in Egypt due to the fact that the rate of Egypt's gross savings as a percentage of GDP is lower than that of other emerging economies such as Malaysia, Korea, India, and Indonesia as reported in Table 5.1.

Moreover, a little savings in Egypt is channeled to the real productive private sector and is mainly used to finance government deficit.

In summary, the Egyptian reformative efforts should focus on lowering the fiscal deficit and public borrowing that has a critical role to play in ensuring a sTable macroeconomic environment.

Finally, it appears that the events affected Egyptian stock markets are differently impacted. The impact ranges from high (Iraq invasion war) to low (Luxor attacks). This impact may depend on the level of integration with international economy. So, it may have been that, the Egyptian stock market is highly integrating with the other region's markets, but does not fully integrated with international markets.

Consequently, it is important for policy makers to maintain stability in all the Middle East region, and work to avoid war and consolidate the integration among its markets.

5.5 Limitation of the Study

This study focused on examining the relationship between stock market development and economic growth, and estimation of volatility in Egyptian stock market and its macroeconomics determinants. No estimation is done on investment, and savings. Hence, it might be useful to further analyze the implications of Egyptian market performance on capital structure and investment, and also on the impact of stock market on savings.

Besides that, due to the limited access of data, the study only manages a range from year 1993 to year 2008. Furthermore, comparative study with other countries is important to achieve generalization.

5.6 Recommendation for Further Research

This study provides much-needed analysis of the relationship between macroeconomic variables and the performance of stock market in Egypt. Moreover, it studies the variables that affect the volatility of stock prices. However, it seems that there remains plenty of research to be done in this area.

There is a need to include other variables not included in this study. It is also important to study if the results hold true for other developing countries as well. There is also a need to study the relationship between the Egyptian stock

market and the international markets, especially markets in the region to assess the level of interaction and integration across the markets.

One might further investigate the impact of liberalization process on stock market development. In this case, it can include trade liberalization, fiscal and monetary reforms and globalization. Future study may also consider to include other financial intermediaries to asses and examine the complementary and substitutability between financial intermediaries and stock market and its contribution to development.

TABLES

Table 1.1 Financial Development and Real Per Capita Growth (1970-2000)

Growth Quartile	Average Annual Growth	Financial Development, Private Credit[1] (%)	Financial Development, Liquid Liabilities (%)	Initial Income per Capita[1]	Final Income per Capita[1]
Q1	-0.90	0.15	0.60	1215.8	1042.3
Q2	1.16	1.04	1.63	4585.2	6544.1
Q3	2.07	1.90	1.20	8987.3	16444.1
Q4	3.33	3.28	2.24	6221.5	15090.3
Average	*1.41*	*1.59*	*1.42*	*5252.4*	*9780.2*
Number of countries		*72*			

[1] Real GDP per capita, constant US$

Table 1.2 The Impact of Changes in Expected Benefits and Risk on Stock Prices

	Expected Benefits Change	Risk Change	Common Stock Price Change
1	Increase	Unchanged	Increase
2	Increase	Decrease	Increase Significantly
3	Unchanged	Decrease	Increase
4	Unchanged	Increase	Decrease
5	Unchanged	Unchanged	Unchanged
6	Decrease	Unchanged	Decrease Significantly
7	Decrease	Increase	Decrease
8	Increase	Increase	?
8a	Increase greater than	Increase	Increase
8b	Increase less than	Increase	Decrease
8c	Increase equal to	Increase	Unchanged
9	Decrease	Decrease	?
9a	Decrease greater than	Decrease	Decrease
9b	Decrease less than	Decrease	Increase
9c	Decrease equal to	Decrease	Unchanged

Note: Source from Steven E. Bolten. (2000), Stock market cycles: a practical explanation. Library of Congress Cataloging-in-Publication Data. p.4.

Table 1.3 Main Economic Indicators (2005/2006-2007/2008)

Indicators	2005/06	2006/07	2007/08
GDP growth rate (%)	6.8	7.1	7.2
FDI (US$ billion)	6.1	11.1	13.2
Inflation (%)	12.1	6.9	18.3
Exchange rate (%)	5.7	5.52	5.51
Budget Deficit(% of GDP)	8.2	7.3	6.8
Net International Reserves (US$ billion)	26.05	31.7	34.1
Balance of Payment Surplus (US$ billion)	3.3	5.3	5.4

Note: Source from Central Bank of Egypt and Ministry of Finance.

Table 1.4 Main Market Indicators for the Period 1991 – June 2001

Indicators	03	04	05	06	07	08
Total Volume Traded (Billion)	1.4	2.4	5.3	9.3	15.1	25.5
Volume Traded (Listed Securities)	1.2	1.8	4.2	7.8	11.4	21.9
Volume Traded (Unlisted Securities)	0.2	0.6	1.1	1.3	3.7	3.6
Total Value Traded (LE Billion)	27.8	42.3	160.6	287.0	363.0	529.6
Value Traded (Listed Securities)	23.0	36.1	150.9	271.1	321.5	475.9
Value Traded (Unlisted Securities)	4.8	6.2	9.7	15.9	41.5	53.7
Total Number of Transactions (Million)	1.2	1.8	4.2	6.8	9.0	13.5
Number of Transactions (Listed Securities)	1.2	1.7	4.0	6.6	8.7	12.8
Number of Transactions (Unlisted Securities)	0.02	0.1	0.2	0.2	0.3	0.7
Average Monthly Value Traded (LE Billion)	2.3	3.5	13.4	23.9	30.3	33.7
Average Monthly Value *Traded (Listed Securities)*	1.9	3.0	12.6	22.6	26.8	29.2*
Average Monthly Value Traded *(Unlisted Securities)*	0.4	0.5	0.8	1.3	3.5	4.5
Turnover Ratio (%)	11.5	14.2	31.1	48.7	38.7	70.3*
Foreign Participation as a % of Value Traded	12.7	20.5	16.4	16.6	19.2	20.0
Arab Participation as a % of Total Value Traded	7.8	7.0	13.9	13.6	12.5	10.0
Number of Trading Days	244	249	249	244	244	244
2. Listed Companies						
Number of Listed Companies	978	795	744	595	435	373
Average Company Size (LE Million)	176	294	613	897	1766	1259
Number of Traded Companies	540	503	441	407	337	322
Traded Companies as a % of No. of Listed Co.	55	63	59	68	77	86
Market Capitalization End of Year (LE Billion)	172	234	456	534	768	474
Market Capitalization as a % of GDP	35	43	74	72	86	53

Note: Source from the Egyptian Exchange yearbook, 2008.

Table1.5 Compare between Emerging Stock Markets

Rank	S & P / IFCG		S&P/IFCI		MSCI	
	Emerging markets	Changes %	Emerging markets	Changes %	Emerging markets	Changes %
1	Egypt	155.9	Egypt	158.8	Egypt	155.23
2	Jordan	117.8	Russia	64.9	Columbia	102.31
3	Saudi Arabia	111.0	Korea	58.8	Jordan	71.72
4	Columbia	108.1	Turkey	49.5	Russia	69.50
5	Russia	82.0	Brazil	47.6	Argentina	59.68
6	Pakistan	58.5	Argentina	45.4	Pakistan	56.50
7	Korea	56.8	Mexico	43.9	Korea	54.28
8	Turkey	50.9	Czech	43.5	Turkey	51.60
9	Brazil	50.0	India	33.6	Brazil	49.96
10	Argentina	44.1	Peru	29.8	Mexico	45.22
12	Czech	43.5	Israel	24.1	India	35.38
13	Oman	38.0	Philippine	21.3	Sri lanka	30.70
14	Zimbabwe	36.6	Poland	20.8	Peru	28.51
15	India	33.3	Hungary	16.1	Israel	25.03
16	Sri lanka	29.3	Chile	14.7	South Africa	24.03
17	Philippine	25.5	China	13.3	Poland	20.99
18	South Africa	24.7	Indonesia	9.1	Philippine	19.94
19	Peru	24.1	Morocco	8.4	Chile	18.39
20	Israel	23.9	Taiwan	4.9	China	15.93
21	Bahrain	20.8	Thailand	3.8	Hungary	15.6
22	Poland	20.7	Malaysia	-2.9	Indonesia	12.56
23	Nigeria	20.7			Morocco	8.69
24	Hungary	15.7			Thailand	4.85
25	Chile	14.4			Taiwan	3.28
26	Indonesia	9.8			Malaysia	1.5
27	Morocco	8.6			Venezuela	-28.9
28	China	4.9				
29	Taiwan	4.6				
30	Thailand	1.6				
31	Malaysia	-3.0				
32	Venezuela	-22.0				

Note :Source from Cairo and Alexandria stock exchanges report, 2005

Table 3.1 Variables and Source of Data

Variable	concept	Description	Units	Source
GDP	Gross Domestic Product	Annual values of domestic product	Millions of National Currency (Bounds)	Ministry of Economic Development
INF	Inflation	A rise in general prices	Percentage per annum	Central Agency for Public Mobilization And Statistics
M2	Money Supply	money supply (m1).and quasi-money	Millions of National Currency (Bounds)	The Central Bank of Egypt
MCAP	Market Capitalization	Number of listed shares X market price end of year	Millions of National Currency (Bounds)	the Egyptian Financial Supervisory Authority
TRVAL	Traded Value	Annual Value of Traded Securities	Millions of National Currency (Bounds	the Egyptian Financial Supervisory Authority
TRVOL	Trading Volume	Annual trading volume of listed securities	Million Securities	the Egyptian Financial Supervisory Authority
INT	Interest Rate	Interest rate on treasury bills (91 Days	Percentage per annum	The Central Bank of Egypt
Gov	A Government budget	Annual values of surplus (deficit)	Millions of National Currency (Bounds	Ministry of Economic Development
TR	Turnover Ratio	Traded Value of Listed Securities /End of Year Market Capitalization	Percentage per annum	Ministry of Economic Development
CMAI	Capital Market Authority Index	The index includes all listed stocks weighted in relation to their market capitalization	Daily points	• The Egyptian Financial Supervisory Authority (EFSA)(1994-2000) • Data stream (2001-2008)
EXCH	Exchange Rate	National Currency per US Dollar	Quarterly data	IFS-IMF CD.

Table 4.1 Descriptive Statistics

	DEV	GOV	GDP	INF	INT	M2	VOL	EXCH
Mean	-0.042344	-165.5781	4.859494	0.170296	0.396151	0.575998	0.323953	1.483643
Median	-0.159714	711.4688	4.848223	0.181150	0.362563	0.568524	0.306250	1.502965
Maximum	1.587939	2351.219	5.280176	0.609127	0.665478	0.684404	0.991797	1.829376
Minimum	-1.006011	-9431.891	4.491688	-0.245079	0.215778	0.502093	-0.101953	1.217876
Std. Dev.	0.717841	2781.126	0.208234	0.269940	0.105040	0.052855	0.247016	0.249929
Skewness	0.746070	-0.928090	0.135710	-0.004169	0.795212	0.964657	0.726948	0.083323
Kurtosis	2.748093	3.043591	2.229715	1.662590	3.445927	1.928168	3.376636	1.196589
Jarque-Bera	6.106504	9.189289	1.778687	4.769961	7.275463	6.642417	6.015121	8.746745
Probability	0.472051	0.214723	0.810925	0.720912	0.326312	0.403115	0.494121	0.012609
Sum	-2.710000	-10597.00	311.0076	10.89896	25.35365	36.86390	20.73300	94.95316
Sum Sq. Dev.	32.46363	4.87E+08	2.731776	4.590664	0.695105	0.176001	3.844053	3.935262
Observations	64	64	64	64	64	64	64	64

Table 4.2 Correlation Matrix

	GOV	VOL	INT	GDP	INF	DEV	M2	EXCH
GOV	1.000							
VOL	.245 (1.3245)	1.000						
INT	.243 (1.32100)	.205 (1.25786)	1.000					
GDP	-.605 (2.5316)	-.311 (1.45137)	-.767 (4.29184)	1.000				
INF	-.124 (1.14155)	.230 (1.29870)	.598 (2.48756)	-.277 (1.38312)	1.000			
DEV	-.227 (1.29366)	-.432 (1.76056)	-.395 (1.65289)	.726 (3.64963)	-.210 (1.26582)	1.000		
M2	-.121 (1.13765)	.052 (1.05485)	.742 (3.87596)	-.447 (1.80831)	.552 (2.23214)	-.278 (1.38504)	1.000	
EXCH	-.497 (1.98807)	-.585 (2.40963)	-.548 (2.21238)	.802 (5.05050)	-.394 (1.65016)	.819 (1.65016)	-.197 (1.24533)	1.000

Note: (*)Variance-inflation factor (VIF) values are within parentheses.

Table 4.3 Augmented Dickey-Fuller and Phillips-Perron Tests Results

	ADF			PP	
	Model1 $t\alpha^*$	Model 2 $t\tilde{\alpha}$	Model 3	Model 1 $t\alpha^*$	Model 2 $t\tilde{\alpha}$
Unit root tests at levels Variables	Constant	Constant *and* trend	None	Constant	Constant and trend
GOV	-0.0573	-1.6208	-0.8360	-1.6624	-2.4952
VOL	-1.9465	-2.4893	-0.9705	-2.3153	-2.4391
INT	-2.5831	-2.6470	-1.4869	-2.2387	-2.3289
GDP	0.2500	-1.8083	2.6014	-0.0189	-2.1282
INF	-1.7260	-1.2860	-1.5461	-1.8558	-1.4959
DEV	-1.2408	-1.9360	-1.2387	-1.5772	-2.0727
M2	-5.0331*	-6.6966*	-0.7933	-1.9081	-1.4699
EXCH	-0.68244	-1.06844	1.59911	-0.7837	-1.3697

	ADF			PP	
	Model 1 $t\alpha^*$	Model 2 $t\tilde{\alpha}$	Model 3	Model1 $t\alpha^*$	Model 2 $t\tilde{\alpha}$
Unit root tests of first difference Variables	Constant	Constant and trend	None	Constant	Constant and trend
GOV	-2.8769*	-3.3390*	-.7518***	-5.0799***	-3.079***
VOL	-2.3667	-2.3280	-2.3958**	-4.6233***	-4.588***
INT	-2.9192**	-3.0385	-.7690***	-4.6639***	-4.711***
GDP	-3.2358**	-3.2573*	-1.8470*	-5.0520***	-5.035***
INF	-2.9490**	-3.2750**	-.9774***	-4.5756***	-4.662***
DEV	-3.8283***	-3.8556**	-.6831***	-3.0799***	-3.079***
M2	-2.0819	-2.5280	-2.0176**	-3.5145***	-3.727***
EXCH	-6.0044***	-5.9587***	-.8262***	-6.0046***	-5.959***
Critical values:					
1%	-3.51	-4.06	-2.6		
5%	-2.89	-3.45	-1.95		
10%	-2.58	-3.15	-1.61		

Note:(***), (**), and (*) significant at 1%, 5% and 10 % respectively. The optimal lag length for each of autoregressive process of ADF tests is determined by Schwarz. Information Criterion (SIC). For PP test the lag truncations for the Bartlett kernel were chosen according to the Newey and West, 1987.

Table 4.4 Unit Root Tests Allowing for Break

variables	Test statistics			Break date
	F1	F2	F3	
DEV	-1.4203	-1.4149	-3. 3993	2003:Q1
EXCH	-1.1129	-1.3225	-1.3730	2002:Q1
GDP	-0.4581	-0.5687	-0.5260	2004:Q1
GOV	-2.2330	-2.3644	-2.1892	1994:Q2
INF	-1.6772	-1.273	-1.4780	2006:Q1
INT	-2.1913	-3.2440**	-2.1648	2008:Q1
M2	-1.7732	-2.2644	-2.0897	1996:Q1
VOL	-3.4346**	-1.9890	-1.6988	2001:Q1

Notes: Critical values based on Lanne et al., (2002). They are as follows: −3.48, −2.88, and −2.58 for 1%, 5% and 10%, significance levels, respectively. The shift dates are estimated by minimizing the objective function.

Table 4.5 Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-380.4121	NA	0.000957	12.91374	13.15808	13.00931
1	175.1697	963.0084	4.49e-11	-3.97232	-1.69713	-3.20773
2	265.8669	136.0457*	1.19e-11*	-5.36223	-2.01760*	-3.92861*
3	316.4159	64.02882	1.35e-11	-5.41387	-0.03838	-3.31122
4	373.9031	59.40338	1.47e-11	-5.69677*	1.38910	-2.92510

Note: (*) indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 4.6 VAR Residual Heteroscedasticity Joint Test

CHI-SQ	df	prob
1026.97	1152	.1159

Table 4.7 VAR Residual Serial Correlation (LM)

lags	*LM-stat*	*prob*
1	40.05262	0.2950
2	46.71516	0.1089
3	25.36698	0.9070
4	27.66698	0.8322
5	43.53254	0.1815
6	15.21677	0.9991
7	16.61430	0.9975

Table 4.8a Johansen and Juselius Cointegration Test Results(Model2)

Hypothesis		eigenvalue	Test statistics		Critical value 5%	
H_0	H_1		λ_{max}	λ_{trace}	λ_{max}	λ_{trace}
r=0	r>0	0.611097	57.60992*	165.4077*	47.07897	134.6780
r=1	r>1	0.457062	37.25639	107.7978*	40.95680	103.8473
r=2	r>2	0.351859	26.45251	70.54140	34.80587	76.97277
r=3	r>3	0.227050	15.70999	44.08890	28.588 8	54.07904
r=4	r>4	0.195329	13.25666	28.37890	22.29962	35.19275
r=5	r>5	0.148237	9.787242	15.12224	15.89210	20.26184
r=6	r>6	0.083744	5.335001	5.335001	9.164546	9.16454

Note: (*) denotes rejection of the hypothesis at the 5% level. The Critical values are from MacKinnon -Haug-Michelis (1999) p- values

Table 4.8b Johansen and Juselius Cointegration Test Results (Model3)

Hypothesis		eigenvalue	Test statistics		Critical value 5%	
H_0	H_1		λ_{max}	λ_{trace}	λ_{max}	λ_{trace}
r=0	r>0	0.60879	57.24975*	151.45599*	46.23141	125.61543
r=1	r>1	0.45270	36.76886	94.20624	40.07757	95.75366
r=2	r>2	0.34766	26.05886	57.43737	33.87684	69.81888
r=3	r>3	0.21270	14.58862	31.37850	27.58439	47.85612
r=4	r>4	0.16160	10.75196	16.78988	21.13161	29.79707
r=5	r>5	0.08992	5.74752	6.037911	14.26467	15.49471
r=6	r>6	0.00474	0.29032	0.29032	3.84146	3.84146

Table 4. 8c Johansen and Juselius Cointegration Test Results (Model 4)

Hypothesis		eigenvalue	Test statistics		Critical value 5%	
H_0	H_1		λ_{max}	λ_{trace}	λ_{max}	λ_{trace}
r=0	r>0	0.648071	63.70387*	209.3080*	50.59985	150.5585
r=1	r>1	0.587567	54.02655*	145.6041*	44.49720	117.7082
r=2	r>2	0.449592	36.42284	91.57758*	38.33101	88.80380
r=3	r>3	0.340027	25.34890	55.15474	32.11832	63.87610
r=4	r>4	0.212669	14.58847	29.80585	25.82321	42.91525
r=5	r>5	0.144952	9.552437	15.22037	19.38704	25.87211
r=6	r>6	0.088731	5.667973	5.667973	12.51798	12.51798

Note: (*) denotes rejection of the hypothesis at the 5% level. The Critical values are from MacKinnon -Haug-Michelis (1999) p- values

Table 4.9 The Pantula Principle Test Results

r	Model 2		Model 3		Model 4	
	λ_{max}	Critical value 5%	λ_{max}	Critical value 5%	λ_{max}	Critical value 5%
0	57.60992	47.07897	57.24975	46.23142	63.70387	50.59985
1	37.25639*	40.95680	36.76886	40.07757	54.02655	44.49720
2	26.45251	34.80587	26.05886	33.87684	36.42284	38.33101

Note:(*) indicates the first time that the null hypothesis cannot be rejected.

Table 4.10 Normalized Cointegration Coefficients

GDP	INF	INT	M2	GOV	VOL	DEV	EXCH	C
1.00	0.031	0.8815	-0.0288	0.0004	0.01459	-0.1815	0.2131	-5.5273
	0.015)	(0.1313)	(0.0169)	(0.00002)	(0.0375)	(0.0187)	(0.077)	(0.1305)
	Diagnostic statistics:							
	Autocorrelation LM(1): CHISQ (64) = 80.49 (0.149)							
	Normality (Jarque - Bera): CHISQ (16) = 123.46 (0.003)							
	White Hetero: CHISQ (1169) = 1224.884 (0.8667)							

Note: Standard errors in parentheses.

Table 4.11 Unit Root Test for Residual

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-10.9181	0.0000	8	463
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-17.5889	0.0000	8	463
ADF - Fisher Chi-square	259.441	0.0000	8	463
PP - Fisher Chi-square	322.002	0.0000	8	488

Note: (**) Probabilities for Fisher tests are computed using an asymptotic Chi square distribution. All other tests assume asymptotic normality.

Table 4.12 Estimation of Error Correction Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT	-0.189443	0.082051	-2.308836	0.0257
D(GDP(-1))	0.520464	0.217342	2.394673	0.0210
D(GDP(-2))	0.324957	0.212545	1.528889	0.1334
D(INF(-1))	-0.059495	0.071428	-0.832937	0.4094
D(INF(-2))	-0.050239	0.066193	-0.758974	0.4519
D(INT(-1))	0.139691	0.212605	0.657044	0.5146
D(INT(-2))	0.079750	0.234212	0.340503	0.7351
D(GOV(-1))	1.38E-06	4.84E-06	0.285080	0.7769
D(GOV(-2))	1.98E-06	6.01E-06	0.329932	0.7430
D(DEV(-1))	-0.055647	0.045145	-1.232626	0.2243
D(DEV(-2))	0.050998	0.059290	0.860142	0.3944
D(EXCH(-1))	0.037016	0.084689	0.437076	0.6642
D(EXCH(-2))	-0.050499	0.102808	-0.491194	0.6257
D(VOL(-1))	-0.021329	0.034174	-0.624136	0.5358
D(VOL(-2))	-0.005549	0.032742	-0.169488	0.8662
D(M2(-1))	-0.113992	0.517342	-0.220342	0.8266
D(M2(-2))	-0.108382	0.509974	-0.212524	0.8327

R-squared	0.720311	Mean dependent var	0.012406
Adjusted R-squared	0.632908	S.D. dependent var	0.020841
S.E. of regression	0.019645	Akaike info criterion	-4.791279
Sum squared resid	0.016981	Schwarz criterion	-4.203003
Log likelihood	163.1340	Durbin-Watson stat	2.069353

Table 4.13 The Granger-causality Test Results

Variables	GDP	INF	INT	M2	EXCH	GOV	VOL	DEV
GDP	-	-	37.03***	-	-	11.08**	13.27**	13.02**
INF	15.52***	-	-	4.05*	8.86**	7.84**	-	-
INT	-	11.57**	-	10.16**	-	8.59*	-	-
M2	-	-	-	-	-	-	-	-
EXCH	-	-	14.06**		-	-	31.76***	11.04**
GOV	-	-	-	-	-	-	-	9.62**
VOL	-	-	-	-	5.31*	-	-	-
DEV	-	-	-	-	8.48*	-	-	-

Bidirectional or Feedback relationships	unidirectional relationships
DEV ⟷ EXCH	DEV → GDP
VOL ⟷ EXCH	GOV → GDP
	VOL → GDP
	INT → GDP
	INT → EXCH
	GDP → INF
	GOV → INF
	EXCH → INF
	M2 → INF
	GOV → INT
	INF → INT
	M2 → INT

Note: (***),(**) and (*) indicate signifivant at 1%, 5% and 10% levels, respectively.

Table 4.14 Variance Decomposition of GDP

Period	GDP	INT	INF	M2	EXCH	GOV	DEV	VOL
4	87.55829	0.021177	2.650798	0.383293	2.770565	4.795647	0.453592	1.366635
8	79.47948	0.019883	2.156645	0.376932	0.810121	9.528013	1.374299	1.254676
12	71.86376	0.223275	1.844544	0.287992	8.350857	10.91271	5.102097	1.414772
16	66.71667	0.636245	2.080233	0.249564	9.658405	11.19854	6.985918	2.474428

Table 4.15 Stock Market Volatility and Macroeconomic Volatilities

Variable	Coefficient	Std. Error	T-Statistic	Prob.
C	0.015181	0.002050	7.405035	0.0000
GDP	-85.42293	26.71314	-3.197787	0.0023
GOV	1.602441	0.501875	3.192912	0.0023
INF	0.431936	0.138832	3.111212	0.0029
INT	136.7223	76.91946	1.777474	0.0809
M2	11.43173	27.94567	0.409070	0.6841
EXCH	226.1757	52.52825	4.305793	0.0001
LUXOR	0.022601	0.000841	3.692732	0.0032
IRAQ	0.001000	0.001155	18.18957	0.0000
SEP.11	0.011580	0.004345	2.665284	0.0102

R-squared	0.737650	Mean dependent var	0.011199
Adjusted R-squared	0.693100	S.D. dependent var	0.013901
S.E. of regression	0.007701	Akaike info criterion	-6.750257
Sum squared resid	0.003143	Schwarz criterion	-6.410077
Log likelihood	222.6331	F-statistic	16.55785
Durbin-Watson stat	1.519655	Prob(F-statistic)	0.000000

Table 4.16 GARCH-M Estimates with Macroeconomic Variables

Variable	Estimates	t. statistic	Estimates	t. statistic
Constant	1.193821	0.14168	0.00537	3.61134
CMAI(-1)	1.054352	4.15285	1.00125	3.23722
SQR(GARCH)	-0.447321	-1.48792	-0.16930	-1.53657
GDP	210.7767	3.60630	-172.7001	-2.03248
GOV	-0.405867	-1.98603	-1.03426	-2.60821
INF	-270.5924	-3.88722	-118.3064	-2.71035
INT	-253.7220	-4.01891	-127.0753	-2.42312
M2	-85.58386	-0.05925	-24.04324	-0.00247
EXCH	381.2819	0.45814	223.3242	1.89954
Variance Equation				
Constant	1.00323	1.64884	0.43921	2.02126
ARCH(1)	0.34569	2.05570	0.06525	2.01928
GARCH(1)	0.49204	6.59875	0.52712	3.02873
LUXOR			1318.914	4.33620
IRAQ			88.1572	2.25303
SEP. 11			1060.581	1060.581
R^2	0.47492		0.51734	
S.D of d.v	0.09154		0.09154	
S.E of Reg.	0.09103		0.09103	
Durbin-Watson	1.97216		1.98011	

Table 4.17 Comparison of Returns Changes in the Post and Pre crises

	Luxor terrorist attacks			Iraq invasion war			September 11 attack		
	-+5 days	-/+10 days	-/+3 month	-+5 days	-/+10 days	-/+3 month	-+5 days	-/+10 days	-/+3 month
Z	-0.674	-1.784	-02.209	-1.214	-2.090	-3.272	-2.209	-1.172	-0.629
P-value	0.500	0.074*	0.936	0.225	0.037**	0.001***	0.027**	0.241	0.529

Table 5.1 Gross Savings as a Percentage of GDP

	2000	2001	2002	2003	2004	2005	2006	2007
Malaysia	37	32	32	34	31	30	32	36
Korea	34	31	30	32	34	32	30	30
Indonesia	28	28	26	30	25	26	28	26
India	25	26	27	28	32	34	35	37
Egypt	19	18	20	19	20	21	22	24

Note: Source from World Development Indicators online database, 2008.

FIGURES

Figure 1.1 Finance and Growth

Source: - Levine, Ross. 1997, Financial Development and Economic Growth: Views and Agenda, *Journal of Economic Literature, Vol. XXXV (June 1997), pp. 688–726*

Figure 1.2 Fitting of Trend Line in Growth Rates

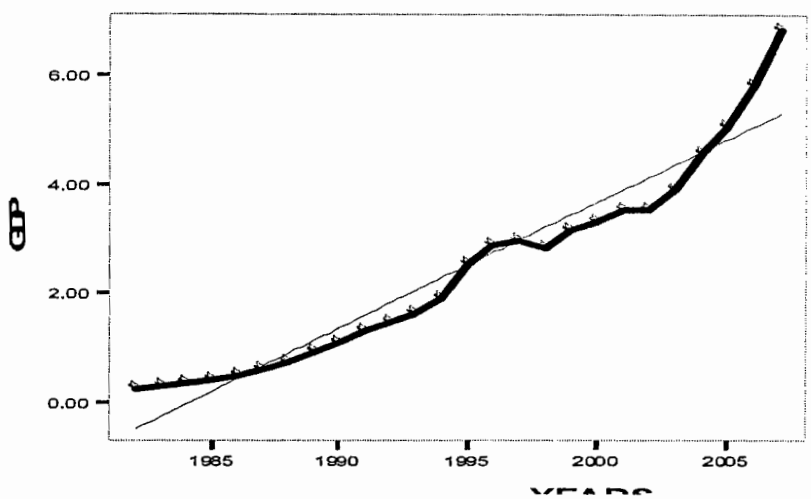
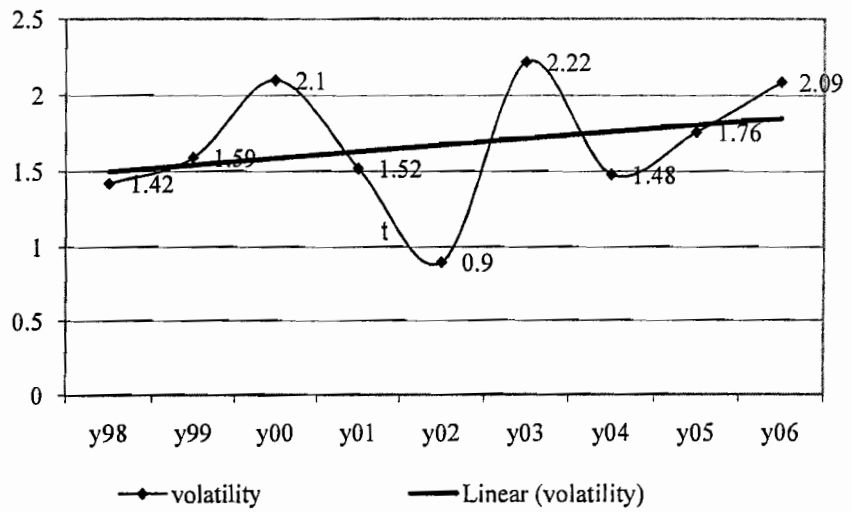


Figure 1.3 Egyptian stock market volatility (1998-2006)



Note: Source from Cairo and Alexandria Exchange

Figure 1.4 Market Capitalizations as a Percent of GDP

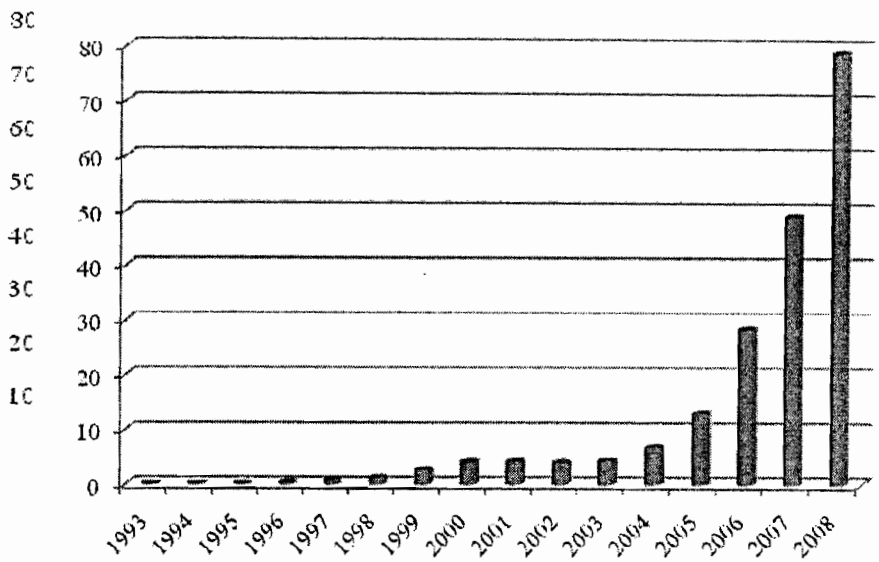


Figure 1.5 Trading Volume

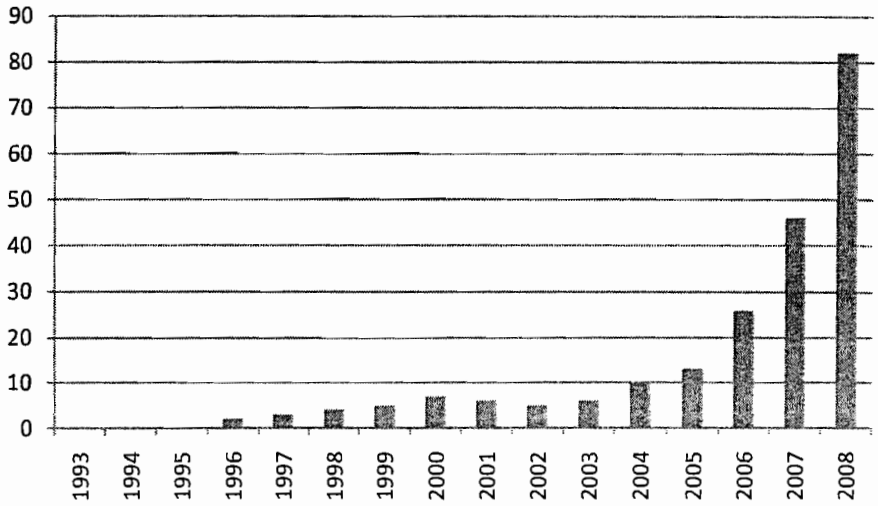


Figure 1.6 Total Value Traded of Securities (Million), 1993-2008

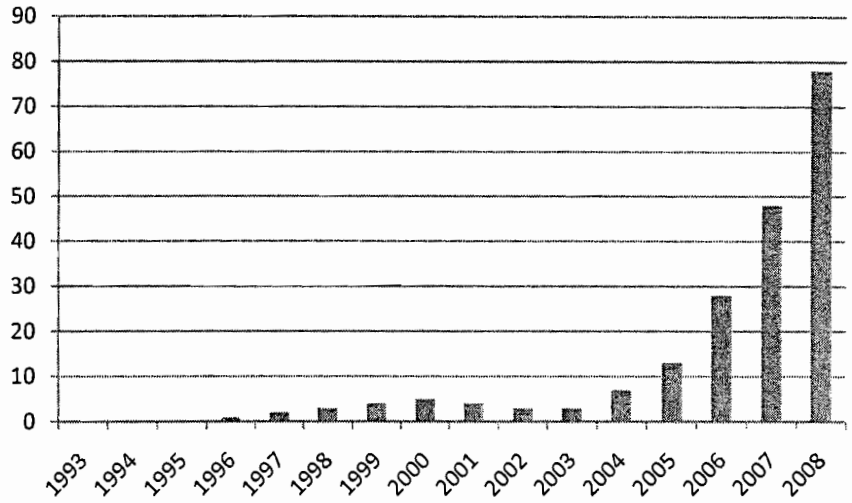


Figure 1.7 Percentage Changes in S&P/IFCI in 2006

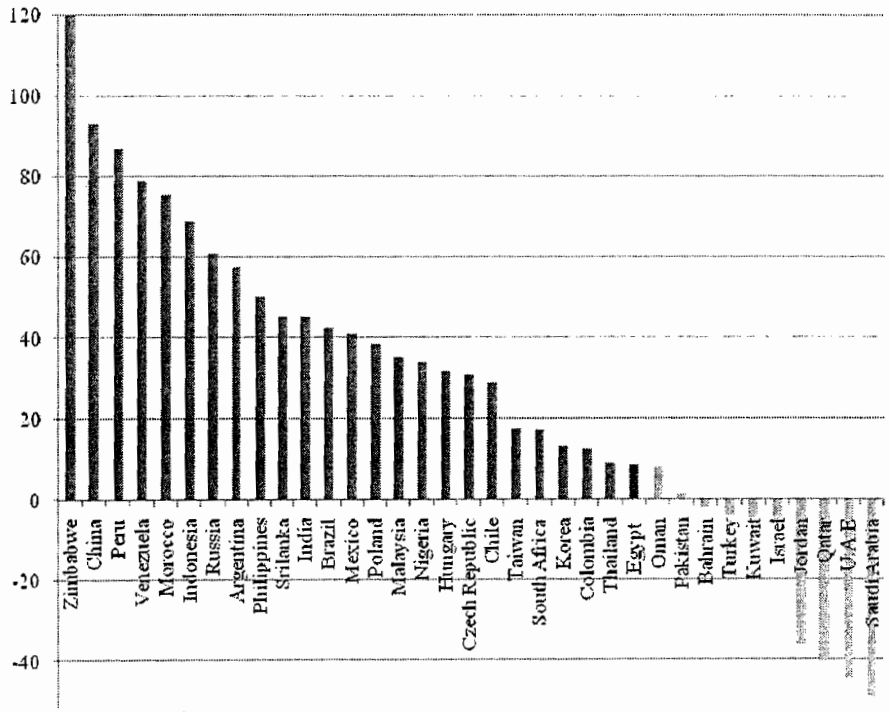


Figure 1.8 Percentage Changes in S&P/IFCG in 2008

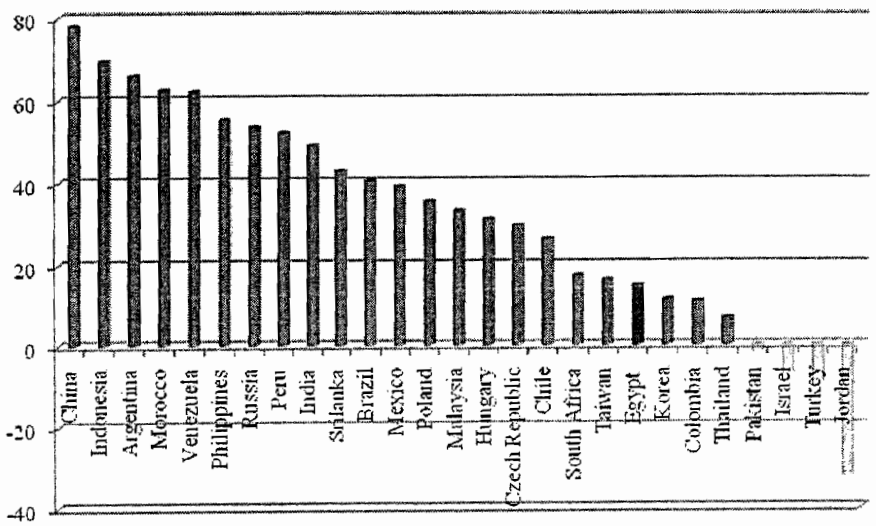


Figure 1.9 Delisting vs. Capital Raised through IPO & SPO

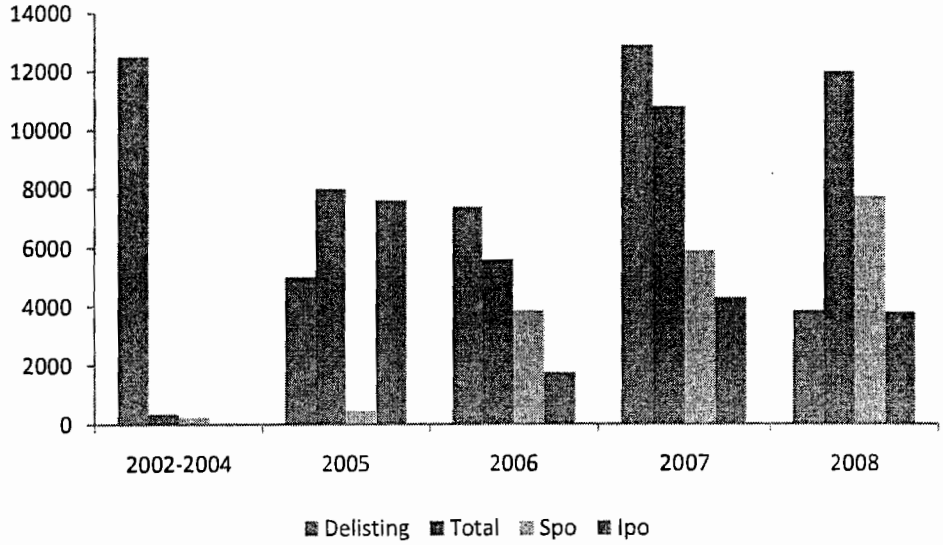


Figure 2.1 Theoretical Framework

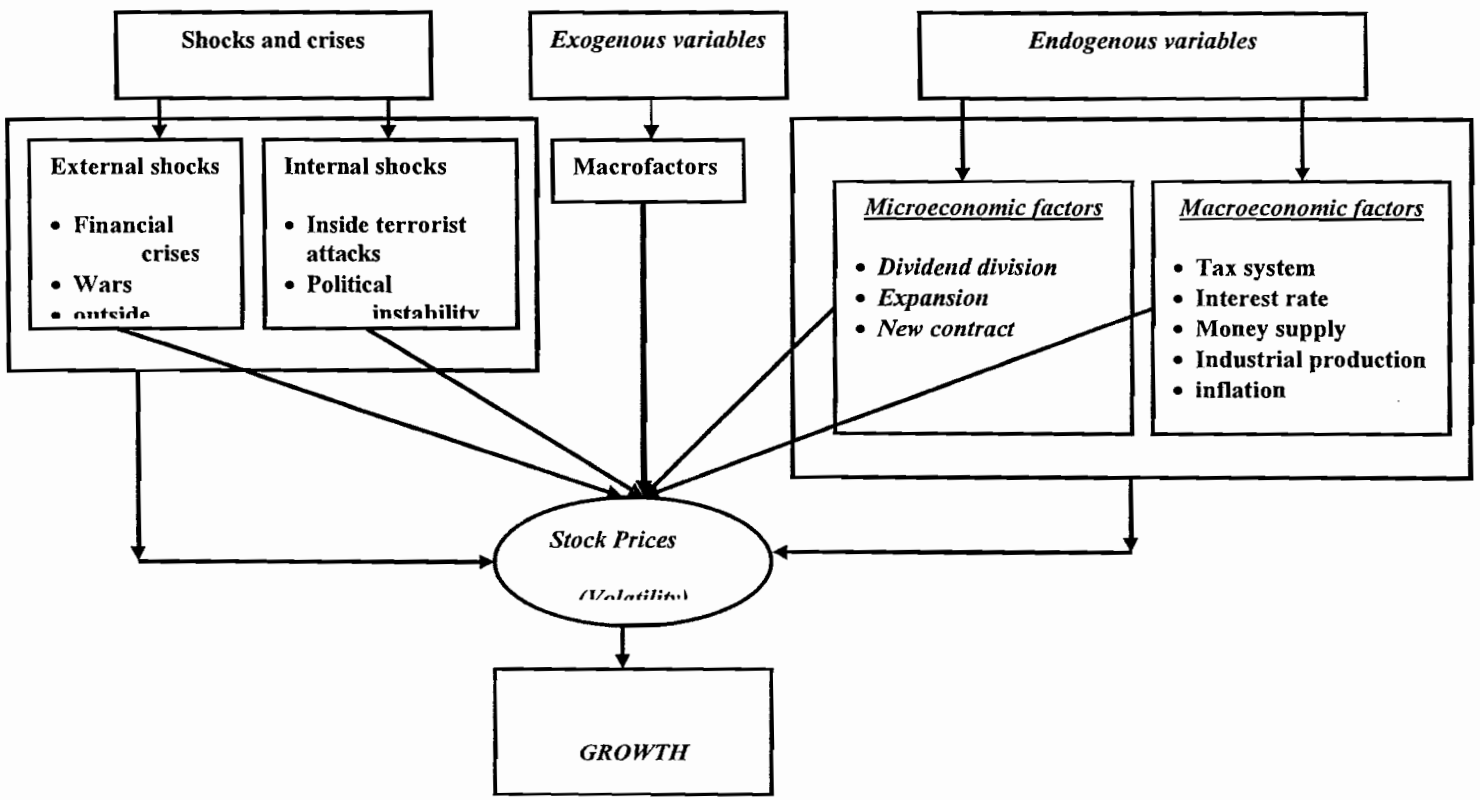


Figure 2.2 Efficient adjustment to new information

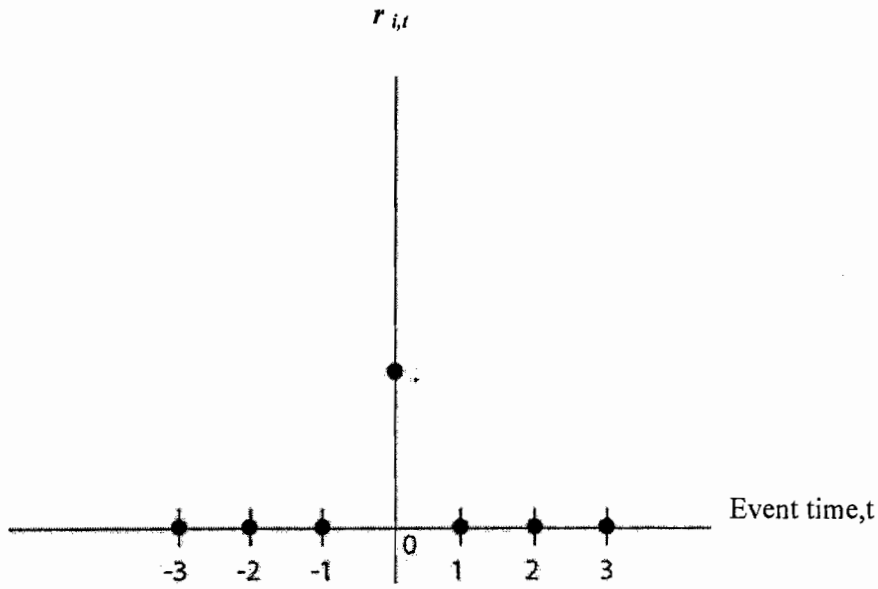


Figure 2.3a The Reaction when Good News Reaches.

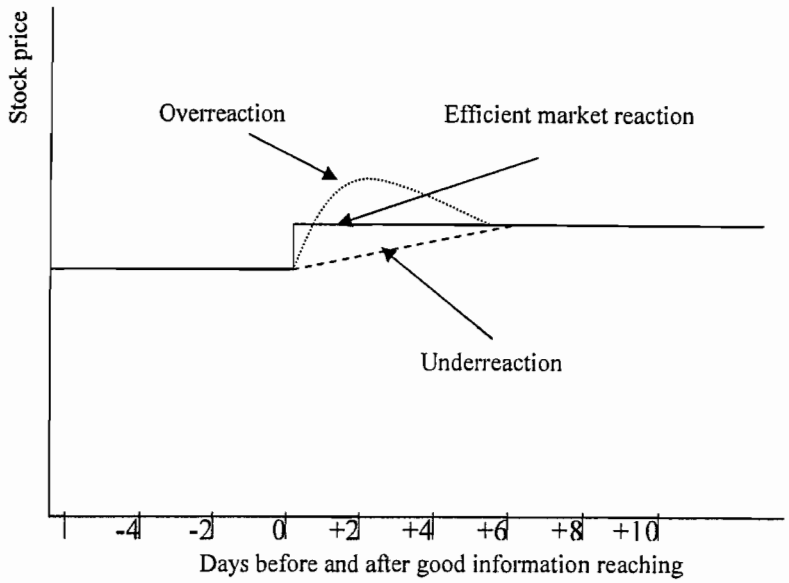


Figure 2.3 b The Reaction when bad news reaches

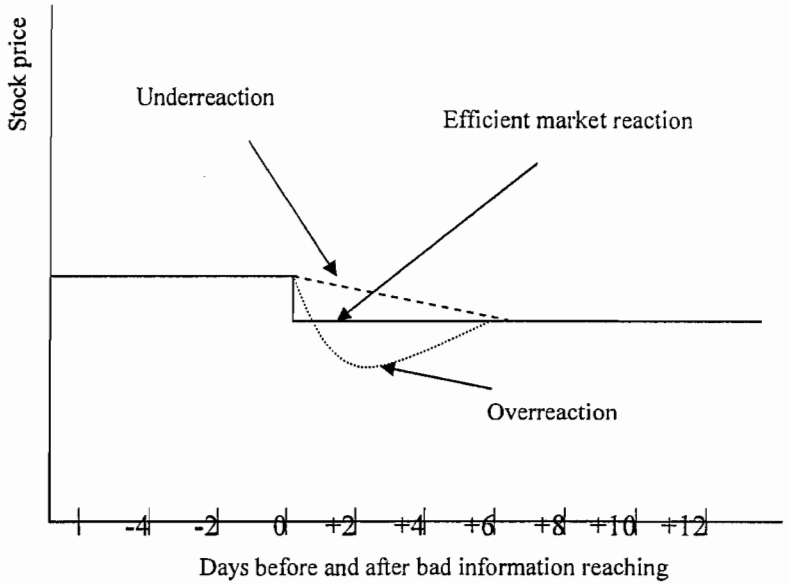
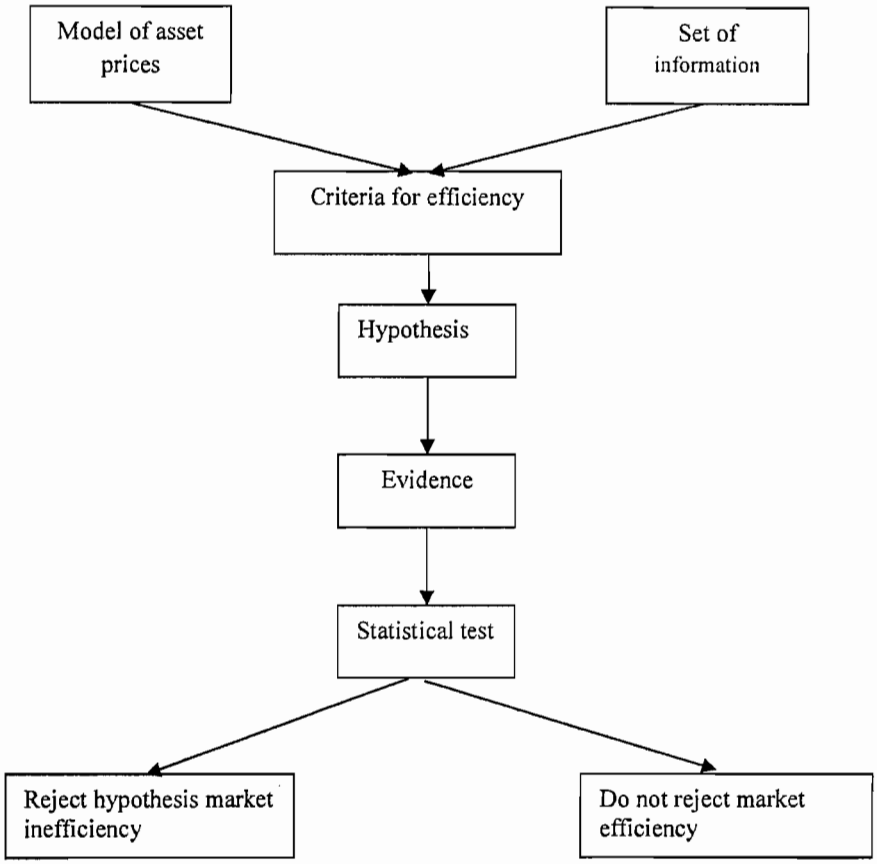


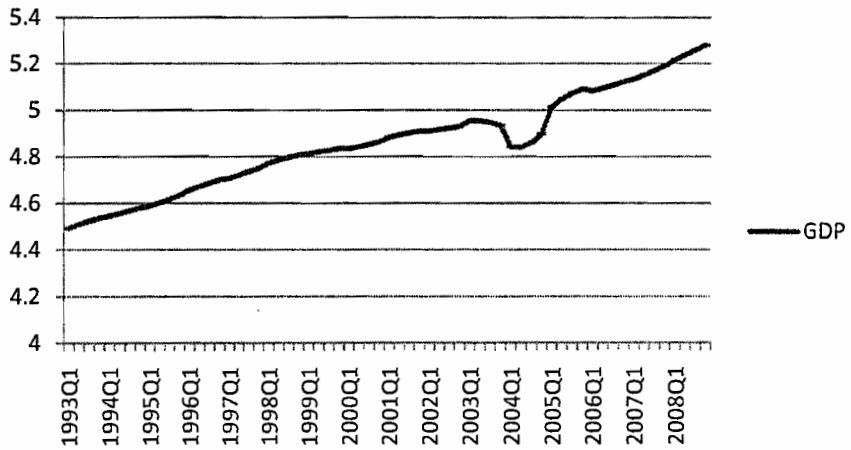
Figure 2.4 Predictability of Prices and Market Efficiency



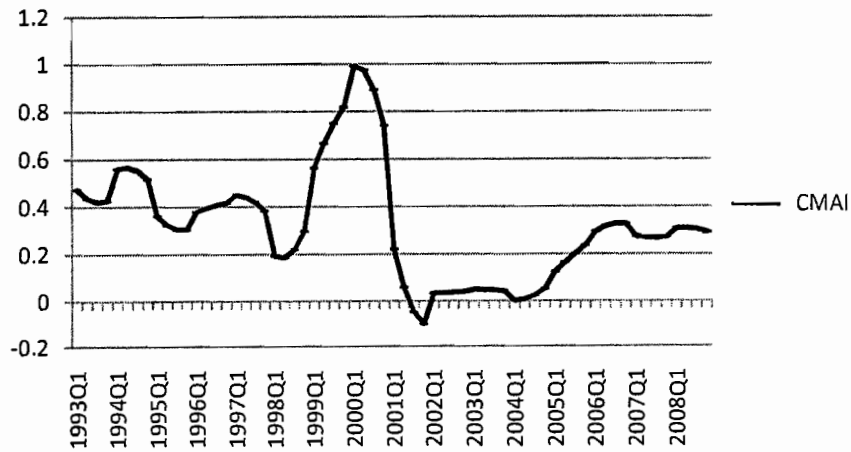
Note; Source from Bailey, Roy E.(2005). The Economics of Financial Markets, Cambridge Press, p.89.

Figure 3.1 The variables trend (sample period: January 1993- December 2008)

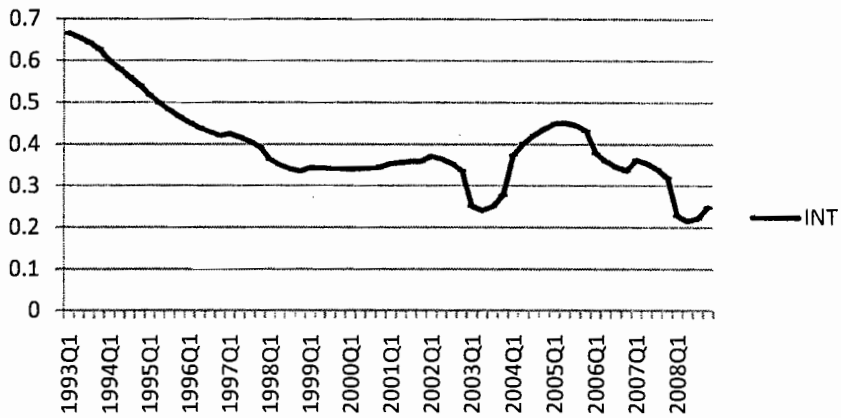
(a) Gross Domestic Product



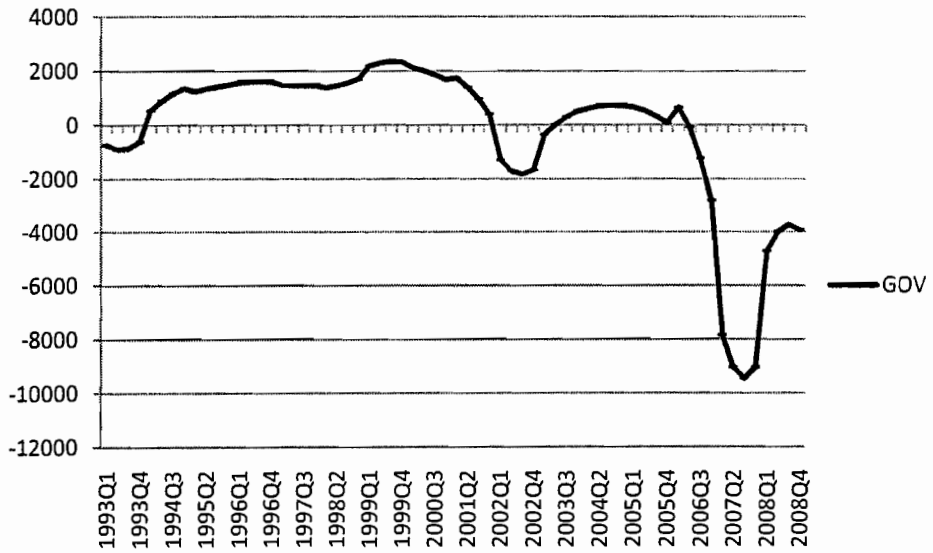
(b) Stock Market Index



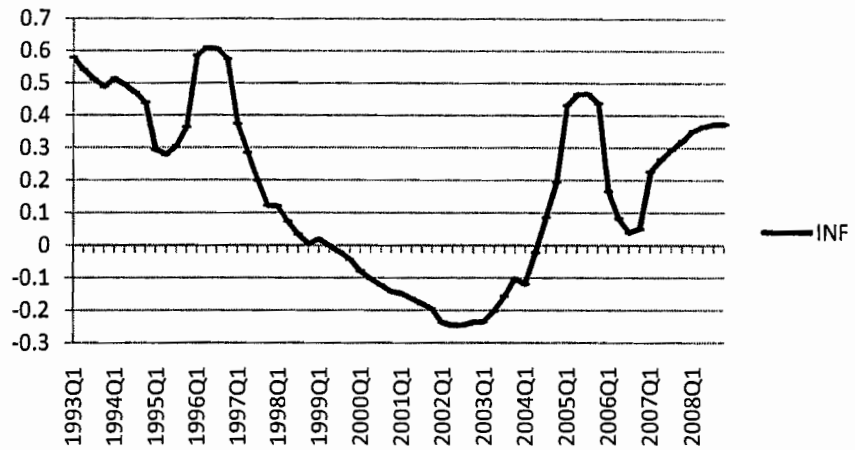
(c) Interest Rate



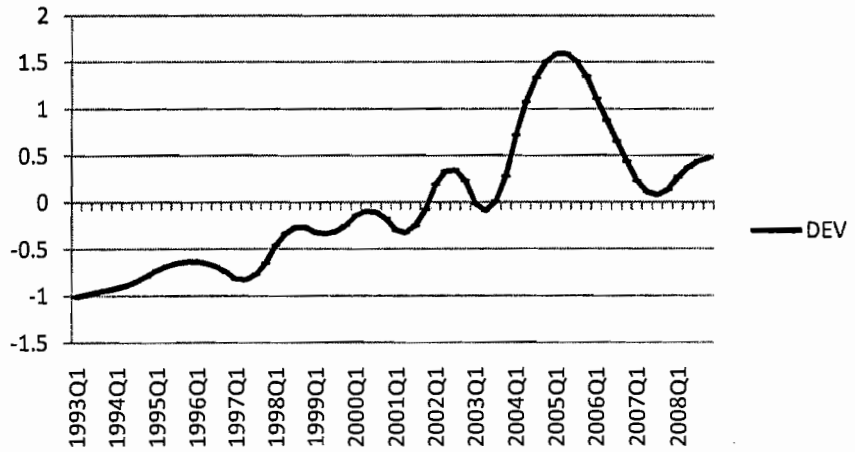
(d) the Governmental Budget Deficit



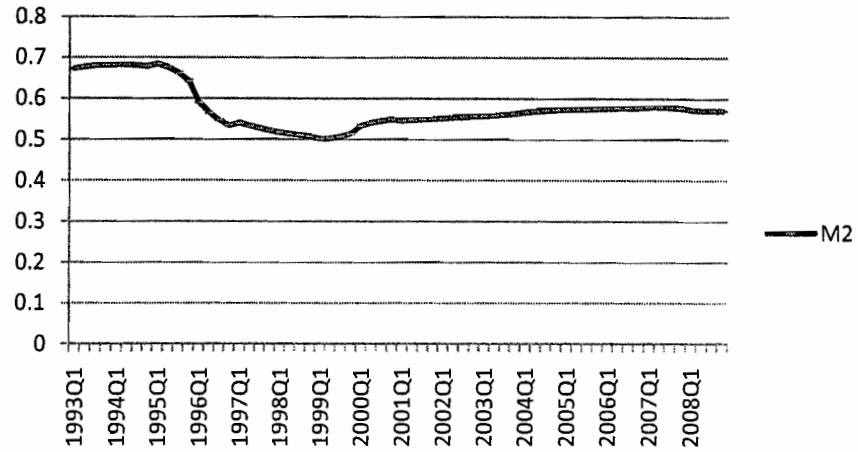
(e) Inflation Rate



(f) Stock Market Development Composite Index



(g) Money Supply



(h) Exchange Rate

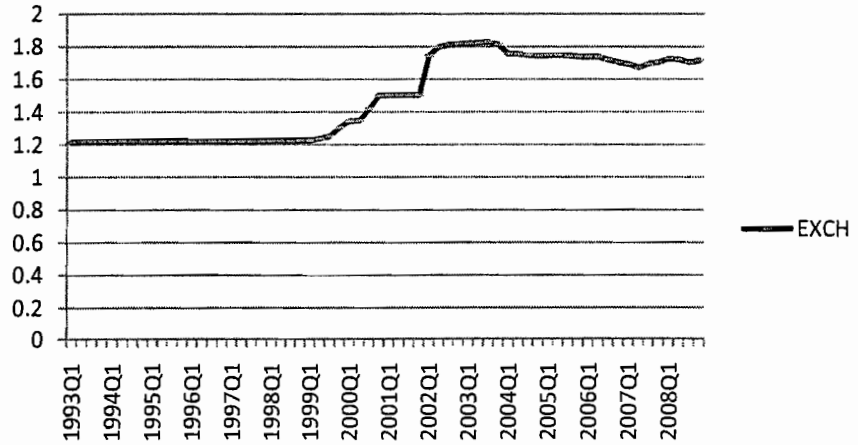


Figure 4.1 The graph of the AR roots

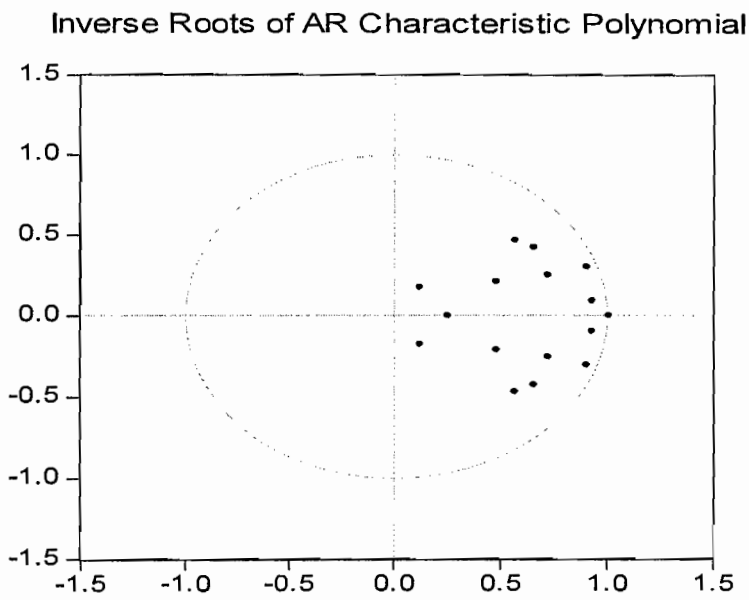


Figure 4.2 Plot of the residuals from the long run relationship

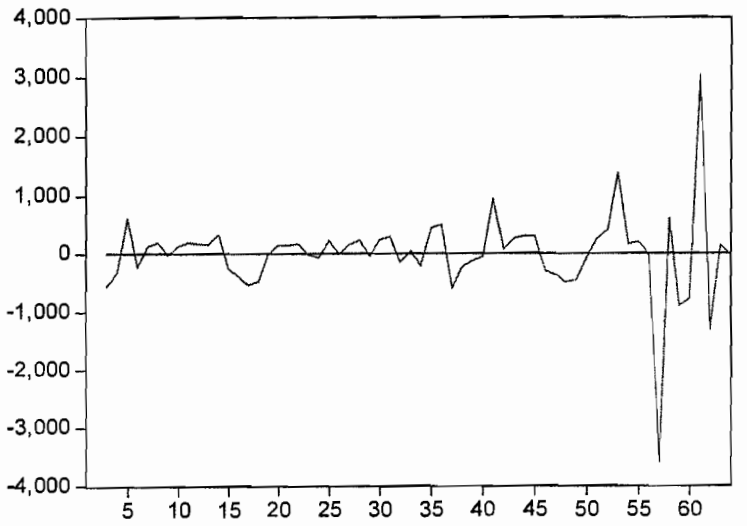


Figure 4.3a Plot of Cumulative Sum of Recursive Residuals

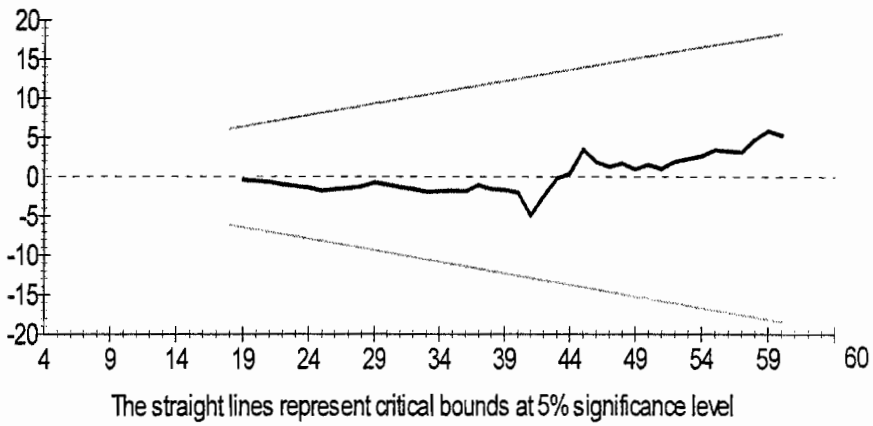


Figure 4.3b CUSUM of Square Stability Test

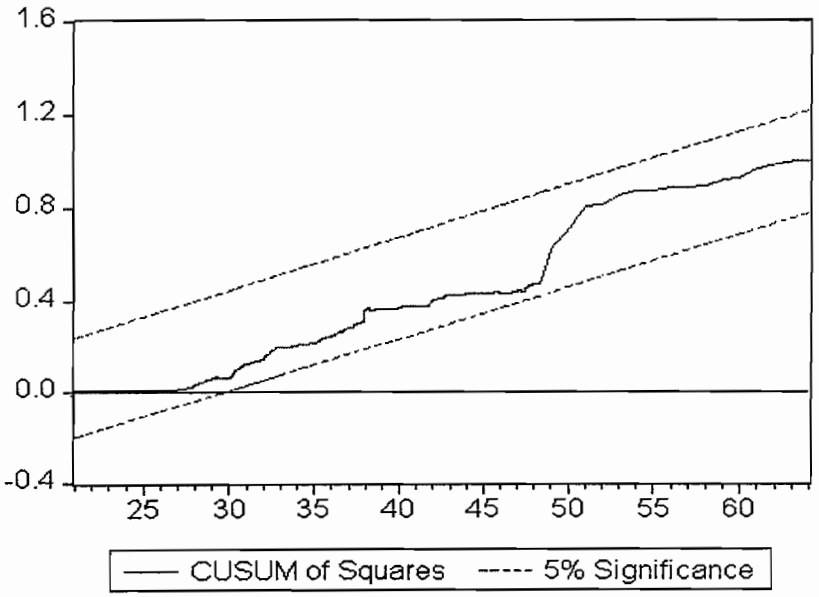


Figure 4.4 Impulse Response

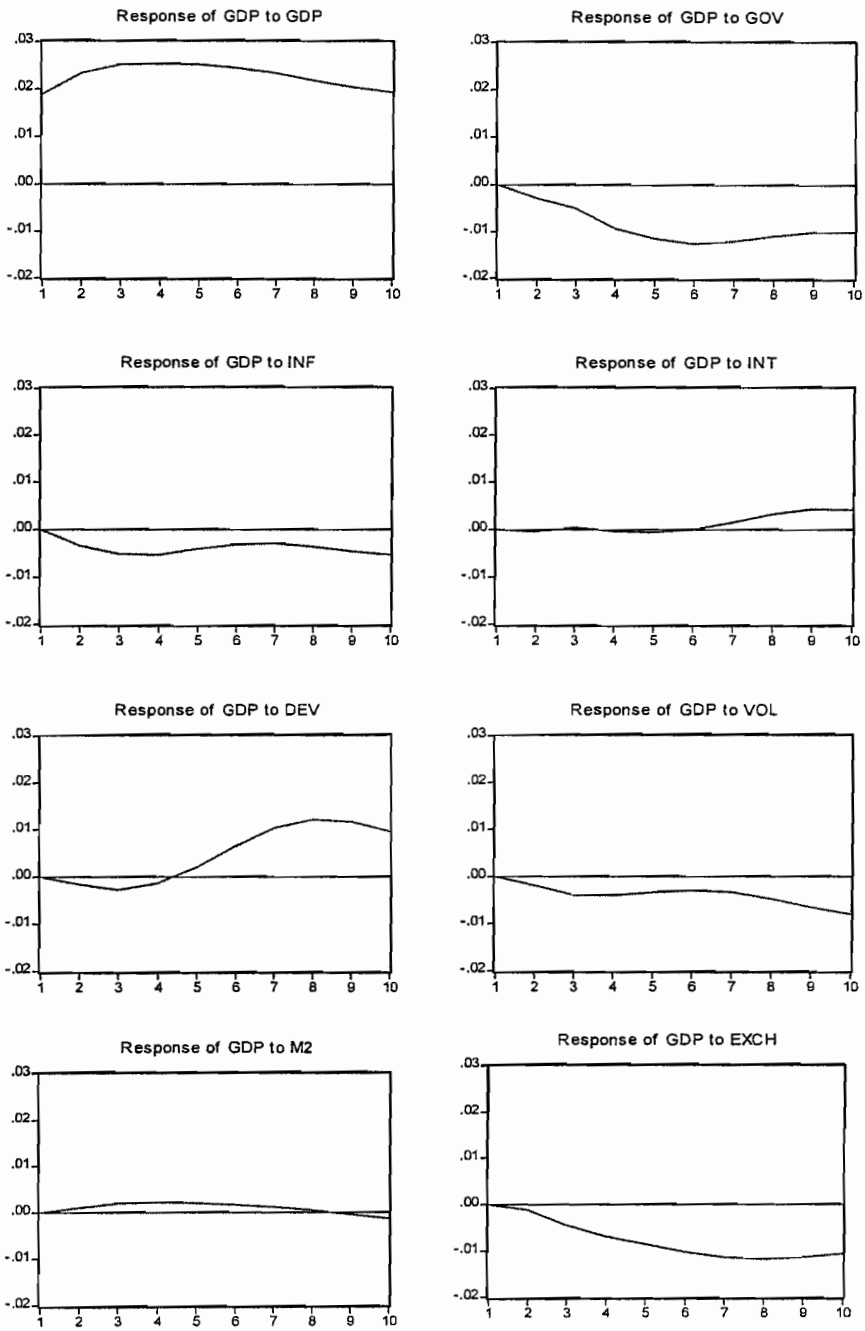
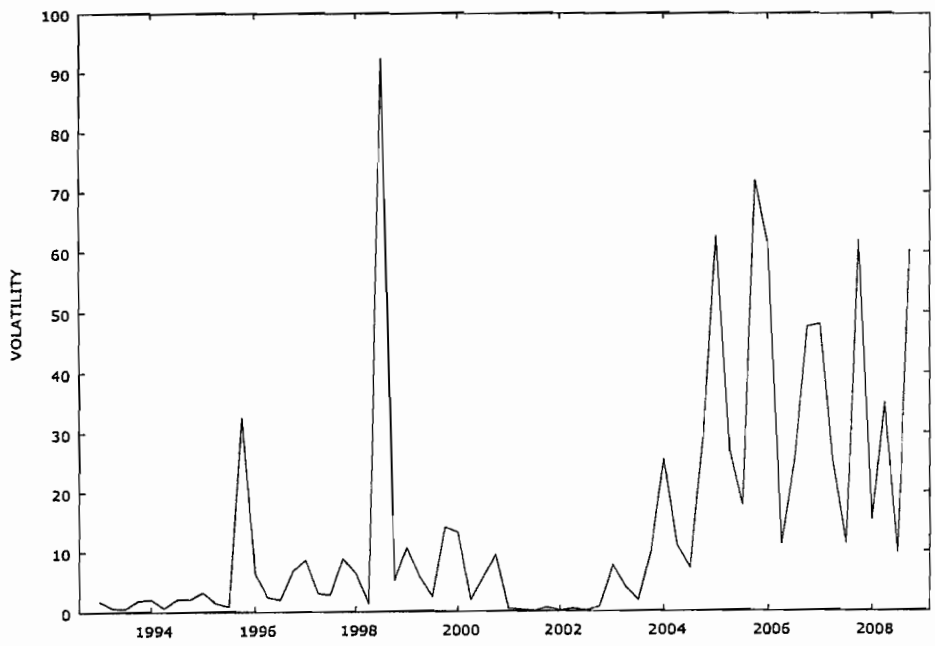


Figure 4.5 Stock market volatility



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APPENDIX 1

1.1 Quarterly interpolation from the annual observation (Gandolfo, 1981)

Let y_t, y_{t-1}, y_{t+1} be three consecutive annual observations of a continuous flow variable of $y(t)$. Assuming that the $y(t)$ represented the quadratic of a parabola $at^2 + bt + c$, where *a*, *b*, and *c* are the coefficients and expressed in the integral forms of:

$$\int_0^1 (at^2 + bt + c)dt = y_{t-1} \quad (1)$$

$$\int_1^2 (at^2 + bt + c)dt = y_t \quad (2)$$

$$\int_2^3 (at^2 + bt + c)dt = y_{t+1} \quad (3)$$

Since the equations above can be represented by $\int_\alpha^\beta (at^2 + bt + c)dt = \left[\frac{1}{3}at^2 + \frac{1}{2}bt + c\right]_\alpha^\beta$ and by integrating out equations (1) to (3), we have

$$\frac{1}{3}at^2 + \frac{1}{2}bt + c = y_{t-1} \quad (4)$$

$$\frac{7}{3}at^2 + \frac{3}{2}bt + c = y_t \quad (5)$$

$$\frac{19}{3}at^2 + \frac{5}{2}bt + c = y_{t+1} \quad (6)$$

Solving the linear system provided in equations (4) to (6) for the unknowns a, b, and c we get that $a = 0.5y_{t-1} - 1.0y_t + 0.5y_{t+1}$, $b = -2.0y_{t-1} + 3.0y_t - 1.0y_{t+1}$ and

$c = 1.83y_{t-1} - 1.16y_t + 0.3y_{t+1}$. now te quarterly figures within any year (t) must turn to satisfy the condition of

$$y_t^{(1)} = \int_1^{1.25} (at^2 + bt + c)dt, \qquad y_t^{(2)} = \int_{1,25}^{1.5} (at^2 + bt + c)dt,$$

$$y_t^{(3)} = \int_{1.5}^{1.75} (at^2 + bt + c)dt, \qquad y_t^{(4)} = \int_{1.75}^{2} (at^2 + bt + c)dt, \qquad (7)$$

By performing the integration in equation 7 and then substitute the values of a, b, and c obtained earlier, we arrived with the quarterly formulate after satisfying each of the condition in any year t are as follows:

$$y_t^{(1)} = 0.0546875y_{t-1} + 0.234375y_t - 0.0390625y_{t+1} \qquad (8)$$

$$y_t^{(2)} = 0.0078125y_{t-1} + 0.265625y_t - 0.0234375y_{t+1} \qquad (9)$$

$$y_t^{(3)} = -0.0234375y_{t-1} + 0.265625y_t + 0.0078125y_{t+1} \qquad (10)$$

$$y_t^{(4)} = -0.0390625y_{t-1} + 0.234375y_t + 0.0546875y_{t+1} \qquad (11)$$

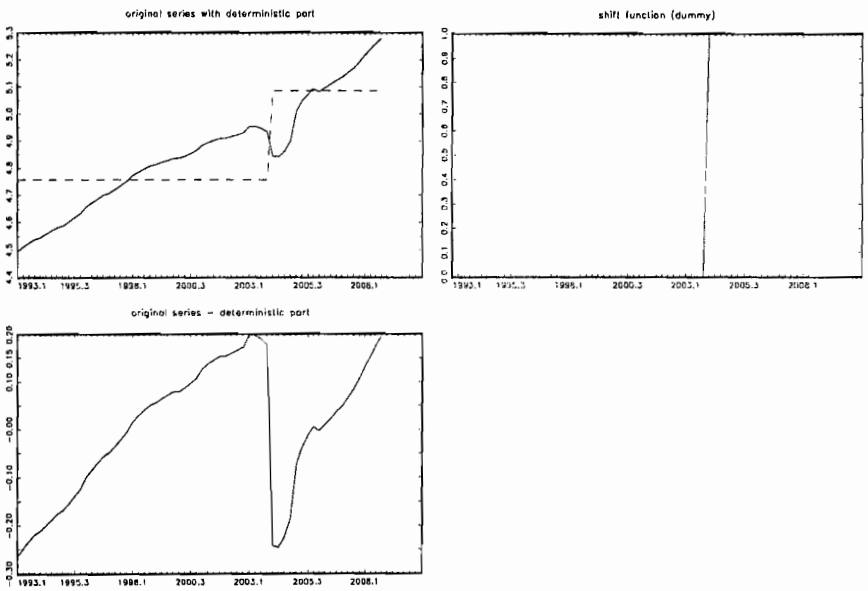
where y_t, y_{t-1}, y_{t+1} are the current, lags and lead values of the variables in equation at time t (annual). In other words, three continuous annual observations of variable *y(t)* are adopted in each of the equation. In order to calculate the value for the first quarter, we apply the formulate for the first quarter and subsequently for the remaining quarters.

1.2 Using PROC EXPAND

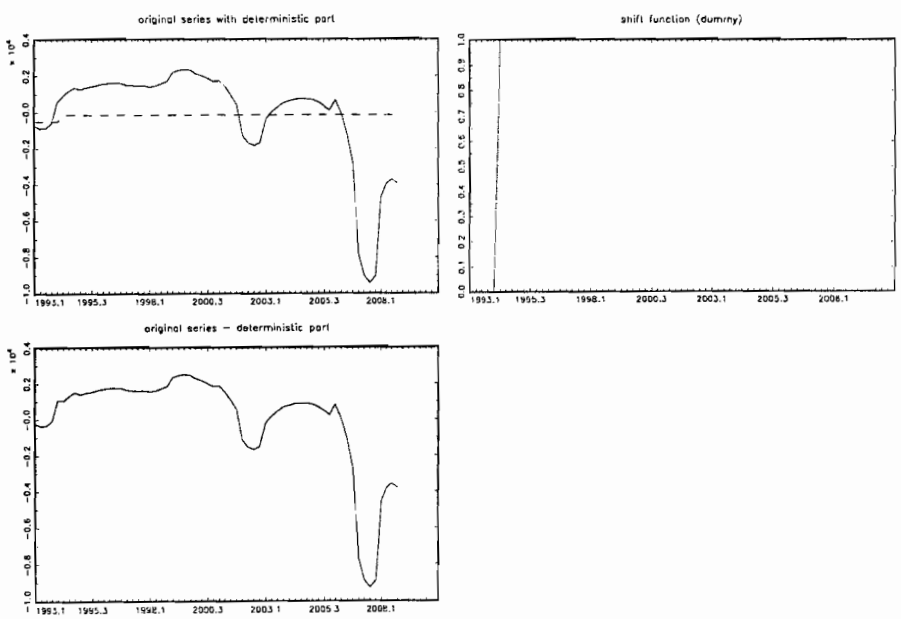
```
Proc expand data=quarter  out=temp1   from=daily  to=qtr;
Id data
Conver series/observed = total;
Run;
```

APPENDIX2
Unit Root test with Structural Break.

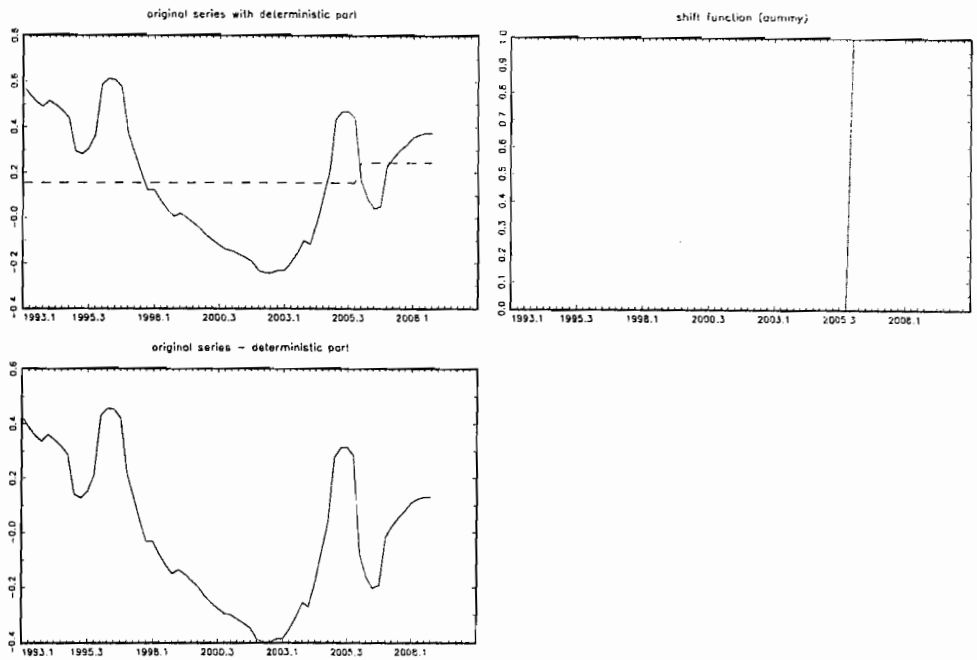
UR Test with structural break: GDP (dummy shift)



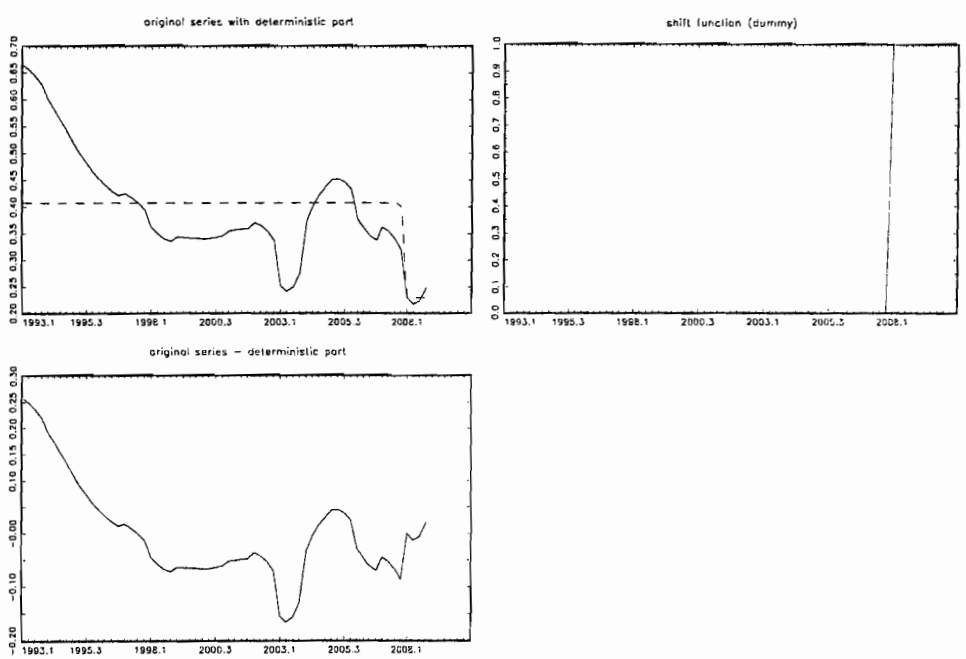
UR Test with structural break: GOV (dummy shift)



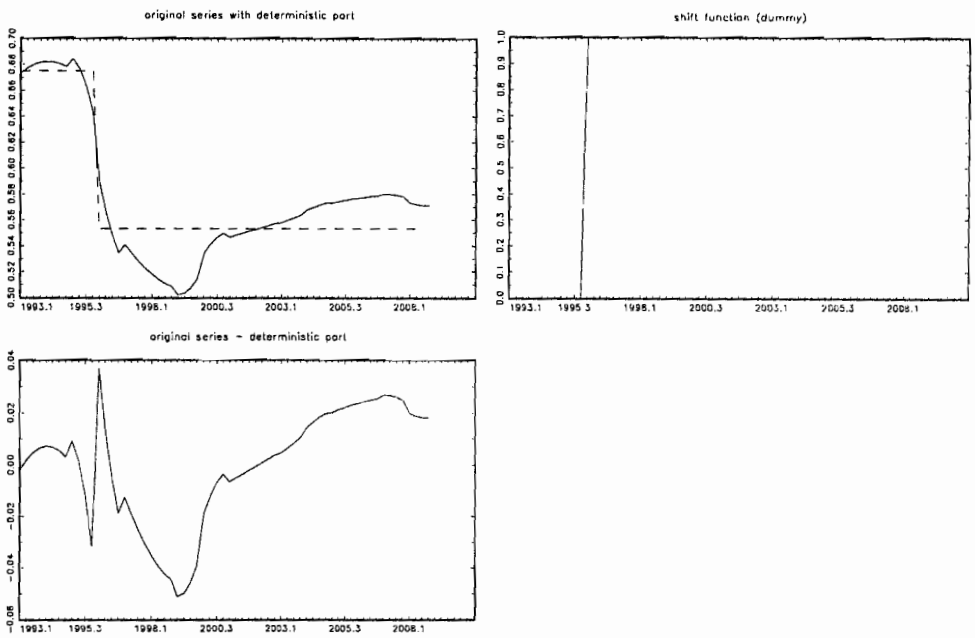
UR Test with structural break: INF (dummy shift)



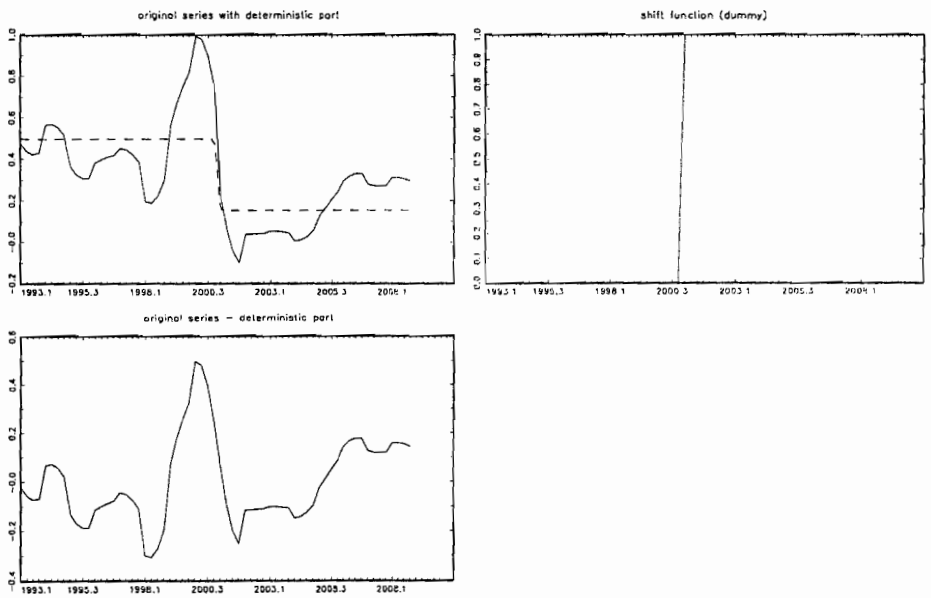
UR Test with structural break: INT (dummy shift)



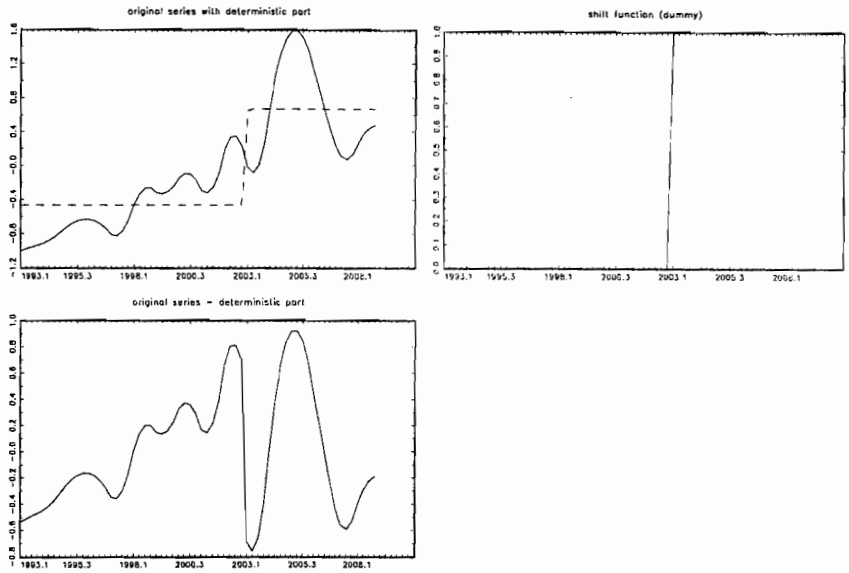
UR Test with structural break: M2 (dummy shift)



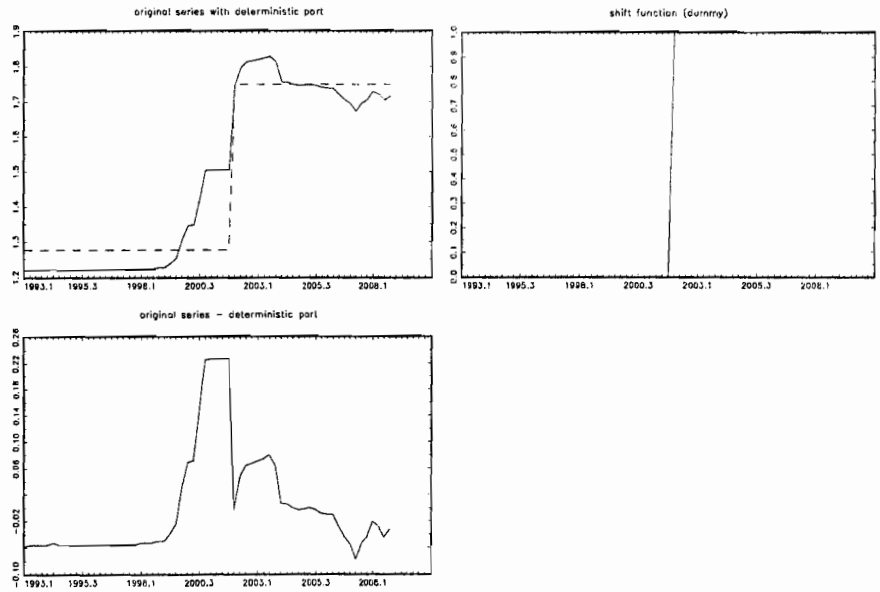
UR Test with structural break: VOL (dummy shift)



UR Test with structural break: DEV (dummy shift)



UR Test with structural break: EXCH (dummy shift)



APPENDIX 3 Datasets Used in the Study

	GOV	VOL	INT	GDP	INF	DEV	M2	EXCH
1993Q1	-734.359	0.474219	0.665478	4.491688	0.57889	-1.00601	0.673085	1.217876
1993Q2	-895.141	0.437031	0.655843	4.508474	0.54193	-0.98344	0.676894	1.22083
1993Q3	-855.141	0.421406	0.643376	4.523428	0.511257	-0.96121	0.679652	1.22083
1993Q4	-614.359	0.427344	0.62783	4.536714	0.488507	-0.93934	0.681378	1.22083
1994Q1	544.8594	0.561094	0.600019	4.544781	0.513134	-0.91782	0.682084	1.22083
1994Q2	900.1406	0.567656	0.580497	4.556641	0.495284	-0.88608	0.681775	1.223775
1994Q3	1169.141	0.553281	0.560803	4.568498	0.4712	-0.84413	0.68045	1.22083
1994Q4	1351.859	0.517969	0.540955	4.580344	0.439826	-0.79196	0.678098	1.22083
1995Q1	1258.414	0.3625	0.517897	4.588016	0.294535	-0.72958	0.684404	1.22083
1995Q2	1344.523	0.325	0.498956	4.601551	0.279824	-0.68243	0.676146	1.22083
1995Q3	1420.305	0.30625	0.481398	4.616525	0.304746	-0.65053	0.662663	1.22083
1995Q4	1485.758	0.30625	0.465429	4.63278	0.363201	-0.63386	0.643455	1.22083
1996Q1	1569.203	0.379688	0.451858	4.656229	0.585108	-0.63244	0.590033	1.22083
1996Q2	1602.672	0.395313	0.439456	4.672008	0.609127	-0.65006	0.566603	1.22083
1996Q3	1614.484	0.407813	0.42897	4.686554	0.605776	-0.68671	0.547853	1.22083
1996Q4	1604.641	0.417188	0.420549	4.69997	0.574393	-0.7424	0.534466	1.22083
1997Q1	1490.641	0.450781	0.42529	4.707536	0.374089	-0.81712	0.54054	1.22083
1997Q2	1470.484	0.442969	0.417056	4.720948	0.284959	-0.82653	0.533892	1.22083
1997Q3	1461.672	0.421094	0.40654	4.735168	0.198786	-0.7706	0.527897	1.22083
1997Q4	1464.203	0.385156	0.393575	4.750104	0.122472	-0.64935	0.522582	1.22083
1998Q1	1395.734	0.194531	0.362759	4.77225	0.12042	-0.46277	0.517974	1.223775
1998Q2	1453.891	0.186719	0.349915	4.78546	0.074348	-0.33675	0.514096	1.223775
1998Q3	1556.328	0.221094	0.340723	4.797135	0.034866	-0.27129	0.510969	1.223775
1998Q4	1703.047	0.297656	0.335427	4.806986	0.004389	-0.26638	0.508609	1.226712

continued

	GOV	VOL	INT	GDP	INF	DEV	M2	EXCH
1999Q1	2182.406	0.564844	0.343501	4.812863	0.018921	-0.32204	0.502093	1.226712
1999Q2	2302.344	0.666406	0.342577	4.820625	-0.00034	-0.33768	0.503276	1.238374
1999Q3	2351.219	0.750781	0.34196	4.827857	-0.02121	-0.31332	0.507218	1.252763
1999Q4	2329.031	0.817969	0.341651	4.834581	-0.04388	-0.24896	0.513845	1.305626
2000Q1	2123.047	0.991797	0.340103	4.835607	-0.07864	-0.14459	0.534241	1.345472
2000Q2	2003.828	0.975078	0.341032	4.843515	-0.10203	-0.09744	0.54121	1.348073
2000Q3	1858.641	0.891641	0.342885	4.85293	-0.12313	-0.10753	0.546284	1.420696
2000Q4	1687.484	0.741484	0.345649	4.863751	-0.14154	-0.17484	0.54953	1.501853
2001Q1	1732.508	0.221484	0.353838	4.883366	-0.14722	-0.29938	0.54653	1.504077
2001Q2	1412.555	0.059141	0.356534	4.893555	-0.16273	-0.32501	0.548004	1.504077
2001Q3	969.7734	-0.04867	0.358322	4.902134	-0.17881	-0.25171	0.549478	1.504077
2001Q4	404.1641	-0.10195	0.359213	4.909193	-0.19552	-0.0795	0.550954	1.504077
2002Q1	-1294.04	0.034727	0.370938	4.910373	-0.23564	0.19163	0.55243	1.745716
2002Q2	-1701.4	0.036336	0.365409	4.916391	-0.24508	0.33347	0.553907	1.796747
2002Q3	-1827.68	0.038305	0.354135	4.922744	-0.24508	0.34602	0.555386	1.813195
2002Q4	-1672.88	0.040633	0.336657	4.929416	-0.23564	0.229279	0.556865	1.816452
2003Q1	-351.578	0.049922	0.251277	4.953927	-0.23447	-0.01675	0.55774	1.819699
2003Q2	11.20313	0.050328	0.241138	4.954086	-0.20087	-0.09066	0.559464	1.822935
2003Q3	300.8906	0.048453	0.250157	4.947716	-0.15587	0.007544	0.561427	1.829376
2003Q4	517.4844	0.044297	0.277197	4.93452	-0.10289	0.27787	0.563626	1.813195
2004Q1	612.7031	0.003133	0.373868	4.843102	-0.11865	0.720314	0.567481	1.756132
2004Q2	702.4219	0.008305	0.401904	4.84055	-0.02156	1.072446	0.569567	1.754404
2004Q3	738.3594	0.025086	0.422649	4.860043	0.086471	1.334266	0.571321	1.7492
2004Q4	720.5156	0.053477	0.437039	4.898829	0.195121	1.505773	0.572745	1.745716

continued

	GOV	VOL	INT	GDP	INF	DEV	M2	EXCH
2005Q1	668.1094	0.126406	0.450309	5.013082	0.431866	1.586968	0.57326	1.747459
2005Q2	535.0156	0.164844	0.451631	5.047702	0.465662	1.587939	0.57427	1.7492
2005Q3	340.4531	0.201719	0.445806	5.073191	0.467516	1.508685	0.57519	1.745716
2005Q4	84.42188	0.237031	0.432541	5.090956	0.43785	1.349208	0.576021	1.740466
2006Q1	660.1641	0.295	0.378144	5.082669	0.167179	1.109507	0.576764	1.73871
2006Q2	-76.1016	0.3175	0.359354	5.095122	0.083402	0.877824	0.577418	1.73871
2006Q3	-1231.13	0.32875	0.345458	5.108521	0.039848	0.654158	0.577984	1.719189
2006Q4	-2804.93	0.32875	0.336961	5.122772	0.050247	0.43851	0.578463	1.704748
2007Q1	-7832.61	0.277266	0.362366	5.134037	0.226841	0.230879	0.580024	1.693779
2007Q2	-9029.89	0.270859	0.354263	5.15129	0.264596	0.110035	0.579861	1.671473
2007Q3	-9431.89	0.269297	0.340337	5.170394	0.295911	0.075978	0.579143	1.695616
2007Q4	-9038.61	0.272578	0.320012	5.191086	0.321896	0.128707	0.577869	1.704748
2008Q1	-4708.02	0.308828	0.229162	5.217037	0.352484	0.268223	0.573194	1.728109
2008Q2	-3980.98	0.310547	0.215778	5.238468	0.366131	0.37286	0.571916	1.720979
2008Q3	-3715.48	0.305859	0.222595	5.259512	0.373084	0.442619	0.571214	1.704748
2008Q4	-3911.52	0.294766	0.248701	5.280176	0.373659	0.477498	0.57109	1.716235