AMERICAN UNIVERSITY OF BEIRUT

IMPACT OF INTEREST RATE FLUCTUATIONS ON STOCK MARKET PERFORMANCE: EMPIRICAL EVIDENCE FROM THE MENA REGION

by
LINE CHARBEL KHOURI

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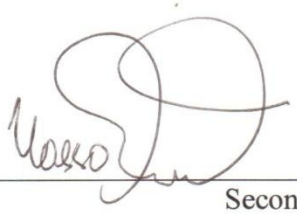
LINE CHARBEL KHOURI

Approved by:

Dr. Simon Neaime, Professor
Economics

First Reader



Dr. Yassar Nasser, Lecturer
Economics

Second Reader

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AN ABSTRACT OF THE THESIS OF

Line Charbel Khouri for Master of Arts in Financial Economics
Major: Financial Economics

Title: Impact of Interest Rate Fluctuations on Stock Market Performance: Empirical Evidence from the MENA Region

This project studies the dynamic relationship between interest rate fluctuations and stock market performance in both Egypt and Morocco. Prior to conducting the analysis, a unit root test is applied and determined that both interest rate and stock market series were not stationary. Johansen cointegration test reveals a long-run relationship between the two parameters in Egypt in the framework of an error correction mechanism (ECM), but failed to detect any evidence of this linkage in Morocco in the context of a Vector Autoregression Model (VAR). Granger causality testing however found no short-run causality from interest rates to stock market in both countries. The study uses monthly data from February 2007 up to May 2015.

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CHAPTER 1

INTRODUCTION

The Middle East and North Africa (MENA) region is an economically diverse region that includes oil-producing countries; the Gulf countries that are considered to be some of the richest countries in the world; and countries that are resource-scarce compared to population size such as Morocco or Egypt (World Bank).

Over the past several years, the overall economic environment in the region has been mainly affected by three factors: oil prices, political instability and economic reforms and policies.

The exchange rate target remains the monetary instrument of choice for the majority of the countries since less autonomous monetary policy is permitted under fixed regimes. Some countries are however starting to expand the monetary framework by moving away from exchange rate targeting and into price stability and inflation targeting.

Albeit the end goal of any monetary policy is sustainable growth, this instrument can have serious implications on stock market activity. Interest rates, a primary tool of monetary policy are speculated to be to have an impact on stock market returns. In theory, interest rates and stock market performance are negatively correlated. An increase in interest rates would cause investors to avoid making high risk investments in the financial markets compared to low risk interest bearing security such as fixed deposits or treasury bills (French, Schwert and Stambaugh). Central Banks use interest rates as a tool to control inflation in a country. Changing those rates would therefore indirectly affect the stock

market activity and eventually have an impact on the general economic performance of the country.

The focus on interest rates has been increasing in the recent years as quantitative easing is being adopted all over the world. Quantitative easing is an unconventional monetary policy based on the intuition that if central banks pumped money in the economy by buying securities such as government bonds with newly printed cash; this would reduce interest rates, encouraging businesses to borrow more in order to invest which would in turn boost the economy. After the worldwide financial crisis of 2008, the United States implemented its first round of quantitative easing (QE1) in November 2008 by purchasing USD 1.25 trillion in mortgage securities, USD 300 billion in treasury bonds and USD 175 billion in federal agency. As a result, mortgage rates declined by 5%. In November 2010, the second round of quantitative easing started with a USD 600 billion bond purchasing program. The third round was announced in September 2012 with the plan to purchase USD 40 billion in mortgage each month until the economy improves and keeping the interest rates near zero till mid-2015 (Bankrate). In August 2015, the Federal Reserve System announced its plan to increase interest rates for the first time since June 2006 (The Economist). Stock markets plummeted in the wake of the announcement (The Wall Street Journal).

This monetary policy was also used in the United Kingdom as well, with its first implementation dating back to March 2009 (Bank of England).

In March 2015, the European Central Bank announced its QE program with the plan to purchase €60 billion monthly until at least September 2016 (The Economist). The euro fell following the announcement and stock markets rallied (The Economist).

Many studies were therefore conducted on the impact of interest rates on stock market performance, but only a few focused on the MENA countries. It would be relevant to shift the attention to the financial markets in the regions because their non-integration with international markets may provide diversification potentials to investors that are not available in more mature markets. On the other hand, the political instability the region has been facing for the past years have seriously influenced the economical framework. Financial and monetary policies as well as general market expectations have been widely influenced by the environment of political turmoil.

This project therefore studies the relationship between interest rate fluctuations and stock market returns in Egypt and Morocco. The study is divided as follows: Chapter 2 includes a summary of related literature. Chapter 3 presents a summary of theories on the impact interest rate fluctuations has on stock returns; discusses monetary policy and stock market development in MENA region and presents the macroeconomic and financial market fundamentals for Egypt and Morocco. Chapter 4 lays down the empirical methodology and results of the analysis and chapter 5 concludes the study.

CHAPTER 2

LITERATURE REVIEW

Various studies have shed the light on the relationship between interest rates and stock market returns in the recent years, given that both parameters represent crucial factors of economic growth. Mahmudul Alam (2009) in his paper *Relationship between Interest Rate and Stock Price: Empirical Evidence from Developed and Developing Countries,* studied the market efficiency of fifteen developed to developing countries by looking at the effect of interest rate on share prices. He looked at Australia, Bangladesh, Canada, Chile, Colombia, Germany, Italy, Jamaica, Japan, Malaysia, Mexico, Philippine, South Africa, Spain, and Venezuela and applied both time series and panel regressions on monthly variables from January 1988 to March 2003. He used the bank deposit rate as a proxy for interest rate and the stock market indices of the respective countries to represent share prices. He first rejected the hypothesis of market efficiency as serial dependency was found among the stock returns of these markets proving that none of them followed a random walk model. His theory of a negative relationship between stock markets and interest rates was then not rejected, the results however varied between testing the impact of interest rate on stock prices, or the change of the interest rate on the change of stock prices. In Malaysia, he found that interest rate had no impact on stock prices but the change of interest rate was negatively correlated with the change of the latter. For Japan, he detected a positive relationship between the two parameters but a negative one between the changes in both variables. The negative relationship between both sets of variables was proven for countries

like Italy, Columbia, Bangladesh and South Africa; while countries like Spain, Germany, Canada, Mexico and Australia showed no impact of the changes in interest rates on the changes of stock prices but a significant negative relationship between interest rates and stock prices. For all of the countries he therefore proved an inverse relationship between either interest rates and stock prices, or between the changes of both variables (Alam). Consequently, controlling interest rates would greatly benefit the stock markets of those countries through the demand and supply channel of investors and investment companies respectively.

Moya-Martinez et al. (2014) examined this relationship in Spain at the industry level. They looked at stock returns of companies from fourteen industries (Consumer Goods, Consumer Services, Technology and Telecommunications, Real Estate, Banking, Financial Services, Utilities, Construction, Chemicals and Paper, Basic Resources, Health Care, Food and Beverages, Industrials, and Energy) over a 10-year period from January 1993 to December 2012. As a proxy for interest rates, they used the 10-year Spanish government bonds for two reasons: they argued that long-term interest rates can influence stock market performance as they contain future expectations for the economy and that long-term government bonds can be considered as substitutes for stocks. They used the wavelet analysis; a method used to analyze variations within a time series at different horizons by decomposing the series in time scales (Torrence and Compo), and concluded that the market was sensitive to interest rate changes, but this sensitivity varied across the different sectors of the economy. The utilities, food and beverages, real estate, and banking sectors were found to be more sensitive to interest rate changes than the health care or construction sector. This relationship was also dependant on time horizons as the

significant reactions from the stock market were only visible at longer horizons. This relationship was found to be negative, proving that stock markets benefit from falls in interest rates and that the latter is a major factor driving stock market performance. Their theory was based on the intuition that investors seeking long-term returns rely on macroeconomic fundamentals in their investment decisions (Moya-Martínez, Ferrer-Lapena and Escribano-Sotos).

The Johansen approach has been widely used in order to determine whether a long-run relationship does exist between those two variables or not. Toraman and Başarir (2014) looked at Turkey during the 1998 to 2012 period and conducted time series analysis on the Stock Market Capitalization Rate of *Borsa Istanbul* and the interest rate set by the Central Bank of Turkey. They argued that long-term interest rates contain future market expectations and would therefore play a role in determining the cost of borrowing. Thus, fluctuations of those rates might have a critical impact on investment decisions and could alter stock market performance. Their data was found to be non-stationary for both ADF[1] and PP[2] tests. They therefore proceeded to test the linkage between the parameters in the framework of a VAR model. They ran the Johansen co-integration test that confirmed the presence of a long-run relationship as the trace statistics indicated rejection of the null hypothesis of no cointegration. Granger causality, impulse response functions and variance decomposition were then examined in order to identify the dynamic properties of the model. The parameters were proved to be negatively correlated; which led to the conclusion that crashes in the stock market can be prevented to a certain extent by controlling the long

[1] Augmented Dickey-Fuller Unit Root Test
[2] Phillips-Perron Unit Root Test

run interest rate. In that case, the behavior of the stock market can be predicted and this would put the market efficiency hypothesis in question (Toraman and Başarir).

Muktadir Al Mukit (2012) also provided evidence for this negative relationship in his paper *Effects of Interest Rate and Exchange Rate on Volatility of Market Index at Dhaka Stock Exchange*. His theory was based on the assumption that lowering interest rates would increase stock prices through two channels: demand and exchange rate. Lowering interest rates would on one hand make it cheaper for people to borrow in order to invest in the financial markets and on the other hand make them reluctant to keep their money in low interest-bearing securities like bonds; demand for stocks would therefore increase boosting their prices. The exchange rate would affect the stock prices as well due to capital inflows in an open market economy. Those inflows appreciate the domestic currency, which reduces the country's exporting competitiveness thus weakening the stock prices. Using monthly data over the period of 1997 to 2010, he tested the economy of Bangladesh by running the cointegration test and then estimating a Vector Error Correction model. A total of 168 observations were used in the study: the DSE General (DGEN) Index was chosen as the measure of stock market performance and the bank's average interest rates on saving deposits was used as a proxy for the interest rate. The data was first found to be non-stationary, with all the variables being integrated of order one. Evidence from the Johansen cointegration test confirmed at least one cointegrating vector among the variables. The causal relationship was then analyzed through variance decomposition and granger causality testing. He showed that a one percent positive shock to the interest rate would lead to a 1.71% decrease in the market index; that causality being unidirectional from interest rate to stock markets (Muktadir Al Mukit).

In a study conducted on the Pakistani stock market, Husain et al. (2014) found evidence of cointegrating relationships between the stock returns of the Karachi Stock Exchange 100 index and the 6-month Treasury bills rate over the 1994 to2014 period but no granger causality between the variables. The data was found to be stationary at first difference. Both cointegration and granger causality were then examined. The cointegration test showed evidence of cointegrating relationships between the variables. In the VECM framework; the residuals of the regression of stock returns against interest rates were used in the regression of the difference of stock returns on the difference of interest rate and those residuals. The coefficients of the model were highly significant proving a linkage between the variables. Granger causality testing however revealed that neither stock returns granger caused the interest rates nor the interest rates are the granger cause of the stock returns (Hussain, Zaman and Bukhsh Baloch).

Arango et al. (2002) studied the stock market of Columbia using daily data from January 1994 until February 2000. The data included the Colombian interbank loan rate as a proxy for the short term interest rate and the Bogotá stock index; the data was found to be non-stationary and the stock market did not present any evidence of weak form efficiency. The Johansen test proved that the variables are cointegrated, but the Granger causality test showed that changes in interest rate do not Granger-cause stock prices. The model captured the non-linear negative relationship between the parameters as the Bogota market was characterized by periods of large returns followed by periods of small returns. The negative effect interest rates have on stock prices was also lagged. They explained this delay by the fact investors don't react quickly to shocks in interest rates, they wait in order to

differentiate between the temporary and permanent movements of the variable as transactions are costly (Arango, Gonzalez and Posada).

Other studies have on the other hand found contradicting evidence for this theory. Ouma and Muriu (2014) used the Arbitrage Pricing Theory (APT)[3] in the framework of the Capital Asset Pricing Model (CAPM) to study the impact of the macroeconomic variables in general on the stock returns in Kenya. The model included monthly data for the period of January 2003 to December 2013. The stock returns were proxied by the NSE-20 index, and the model included four macroeconomic variables: money supply (proxied by the M2), exchange rate, inflation (measured by the Consumer Price Index) and interest rate (proxied by the 91-day Treasury bill rates). The data was transformed in rates of change by taking the log differences of each of the variables (dLn(X)) for two reasons: to be consistent with the theory of the APT model that the return forms of the data should be used and because the variables were found to be non-stationary, therefore using them in their level form could cause spurious regressions. The regression was based on the Ordinary Least Squares (OLS) technique to estimate the coefficients and the results presented interesting insights. Only the interest rate was found to be not significant in explaining stock market long run returns. Exchange rates had a negative impact on stock returns while money supply and inflation had both a positive impact. A stable macroeconomic environment therefore matters to proper stock market development but contrary to the hypothesis, interest rates do not impact stock returns. This conclusion could be explained by the fact that investors in

[3] A model based on the idea that an asset's returns can be predicted using the relationship between that same asset and many common risk factors. It advocates for multifactor analysis.

Kenya do not consider government bonds as the alternative to holding shares or as a proxy for measuring interest rate (Ouma and Muriu).

A second paper by Banerjee and Adhiarky (2009) studied the dynamic properties of changes in interest rates and exchange rates on stock market activity in Bangladesh. They used monthly data from January 1983 until December 2006. The weighted average interest rate on bank deposits was used and the stock market data was retrieved from the Dhaka Stock Exchange. The data was used in its log form because the cointegrating vector would represent long-term elasticities and the first difference would represent growth rates. Unit root tests revealed non-stationarity of the logged variables and therefore the Vector Error Correction Model (VECM) was applied to detect the presence of cointegrating relationships. Trace statistics showed no evidence of cointegration while the maximum eigen value showed a long-run linkage between the variables. They therefore tested both hypotheses. Following the maximum eigen results, they applied a VEC model. The coefficients of the lagged terms of changes in the interest rate showed a short-run positive impact of interest rate on stock market, contrary to the negative relationship idea. But the t-statistics of those coefficients were insignificant, proving that this effect was minimal. Using variance decomposition analysis, they found that with time the impact of interest rate increases to 6%, but the main variations of the stock returns were self explanatory. The impulse response function showed that a positive shock to changes of the interest rate does not have any significant influence on stock market return. They then applied the VAR model to comply with the trace statistics results of no cointegration. In this framework, they found no effect of both exchange rate and interest rate on stock market. No granger causality was detected as well (Banerjee and Adhikary).

CHAPTER 3

MONETARY POLICY AND STOCK MARKET ACTIVITY

3.1 Relationship between interest rate and stock market

Many theories nowadays advocate the importance of stock market development to the economic growth of a country. The market capitalization, that reflects the depth of a given stock market, is an important component of financial development (Massa and Billmeier) and there has been substantial evidence of the positive impact financial development has in fostering economic growth and development of a country (Khan and Senhadji). Other economists however object to this theory and argue that the development of the financial system does not affect economic growth; some of them even ignored the former while examining development economics (Levine).Given that both investors and policy makers have the purpose to ensure long term commitments in real capital in a given economy (Alam), they have given the level of efficiency of the stock markets a great deal of attention: a mature and efficient stock market indicates a healthy economy, this therefore boosts the confidence of domestic as well as foreign investors in the market.

Another important determinant of economic growth is the interest rate, a macroeconomic factor that represents the cost of capital, i.e. the cost or fee for borrowing money. Controlling the interest rate is a primary tool in monetary policy implementations. Expansionary policies are based on lowering interest rates while contractionay ones rely on central banks raising interest rates to reduce the money supply and avoid inflation.

While the ultimate goal of monetary policy is economic growth and sustainability, questions have been raised on whether these policies would affect the stock market performance and development in the country. A lot of studies were conducted on this matter as the relationship between the two parameters would provide significant implications for policy implementations, risk management practices and financial securities valuation (Alam). In theory, interest rates and stock markets are believed to be negatively correlated. Since low interest rates increase the value of equity as stated by the dividend discount model (Farrell); people would invest their money in stock markets to earn higher returns than the banks provide. Fixed income securities would be less attractive than holding stocks and lower interest rates would decrease the cost of doing business hence boosting the stock market performance.

In contrast, higher interest rates would push investors away from the stock market as low-risk interest-bearing assets such as fixed deposits, savings certificates, treasury bills or government bonds become more attractive compared to shares (French, Schwert and Stambaugh). This would lead investors to restructure their portfolios by buying bonds and selling stocks, therefore decreasing stock prices through the demand and supply channel. This inverse relationship was proved by Jefferis and Okeahalam (2000). They studied African stock markets and concluded that higher interest rates would depress stock prices due to the substitution effect (Jefferis and Okeahalam). Therefore, while central banks use the interest rate as a tool for controlling the inflation in a country, the repercussions of those decisions would indirectly affect the stock market and thus the overall economic development of the country.

On the other hand, the causes for increasing or decreasing the interest rate can be correlated with market efficiency in a country: in inefficient markets, few profits are made and people lose confidence. It becomes riskier to invest; interest rates rise and capital is moved away from the stock market and deposited into banks. The share prices therefore fall indicating a bearish stock market. Efficient stock markets on the other boost the confidence of investors. The banks consequently lower the interest rates and we witness a bullish trend in the stock markets. In addition, Fama and Schwert (1977) proved that short-term interest rates were related to future stock returns, those expectations being affected by the overall market efficiency (Fama and Schwert).

The linkage between the two parameters can also be proved by corporate finance theories. In the framework of present value analysis; all firms in general are expected to generate future cash flows, and the stock price of a firm equals the discounted value of this revenue stream. Thus higher interest rates increase the cost of capital, resulting in higher discount rates that negatively affect stock prices (Moya-Martínez, Ferrer-Lapena and Escribano-Sotos). Interest rates might also affect companies' profits: higher rates mean the cost of borrowing money has increased (E. Fama) which can reduce the demand for products by the indebted consumers. Profit margins decline as a result, affecting share prices negatively. Evidence has also shown that this negative liaison between interest rates and stock prices holds for both financial and non-financial companies (Moya-Martínez, Ferrer-Lapena and Escribano-Sotos).

Findings have suggested that whereas interest rate fluctuations have an impact on the stock market, this relationship was mostly significant on long horizons (Chutang and Kumara). In addition, Zhou (1996) proved that movements in price to dividend ratios can

be attributed to long-term interest rates in view of the fact that the high volatility of stock markets was highly related to that of bond yields; and that the latter could be controlled by changing the forecasts of the discount rates (Zhou). We therefore use in this project the long-term interest rate benchmarked by the Central Banks of the countries being analyzed.

3.2 MENA region

In the recent years, price stability and inflation targeting became a common objective among emerging markets, specifically the Middle East and North African countries (Neaime). Countries like Lebanon were able to control the inflationary bubble by pegging their currencies to low inflation ones like the Euro or the United States Dollar (Neaime). However the downfalls resulting from a fixed exchange rate regime; like real exchange rate appreciations, losses in international competitiveness and large trade and budget deficits (Neaime); pushed policy makers to search for alternative solutions. But overall, most countries maintained the exchange rate as the primary monetary tool (Gray, Karam and Meeyam).

After the Barcelona Declaration of 1995 that proclaimed partnership between the European Union and Mediterranean countries (EUR-Lex), MENA countries have been aiming for regional and inter-regional monetary and financial economic integration. A major part of economic integration is capital accounts openness, which would be difficult to achieve in some countries as monetary independence, exchange rate stability and financial integration cannot co-exist – a theory referred to as the "impossible trinity" (Aizenman). The GCC countries for example, that decided to peg their currencies to the US Dollar in 2003, were pushed to implement fiscal policies as it is the only instrument that would steer the economy under a fixed exchange rate regime (Gray, Karam and Meeyam). Other countries on the other hand adopted inflation targeting and central banks were successful in controlling inflation and interest rate expectations. Tunisia and Morocco for example decided to focus on the real exchange rate instead of the nominal one in order to avoid a currency crisis. Egypt's most

important concern after adopting a flexible regime in 2002, is implementing a monetary policy that focuses on price stability.

Financial integration on the other hand, remains a distant goal in the MENA region. While markets like Egypt are fully accessible to foreign investors, others impose investment restrictions. GCC[4] markets for instance limit portfolio investments for non-GCC investors, even non-GCC MENA countries. In Saudi Arabia, it is required that local citizens hold the majority ownership in the banking and insurance sectors. In Morocco, FDIs require prior approval. This translates into illiquid stock markets inducing stagnant market capitalization growth. In Saudi Arabia, the figure only increased from USD 40 billion to USD 60 billion from 1995 to 1999, while in Kuwait, over the 10-year period of 1989 to 1999, it increased from USD 11 billion to USD 20 billion (Neaime).

Some MENA countries made considerable efforts towards improving the efficiency and depth of their respective stock markets. The market capitalization increased in Egypt from USD 1.71 billion in 1889 to USD 32.83 billion in 1999 and in Morocco from USD 0.62 billion to 13.69 billion during the same period (Zawya), (Zawya). Most of the attention devoted to emerging financial markets is attributed to the fact that financial markets offer diversification potentials unlike mature markets. Neaime (2004) studied the degree of integration of the MENA stock markets (Neaime). He found that the GCC markets were cointegrated with each other, which can be expected since they have removed the barriers to trade between the member countries; but that those markets were not integrated with the international stock markets (US, UK and France). MENA financial markets however were

[4] Gulf Cooperation Council Countries: Bahrain, Oman, Qatar, Kuwait, Saudi Arabia, and the United Arab Emirates.

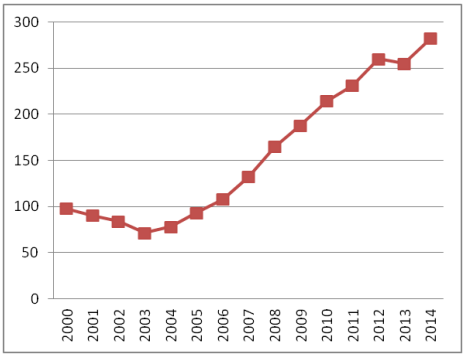
more mature and have reached a degree of integration with the world financial markets as shocks to the S&P or FTSE indices have a significant impact on their stock markets. Both long run and short run linkages were proved with cointegration and granger causality testing. Diversification potentials for MENA investors can therefore be found in GCC markets. Results also showed that while the stock markets of some MENA countries have matured and are cointegrated with the international markets, financial integration in the region was still weak.

3.3 Macroeconomic and Financial Market Overview

3.3.1 Egypt

3.3.1.1 Macroeconomic Overview

Since 2004, Egypt has been pursuing many reforms to attract foreign investments and enable economic growth (Central Intelligence Agency). This has rendered Egypt an attractive destination for foreign direct investments that amounted to USD 13.2 billion according to the calculations of the 2007/2008 fiscal year (Abu Hatab). The GDP calculated in purchasing power parity also witnessed an upward trend rising from USD 904.1 billion in 2012 to USD 943.1 billion in 2014 (Central Intelligence Agency).

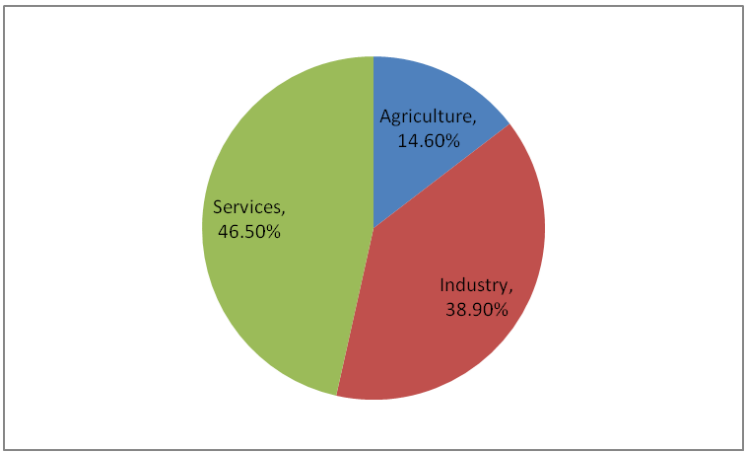


Source: Zawya

Figure 1: Nominal GDP (USD billion – Official Exchange rate)

At the official exchange rate, the GDP has been rising since 2003 and reached USD 282 billion by the end of 2014 (Zawya).

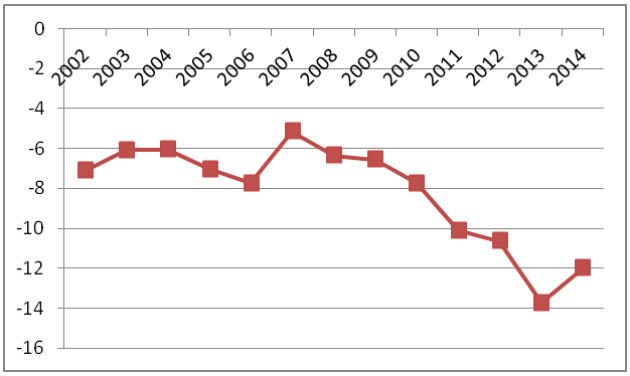
The services sector accounts for the biggest share with 46.5% as of 2014, versus 38.9% and 14.6% for the Industry and Agriculture sectors respectively (Central Intelligence Agency).



Source: Central Intelligence Agency

Figure 2: GDP Repartition by Sector - Egypt

The country however suffers from a budget deficit that amounted to 11.8% of GDP as of the end of 2014; with the government revenues of USD 65.48 billion being outweighed by the expenditures of USD 99.14 billion at that time (Central Intelligence Agency).



Source: Zawya

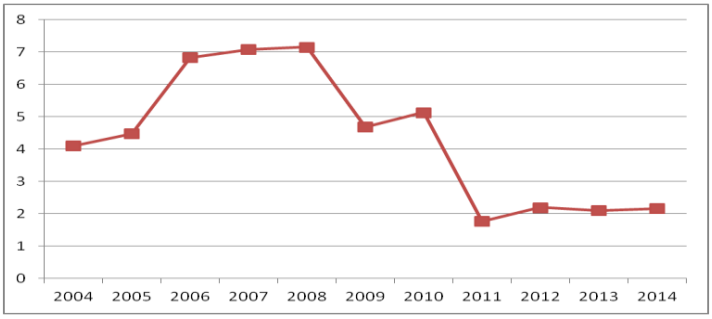
Figure 3: Budget Balance (% of GDP)

In 2002, Egypt adopted a flexible exchange rate regime. By mid-October 2003, the Egyptian Pound (EGP) had declined by 33% reaching EGP 6.15 per US Dollar, a figure that increased to about EGP 7.8 per USD nowadays (Zawya).

Source: Zawya

Figure 4: Egyptian Pound (USD/EGP)

Towards the end of 2008, the global financial crisis that hit the worldwide economy; starting from the United States then spreading to Europe and the rest of the world; had negative repercussions on the Egyptian economy. The real GDP growth witnessed a setback, decreasing from 7% in the years prior to the crisis to 4% in 2009 (Zawya).



Source: Zawya

Figure 5: GDP Growth (% change pa)

The foreign trade took also a hit with the percentage change in real exports of goods and services declining from 28.7% in 2008 to -14.5% in 2009, and the percentage change in real imports of goods and services also falling from 26.2% in 2008 to -17.8% in 2009 (Zawya). Furthermore, the percentage change in real gross fixed investment decreased from 14.8% in 2008 to -10.2% in 2009 (Zawya) and the Foreign Direct Investment that had reached USD

13.2 billion in the 2007-2008 fiscal year dropped to USD 9.56 billion in that of 2008-2009 (Abu Hatab). This was not only due the consequences of the crisis on the Egyptian economy, but also to the fact that more than half of the FDI flows that entered Egypt came from the United States and Europe that were already in recession by that time (Abu Hatab).

After this financial crisis, Egypt witnessed another setback. In early 2011, a revolution struck, known as the January 25 revolution, with the goal to overthrow the president – at that time Husni Mubarak. The poor living conditions and limited job opportunities in the country mainly contributed to public discontent that resulted in this revolution (Central Intelligence Agency). This incident didn't only have political repercussions, but also economic ones. The real GDP growth that reached 4% after the financial crisis as previously stated, started picking up and increased to 5.1% in 2010 (Zawya) took an even larger hit after the revolution and fell to 1.7% in 2011 (Zawya). Before the revolution, total investments amounted to 16.4% of GDP in the 2010/2011 fiscal year according to World Bank figures, a number that dropped to 14.2% of GDP in FY 2012/2013. The unemployment levels increased from 9% in 2010 to 12.7% in 2012 and foreign reserved decreased from USD 36 billion in 2010 to USD 14 billion in 2012 (Zawya).

Political tensions resumed in 2013 with demonstrations against President Morsi who was therefore replaced President Adly Mansour on July 4, 2013. On 8 June 2014, Abdel Fattah El-Sisi was elected as president with almost 97% of the votes (World Bank). The newly elected president announced a wide range of reforms that had a positive impact on the economy. The economic growth of 2.2% in the 2014 FY is expected to reach 4.7%

by the end of 2015 (Zawya). The budget deficit that was at 14% in 2013 is expected to decline to 11.3% in FY 2015 (World Bank).

3.3.1.2 Financial Market Overview

Source: Zawya

Figure 6: Egypt Stock Exchange

One of the oldest stock markets established in the MENA region in the Egyptian Stock Exchange. It dates back to 1883 when the Alexandria Stock Exchange was established followed by the Cairo Stock Exchange in 1903 (Egyptian Exchange). In the 20th century, the Egyptian Exchange was considered the 5th most active exchange in the world (EFSA). Today, it includes 7 indices: EGX 30 Index, EGX 70 Index, EGX 100 Index, DJ EGX Egypt Titans 20 Index, S&P/EGX ESG Index, EGX 20 Capped Index and Nile Index. The Nile Index (Nilex) is the Egyptian Exchange market for small and medium enterprises (SMEs). Trading on the Nilex started effective 3 June 2010. The Egyptian stock market experienced a severe fall in the first quarter of 2009 in the wake of the worldwide financial crisis, with the EGX 30 Index reaching its lowest level in four years (The Egypian Exchange). In 2011 due to the revolution, the stock market took another hit and the Exchange was closed from 30 January 2011 until 22 March 2011.

Table 1: EGX Listed Companies

Year	no. of listed companies	average company size (LE million)	no. of traded companies	no. of traded companies (% of listed companies)
2004	795	294	503	63
2005	744	613	441	59
2006	595	897	407	68
2007	435	1,766	337	77
2008	373	1,259	322	86
2009	306	1,633	289	94
2010	212	2,302	211	99
2011	213	1,378	204	96
2012	213	1,763	204	96
2013	212	2,013	206	97
2014	214	2,337	206	96

Source: Egypt Stock Exchange

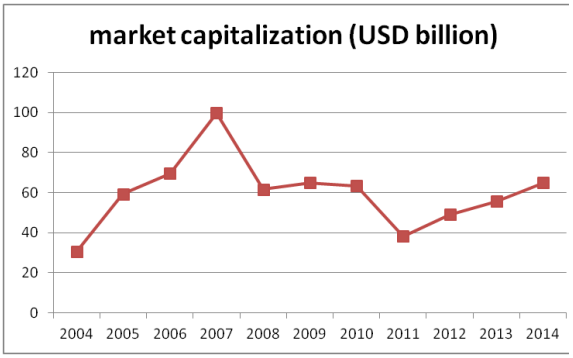
The number of companies has been sharply declining over the past 10 years, going from 795 listed companies in 2004 to 214 by the end of 2014. The number of traded companies as a percentage of all listed companies has however increased, reaching 96% in 2014. The average company size, calculated by dividing the total market capitalization over the number of listed companies reached EGP 2,337 million according to the last calculations.

Table 2: Egyptian Stock Exchange Market Capitalization

Year	market capitalization (LE billion)	market capitalization (USD billion)**	market capitalization (% of GDP)
2004	234	30.42	43
2005	456	59.28	74
2006	534	69.42	72
2007	768	99.84	86
2008	474	61.62	53
2009	500	65	41
2010	488	63.44	40
2011	294	38.22	19
2012	376	48.88	24
2013	427	55.51	21
2014	500	65	25

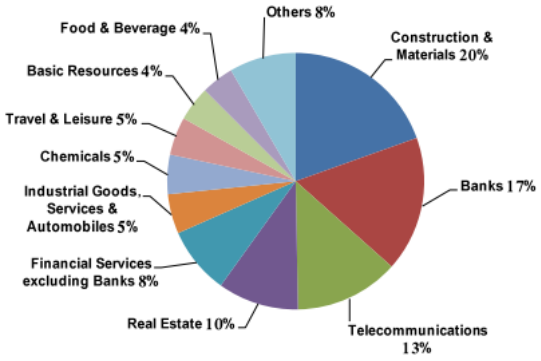
Source: Egyptian Stock Exchange
**EGP 1 assumed to be equal USD 0.13

By the end of 2014, the market capitalization calculated as the number of listed shares times the closing prices at end of year, amounted to around USD 65 billion. The Egyptian stock market has witnessed heavy fluctuations since 2004, taking a serious bearish trend from 2007 till 2008 and then again from 2010 till 2011. This can be explained by the two crises that occurred during those years: the worldwide financial crisis followed by the political revolutions in Egypt. The market capitalization as a percentage of GDP has also been declining. In 2014, only 25% of the GDP was attributable to the market capitalization.



Source: Egypt Stock Market

Figure 7: Egypt Stock Exchange Market Capitalization



Source: Egypt Stock Market

Figure 8: Egypt Market Capitalization by Sector (2014)

The market capitalization is divided among all the sectors of the Egyptian economy. The main shares of market capitalization are attributable to the constructions and materials sector (20%), banking sector (17%), telecommunications (13%) and real estate (10%) by the end of 2014.

The securities traded on the Egyptian stock market are stocks, bonds (government bonds, housing bonds and corporate bonds), mutual funds and exchange traded funds (ETFs). In 2013, EGX has approved the listing of ETFs on EGX 30 index (Egyptian

Exchange). The Egyptian stock exchange is also divided in 3 categories: the main market, the Nilex market, and over the counter transactions (OTC).

The following table includes the trading aggregates of the three markets.

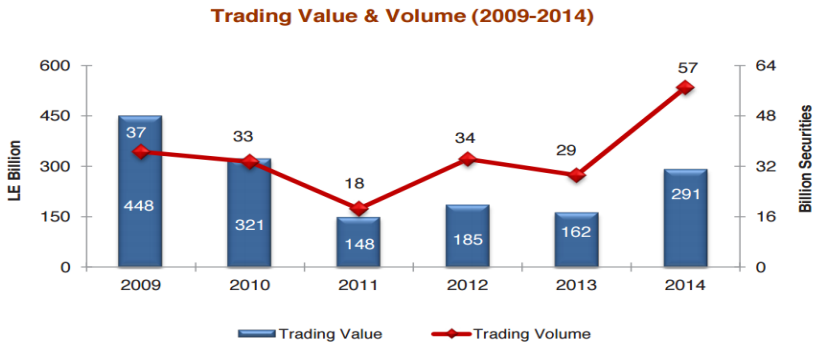
Table 3: Trading Aggregates - Egypt Stock Exchange

Year	Total Volume Traded (billion securities)	Total Value Traded (LE billion)	Total Value Traded (USD billion)	Total Number of Transactions (million)	Turnover Ratio %
2004	2.4	42.3	5.499	1.8	14.2
2005	5.3	160.6	20.878	4.2	31.1
2006	9.1	287	37.31	6.8	48.7
2007	15.1	363	47.19	9	38.7
2008	25.5	529.6	68.848	13.5	70.3
2009	36.6	448.2	58.266	14.6	50
2010	33	321	41.73	10	41
2011	18.5	148	19.24	5.6	32
2012	34	185	24.05	6.2	29
2013	29	162	21.06	4.8	21
2014	57	291	37.83	7.3	38

Source: Egypt Stock Exchange

The trading volume has jumped to 57 billion securities in 2014; the highest ever for the Egyptian stock exchange, amounting to USD 37 billion. After the 2008 financial crisis, the value has sharply dropped from USD 69 billion till USD 20 billion in 2011. Two years after the Egyptian revolution, the stock market was still struggling. It wasn't until 2013 that the value started increasing again and reached USD 38 billion by the end of 2014. Trading on the Nilex market started effective 3 June 2010. The Exchange was closed from 30 January 2011 till 22 March 2011 due to the Egyptian revolution during this time.

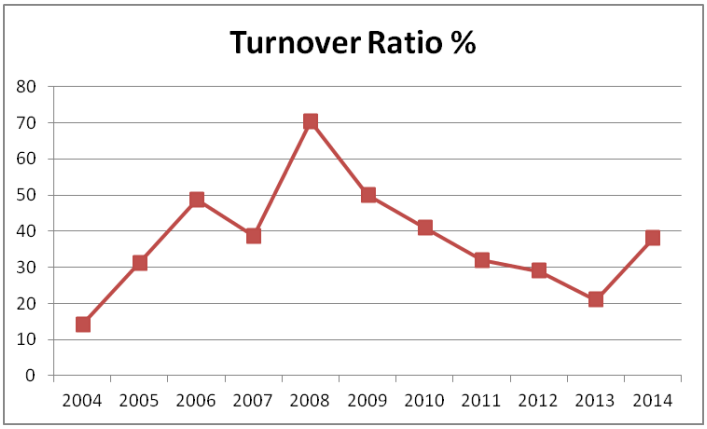
The five most active sectors on the Egyptian stock exchange in terms of volume traded are: financial services excluding banks (17 billion shares), telecommunication (17 billion shares), real estate (6 billion shares), travel and leisure (4 billion shares) and industrial goods and services and automobiles (3 billion shares).



Source: Egypt Stock Exchange

Figure 9: Trading Value and Volume – Egypt Stock Exchange

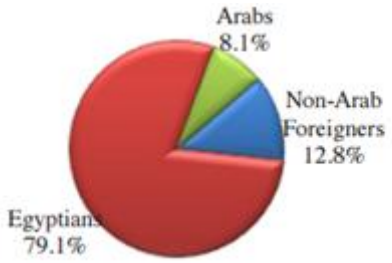
The turnover ratio, calculated as the value traded of listed shares divided by the market capitalization, was therefore decreasing as well, going from 70% in 2008 to 21% in 2013.



Source: Egypt Stock Exchange

Figure 10: Turnover Ratio – Egypt Stock Exchange

The Egyptian stock market is an open market allowing investors from all over the world to participate. However, more than half of the investors were still Egyptians (79.1%) by the end of 2014 with 12.8% of non-Arab foreigners and 8.1% of Arabs investing in the Egyptian stock market.



Source: Egypt Stock Market

Figure 11: Egyptians vs. Foreigners in Terms of Value Traded (end of 2014)

Those numbers have however been fluctuating a lot since 2005. The numbers of Egyptian, Arab and Foreign investors are reported in the table below.

Table 4: Numbers of Coded Investors – Egypt Stock Exchange

Year	Egyptians	Arab Investors	Foreigners
2005	41,5045	5,333	1,271
2006	120,733	2,873	1,206
2007	89,637	1,099	1,177
2008	61,348	1,983	1,273
2009	511	93	1,050
2010	29,187	1,667	3,909
2011	33,569	886	1,597
2012	20,082	742	1,398
2013	14,693	538	1,076
2014	19,621	571	1,480

Source: Egypt Stock Exchange

During the crisis of 2008, only the numbers of Egyptians and Arab investors took a hit while surprisingly foreign investors were not largely affected. According to the Egyptian stock exchange annual report of 2014, foreign investors had a significant trading activity during that year, generating capital inflows of more than EGP 3.4 billion. This reflects the growing investors' confidence in the Egyptian market nowadays (Egyptian Exchange).

The rules of the exchange states that all non-Egyptians can invest up to 100% of all companies except for four companies that do not allow foreign ownership: Export Development Bank, Sharm Dreams, Abu Kir Fertilizers and Sinai Cement Company (Zawya).

Source: Egypt Stock Market

Figure 12: Individuals vs. Institutions in terms of value traded (end of 2014)

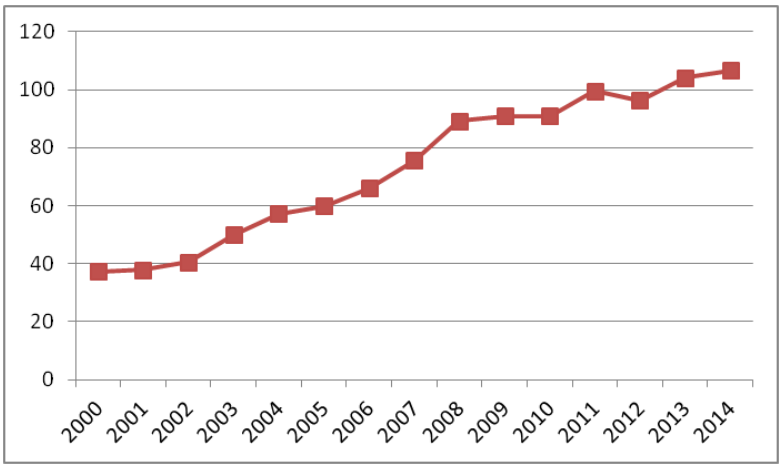
As of 2014, the Egyptian market was mainly dominated by individuals, accounting for 71% of the value traded during 2014 versus only 29% for institutions, after excluding deals and bonds.

For the study we use the EGX30 Index; a weighted index of the most liquid stocks traded on the Egyptian exchange; developed on January 1st 1998 with a base level of 1000 (Bloomberg). Previously known as the CASE 30 Index, its constituents are reviewed in February and August of every year (Bloomberg). The market capitalization of that index reached EGP 207 billion in September 2015, 51.49% of the total market capitalization in Egypt (Egyptian Exchange).

3.3.2 Morocco

3.3.2.1 Macroeconomic Overview

Morocco is considered to be a constitutional monarchy that has developed a market oriented economy; with a GDP per capita of USD $7,600 as of 2014 (CIACentral Intelligence Agency). The country was ranked first most competitive North African economy according to the African Competitiveness 2014-15 report published by the World Economic Forum (World Economic Forum).



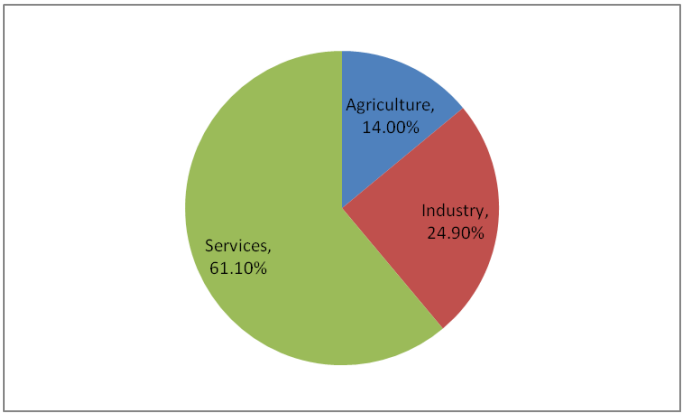
Source: Zawya

Figure 13: Nominal GDP (USD billion – Official Exchange Rate)

The nominal GDP converted to USD has been increasing since 2000, reaching USD 106 billion in 2014 (Zawya).

As of 2014, the services sector accounted for 61.1% of total GDP followed by 24.9% and 14% for the industry and agriculture respectively. Despite the fact that it only accounts for 14% of the total GDP the agriculture sector employs almost 40% of the Moroccan population (CIACentral Intelligence Agency). The Travel and Tourism sector contributed

to 8.1% of total GDP in 2014 and has directly supported 775,500 jobs (7.1% of total employment). Its contribution to GDP is expected to rise by 3.7% in 2015, and then to increase by 5.5% per annum for the 2015-2025 period (The Authority on World Travel & Tourism).



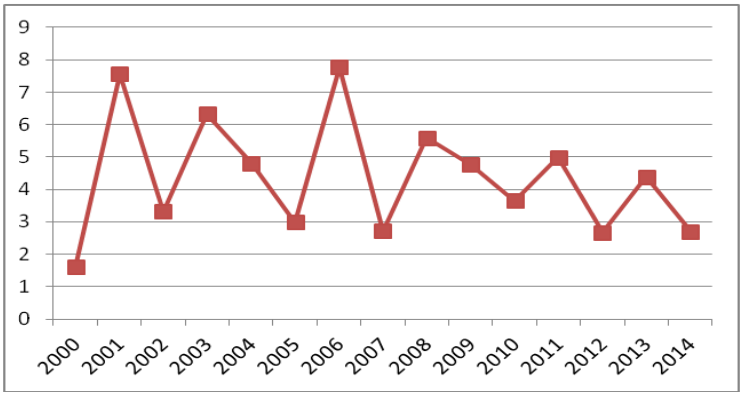
Source: Central Intelligence Agency

Figure 14: GDP Repartition by Sector – Morocco

One of the most important aspects of the Moroccan economy is the free trade agreements that Morocco has signed with its principal economic partners. On 1 March 2000, the Euro-Mediterranean free trade area agreement entered into force with the European Union (EU). The objective of this agreement is to liberalize trade between the EU and Mediterranean countries (European Commission). In 2001, the Agadir Agreement was signed with Egypt, Jordan and Tunisia, within the framework of the Greater Arab Free Trade Area (Agadir Agreement). It was followed by the free trade agreement between the United States and Morocco that came into force on June 15, 2004 (Office of the United States Trade Representative). Lastly, an agreement was ratified with Turkey in 2004 for free exchange to promote economic relations between the two countries and contribute to the development

and expansion of world trade (Moroccan Ministry of Economy and Finance). This agreement came into effect on January 1st, 2006.

Despite a difficult economic environment after the 2008 financial crisis, the Moroccan economy did not to suffer any significant backslash in that year. Even with reduced international economic growth and the increase in raw materials prices, the growth rate of real GDP stood at 5.6% by the end of 2008 versus 2.7% in the previous year (Zawya).



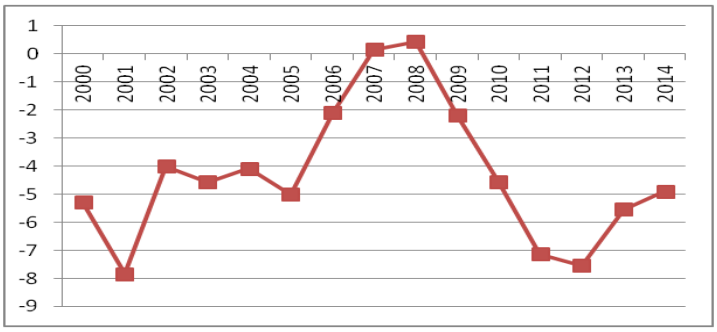
Source: Zawya

Figure 15: GDP Growth (% change pa)

The impact of the crisis was more severe in the first half of 2009, when the growth rate of the non-agricultural GDP reached only 0.6%. The overall GDP growth declined to 4.9% by the end of 2009 with a budget deficit of 2.2% of GDP versus a 0.4% surplus in 2008 (Zawya).

Foreign trade recorded a deficit of MAD 153.2 billion in 2009 compared to MAD 170.3 billion 2008 (Casablanca Bourse). In a troubled international and regional environment, Morocco continued registering economic slowdown until 2013. Improvement in the economic indicators was registered. Budget deficit fell from -7.5% of GDP in 2012 to -

5.5% in 2013 and a 25.5% growth in foreign direct investment was recorded by the end of December 2013 (Zawya).

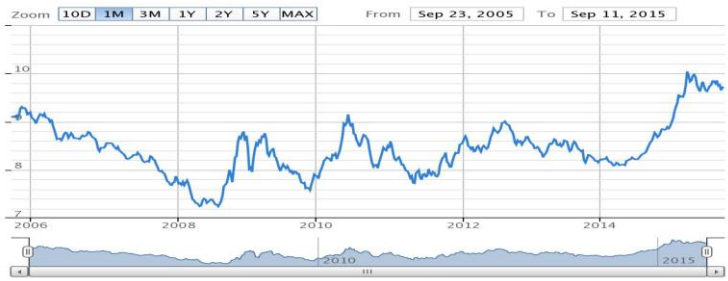


Source: Zawya

Figure 16: Budget Balance (% of GDP)

A further 6.3% reduction in the budget deficit was witnessed in 2014 according to the 2014 Annual report of the Casablanca Stock Exchange, with the main economic indicators being positive (Casablanca Sotck Exchange). Investment levels were maintained that year, the money supply increased by 6.6% by the end of December 2014 and net foreign direct investment increased by 7.8%. Despite the progress in macroeconomic stability, growth is relatively weak reflecting the dependence on the agricultural sector and the slow pace of structural reforms (Jbili and Kramarenko).

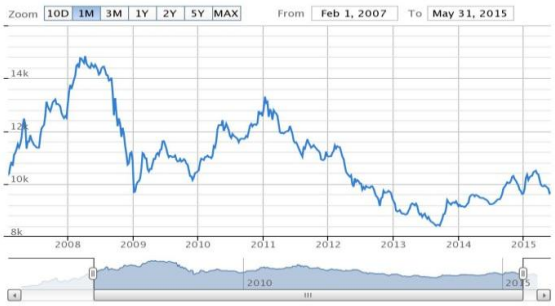
The currency in Morocco, the dirham, is pegged to a basket of currencies. Bank Al-Maghrib has however announced a plan to revise the currency peg in December (Bloomberg).



Source: Zawya

Figure 17: Moroccan Dirham (USD/MAD)

3.3.2.2 Financial Market Overview



Source: Zawya

Figure 18: Morocco Stock Exchange

The Casablanca Stock Exchange was established in 1929 under the name "Office de Compensation des Valeurs Mobilières" (Office for Clearing of Transferable Securities). In April 2009, it officially adopted a corporate governance structure by establishing a Board of Directors and General Management (Casablanca Bourse).

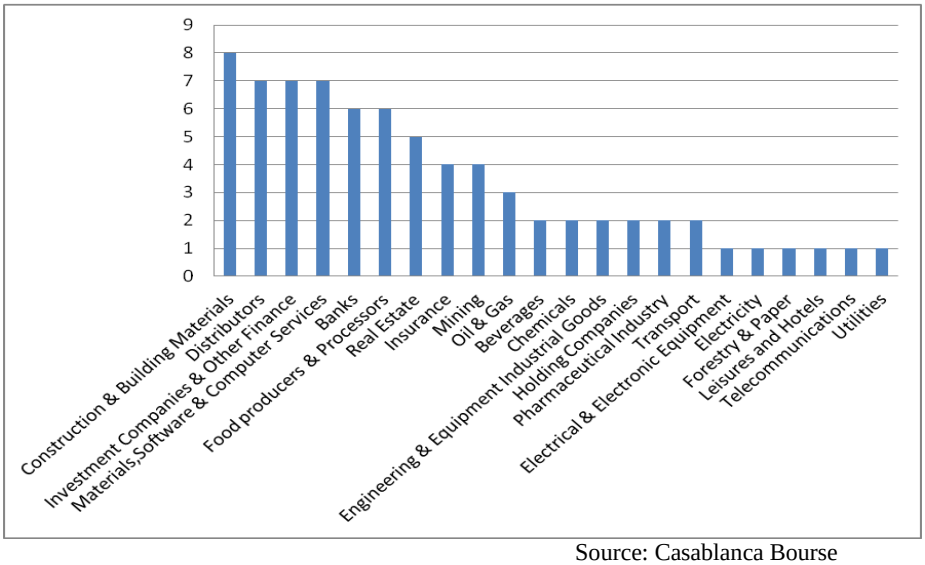
The number of companies listed on the Exchange has risen from 53 listed companies in 2004 to 77 in 2013 and decreased to 75 to date (Casablanca Bourse), (World Federation of Exchanges). The companies belong to the three markets of the Moroccan stock exchange: main market, development market and growth market.

Table 5: Listed Companies – Morocco Stock Exchange

Year	2004	2013	2015
no. of listed companies	53	77	75

Source: Casablanca Bourse

They are also divided across the different sectors of the economy. The main share belongs to the construction industry, followed by investment companies, distributors and materials and software.



Source: Casablanca Bourse

Figure 19: Listed Companies by Sector (2015) – Morocco Stock Exchange

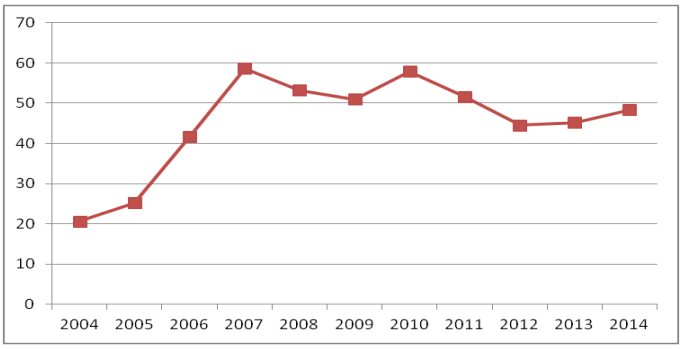
Equities, bonds, venture capital funds and special purpose vehicles are traded on this exchange (World Federation of Exchanges). The market capitalization of the stock exchange increased from MAD 451 billion in 2013 to MAD 484 billion in 2014, an increase of 7.3% versus a 1.3% increase from 2012 to 2013.

Table 6: Market Capitalization – Morocco Stock Exchange

Year	market capitalization (MAD billion)	market capitalization (USD billion)**
2004	206	20.6
2005	252	25.2
2006	417	41.7
2007	586	58.6
2008	532	53.2
2009	509	50.9
2010	579	57.9
2011	516	51.6
2012	445	44.5
2013	451	45.1
2014	484	48.4

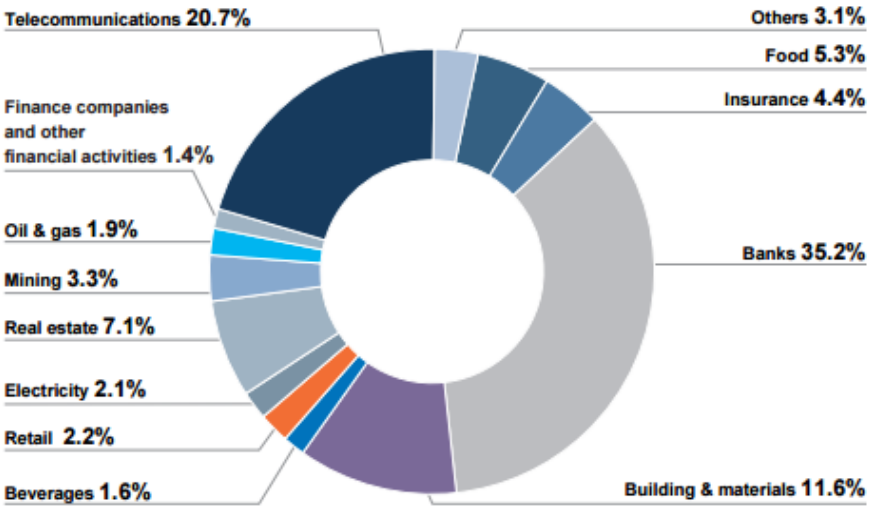
Source: Casablanca Bourse
**MAD 1 assumed USD 0.10

A sharp increase was witnessed 10 years ago. The market capitalization grew from USD 20 billion in 2004 to USD 58 billion in 2007, an increase of almost 35%. This was largely due to the increase of public offerings and trading volume during those years.



Source: Casablanca Bourse

Figure 20: Market Capitalization in USD billion – Morocco Stock Exchange



Source: Casablanca Bourse

Figure 21: Breakdown of Market Capitalization by Sector (2014)

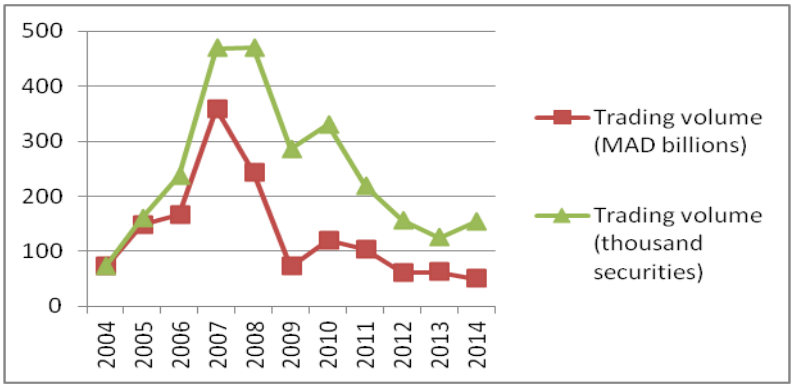
By the end of 2014, the banking, telecommunications and building & materials sectors accounted for the largest share of market capitalization with 35.19%, 20.65% and 11.62% respectively (Casablanca Sotck Exchange).

Table 7: Trading Volume – Morocco Stock Exchange

Year	Trading volume (MAD billions)	Trading volume (thousand securities)
2004	72	73
2005	148	160
2006	166	238
2007	359	469
2008	244	470
2009	72	285
2010	120	330
2011	103	219
2012	61	157
2013	62	125
2014	50	155

Source: Casablanca Stock Exchange

The overall trading volume amounted to MAD 50 billion by the end of 2014 versus MAD 62 billion in 2013, falling almost 19.8% in one year. Also, 89% of this volume belongs to the equities and only 11% to the bonds market with 62.1% of the transactions executed on the central market (CSE).



Source: Casablanca Bourse

Figure 22: Trading Volume – Morocco Stock Exchange

Since 2008, trading volume has been sharply declining, reaching 155 thousand securities traded in 2014 versus 470 thousand in 2008. The index has lost almost 20% in the last 5 years according to Thomson Reuters' calculations. The negative repercussions were witnessed as the MSCI index downgraded the Casablanca exchange to "frontier market" status in 2013 due to lack of liquidity (El Yaakoubi).

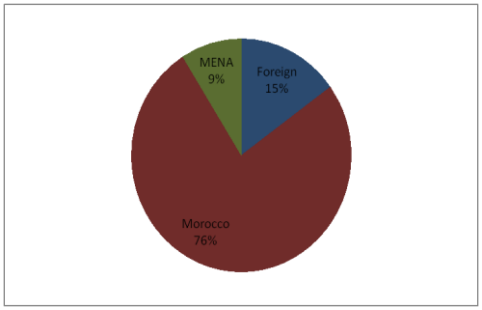
In 2014, many relationship agreements with therefore employed with foreign countries like China, the United Kingdom, Tunis, South Africa and Istanbul as part of a plan to establish openness with the international financial community (CSE). In September 2015, the government announced considering foreign companies to list on the Casablanca stock exchange and creating a second market dedicated to small and medium-sized businesses (El Yaakoubi). This would represent the first major move since the 90's to develop the Casablanca Market, but this law is still awaiting parliament approval.

Reforms have modernized the stock market recently in order to make it possible for the country to qualify for trade agreements with the European Union and the United States (UHY) . The restraints on foreign-held businesses and foreign trade and exchange systems were relaxed and all economic sectors are now open to foreign investment. According to the World Bank's Report *Investing across Borders 2010,* the foreign ownership limit varies across the different sectors of the economy. The restriction is mostly severe in the Media sector with a 20% foreign ownership Limit. However foreign direct investment in Moroccan companies requires prior approval (Hufbauer and Brunel).There are no local partner or joint venture requirements but the country doesn't allow ownership of land by foreigners (IAB). Most of the shareholders however remain Moroccan until today (Zawya).

Investing across sectors	Foreign Ownership Allowed (%)
Mining, Oil & gas	100
Agriculture and Forestry	100
Light Manufacturing	100
Telecommunications	75
Electricity	100
Banking	100
Insurance	100
Transportation	100
Media	20
Construction, Tourism, Retail	100
Health care, Waste Management	100

Source: World Bank

Figure 23: Foreign Ownership Limit by Sector



Source: Zawya

Figure 24: Moroccan vs. Foreign ownership (2015)

On the other hand, holding foreign assets by Moroccan nationals is prohibited. The foreign exchange office has control over currency transfers and exchanges as it is not possible to use debit or credit cards for international transactions (Hufbauer and Brunel).

We use in this study the Casablanca Stock Exchange CFG 25 Index, comprised of 25 stocks listed on the Casablanca Stock Exchange. The stocks included in this index are included in the top 35 market capitalizations and the top 30 most liquid stocks during the last 12 month (Bloomberg). It is a close representative of the listed companies in the various industries.

CHAPTER 4

METHODOLOGY AND RESULTS

4.1 Data and Methodology

This paper examines the impact of changes in interest rate on stock returns in Egypt and Morocco. For this purpose, the data chosen includes monthly prices from February 2007 to May 2015 and the dataset is retrieved from the Thomson Reuters database. As a representative benchmark of the stock market, we use the Egyptian Exchange EGX 30 Price Index (***EGX30***) and the Casablanca Stock Exchange CFG 25 (***MCSINDEX***) for Morocco. For the interest rates, we use the benchmark interest rate for deposits recorded by the Central Bank of Egypt (***EINTEREST***) and the benchmark interest rate for deposits recorded by the Bank Al-Maghrib for Morocco (***MINTEREST***). Our analysis is limited to a bivariate one.

4.1.1 Unit Root

To examine to time series property of each of the variables, we need determine the order of integration of the variables used in the study. Following the Dolado et al. strategy (Dolado), we use the Augmented Dickey Fuller (ADF) and the Phillips Perron (PP) tests for this matter. Both tests are based on the following equation but the tests statistics are calculated differently:

$$\boldsymbol{X_t = \rho X_{t-1} + \mathcal{E}_t}$$

If we have a unit root; $\rho = 1$ and we get: $\boldsymbol{X_t = X_{t-1} + \mathcal{E}_t}$

If $\rho \neq 1$, then we don't have unit root and X_t is a stationary process.

Hypothesis Testing:

H_0: ρ=1 (prices follow a random walk, distribution non-stationary)

$H_{1:}$ $\rho < 1$ (prices do not follow a random walk, distribution stationary)

For to the ADF test, the lag length is determined based on the Akaike Information Criterion (Akaike). For PP test, we automatically select the Newey-West bandwidth.

4.1.2 Cointegration Testing

In order to capture the dynamics of long run effects, co-integration analysis is used (Engle and Granger). If each variable of a time series is stationary after being differenced, but a linear combination between the non-stationary variables is already stationary, then the variables are said to be co-integrated (Wang) (Engle and Granger).

Assume we have the following model:

$$\boldsymbol{Y_t = \beta_1 + \beta_2 X_t} + \varepsilon_t$$

If Y_t and X_t are nonstationary I(1) variables, we might expect that ε_t is also I(1). However, Y_t and X_t are nonstationary I(1) variables but ε_t is stationary I(0), then Y_t and X_t are said to be cointegrated. So two series are cointegrated if a linear combination has a lower level of integration.

To test for cointegration we use Johansen's approach. We test for cointegration of the I(1) variables so we use the non-stationary data set and not the differenced one. If cointegration is found then the remaining analysis can be performed using a VECM, otherwise the I(1) variables are differenced and a simple unrestricted VAR can be used. We first specify the number of lags ρ based on the AIC criterion (Akaike). After the number of lags has been specified, we can run the test and look at the results of the Trace Statistics and Maximum Eigenvalue statistics.

Assume Z_t is stationary and has the following equation: $\mathbf{Z_t = Y_t - \gamma X_t}$

We test the significance of the the cointegrating coefficient γ.

Hypothesis Testing:

For None:

H_0: γ=0 (No cointegration)

H_1: $\gamma \geq 1$ (At least 1 cointegrating relationship)

If we fail to reject the null hypothesis, we have no cointegration relationship.

If we reject the null hypothesis, we move to the next step.

At most 1:

H_0: γ=1 (At most 1 cointegrating vector)

H_1: $\gamma \geq 2$ (At least 2 cointegrating vectors)

If we fail to reject the null hypothesis, we have a cointegration relationship of vector 1; in other words, we have a weak form cointegration relationship.

If we reject the null hypothesis, we move to the next step where there are either at most 2 cointegrating vectors or at least 3 cointegrating vectors and so on.

4.1.3 VAR Model

If there is no evidence of cointegrating vectors among the variables, we proceed by using a simple unrestricted vector autoregression (VAR) model. This model considers all variables to be endogenous and is mainly used for forecasting purposes; to determine the direction of causality between variables and to study the effect of shocks through impulse response and variance decomposition functions (Sims).

The basic p lag vector autoregressive (VAR) model has the following reduced form:

$$\boldsymbol{Y_t = c + \Pi_1 Y_{t-1} + \Pi_2 Y_{t-2} + \cdots + \Pi_\rho Y_{t-\rho} + \mathcal{E}_t}$$

Where Y_t is an ($_{nx1}$) vector of stationary variables, II are ($_{nxn}$) coefficient matrices and ρ is the order of the VAR.

To appropriately specify the lag length ρ, we check once again the lag structure for each of the models based on the AIC criterion (Akaike) where the maximum number of lags is calculated using Schwert's formula: $\rho_{max} = 12 * (\frac{T}{100})^{0.25}$ (Schwert).

4.1.4 VECM

If we find evidence of cointegrating relationship between the variables, we proceed by applying a Vector Error Correction Model (VECM). The paths of cointegrated variables are influenced by the extent of any deviation from long-run equilibrium. And if the system is to return to long run equilibrium, the movement of at least some of the variables must respond to the magnitude of the disequilibrium. We therefore examine the time paths of the non-stationary variables using the VECM of the following form:

$$\boldsymbol{\Delta I_t = \gamma + \prod I_{t-1} + \sum_{k=1}^{k} \Gamma_k I_{t-k} + \epsilon_t}$$

Where ΔI corresponds to vector of variables in difference, $\boldsymbol{\Pi = -(I - \sum_{i=1}^{k} A_i)}$ is an ($_{nxn}$) matrix that represents error-correction adjustments toward the long–run equilibrium, $\boldsymbol{\epsilon_t}$ is a column vector of pure shocks and $\boldsymbol{\gamma}$ corresponds to a vector of constants that accounts for the increasing trend in both series over time.

4.1.5 Granger Causality Testing

To determine the direction of the causality between the variables, i.e. test the short run relationship between them if any, we use the Granger method (Granger, Investigating

causal relations by econometric models and crossspectral methods). This method consists of applying the Wald test on an unrestricted VAR model to determine if the coefficients are jointly significant or not (Granger, Investigating causal relations by econometric models and crossspectral methods); provided that all the variables are stationary (Granger and Newbold, Spurious regressions in econometrics), or on the restricted VECM applied on the non-stationary data.

The granger causality is tested by estimating the following model:

$$\boldsymbol{Y_t = a_0 + a_1 Y_{t-1} + \ldots + a_\rho Y_{t-\rho} + b_1 X_{t-1} + \cdots + b_\rho X_{t-\rho} + u_t}$$

<u>And then testing:</u>

$H_{0:}\ b_1 = b_2 = b_3 = \ldots = b_p = 0$ (X_t does not granger cause Y_t)

$H_{a:}\ b_1 = b_2 = b_3 = \ldots = b_p \neq 0$ (X_t granger cause Y_t)

<u>And similarly:</u>

$$\boldsymbol{X_t = c_0 + c_1 X_{t-1} + \ldots + c_\rho X_{t-\rho} + d_1 Y_{t-1} + \cdots + d_\rho Y_{t-\rho} + v_t}$$

$H_{0:}\ d_1 = d_2 = d_3 = \ldots = d_p = 0$ (Y_t does not granger cause X_t)

$H_{a:}\ d_1 = d_2 = d_3 = \ldots = d_p \neq 0$ (Y_t granger cause X_t)

If the probability of X_t does not granger cause Y_t is less than 0.05, then we reject the null hypothesis of no granger causality and there is a short run relationship between X_t and Y_t; otherwise there is no short run relationship.

4.1.6 Impulse Response Function

To further investigate how a shock to the one variable is transmitted to the other, we examine the Impulse Response Functions.

Impulse response function shows the impact of a shock to an endogenous variable on the variables in the VAR. The effect traced is that of a one standard deviation shock to one.

4.1.7 Variance Decomposition

The last step needed to characterize the dynamics of the model is to run the variance decomposition analysis.

Variance decomposition decomposes the variation in an endogenous variable into the component shocks to the endogenous variables in the VAR. The variance decomposition shows the relative importance of each random innovation to the variables in the VAR.

4.2 Empirical Results

4.2.1 Descriptive statistics

We start by the descriptive statistics of the variables used in the study. The table presents some descriptive statistics of the monthly stock market returns for Egypt and Morocco as well as the benchmarked interest rates for the two countries, including mean, median, standard deviation (Std. dev.), minimum (Min.) and maximum (Max.) values and also skewness and kurtosis measures. The Jarque-Bera test for normality and its probabilities are presented in the last two rows.

Table 8: Sample descriptive statistics

	EGX30	EINTEREST	MCSINSEX	MINTEREST
Mean	6790.048	9.0225	22754.76	3.13
Median	6478.475	8.75	22688.28	3.25
Max.	11786.51	11.5	30057.31	3.5
Min.	3597.56	8.25	17421.49	2.5
Std. Dev.	1968.357	0.842446	3032.424	0.223268
Skewness	0.582106	1.407001	0.399511	-1.21486
Kurtosis	2.496772	4.746715	2.626455	4.681547
Jarque-Bera	6.702622	45.70676	3.24155	36.37956
Probability	0.035038	0	0.197745	0

Inspection of the descriptive statistics reveals approximate normality in the data distribution of the stock returns but non-normality for the interest rates. The kurtosis for both stock markets falls below the benchmark of 3 for a normal distribution revealing approximate normality but is above that threshold for the interest rates. The Jarque-Bera that tests the null hypothesis of a normal distribution indicates normality for the *MCSINDEX* at the 1%, 5% and 10% confidence intervals. For the *EGX30* returns, this test

only reveals normality at the 1% statistical significance level and indicates a non-normal distribution for the interest rates; those results being in line with the descriptive statistics. Looking at the skewness, we can see that for the exception of the Moroccan interest rates, all the data distributions are skewed to the right (the highest values are clustered on the left of the distribution). The standard deviations for are also quite low compared to the mean of the distributions showing a small coefficient of variation.

4.2.2 Unit Root

The results for the level and differenced variables are summarized in Table 1, from which we can conclude that all the variables are integrated of the first order (I(1)).

Table 9: Unit root test results

Variables	**ADF**				**PP**			
	Trend &Intercept	***Intercept***	***None***	***Order***	***Trend& Intercept***	***Intercept***	***None***	***Order***
EGX30	-1.63 (0.77)	-2.69 (0.07)	-0.25 (0.59)	I(1)	-1.85 (0.67)	-1.92 (0.32)	-0.32 (0.56)	I(1)
Δ*EGX30*		*-8.06 (0)*		*I(0)*		*-8.23 (0)*		*I(0)*
EINTEREST	-3.82 (0.019)	-3.67 (0.006)		I(1)	-2.37 (0.38)	-2.30 (0.17)	-0.21 (0.60)	I(1)
Δ*EINTEREST*		*-3.99 (0.002)*		*I(0)*		*-7.69 (0)*		*I(0)*
MCSINDEX	-2.55 (0.30)	-1.36 (0.60)	-0.44 (0.51)	I(1)	-2.71 (0.23)	-1.35 (0.60)	-0.44 (0.51)	I(1)
Δ*MCSINDEX*		*-9.33 (0)*		*I(0)*		*-9.33 (0)*		*I(0)*
MINTEREST	-1.56 (0.79)	0.33 (0.97)	-1.32 (0.17)	I(1)	-1.73 (0.72)	0.26 (0.97)	-1.26 (0.18)	I(1)
Δ*MINTEREST*		*-4.81 (0001)*		*I(0)*		*-9.99 (0)*		*I(0)*

Probability values are in parentheses.
a) AIC is used to select the lag length.
b) Barlett Kernel is used as the spectral estimation method. Newey-West is used as the bandwidth selection method.
c) Data is tested at the 99% confidence level

The statistical output of unit root test for the stock markets suggests that there are no serial dependencies of return of the two stock exchanges. ADF calculated values are significant at 99% confidence level for all 12 degrees of freedom (lags) which suggest that these markets follow a random walk model; meaning that they are both week form

efficient. This conclusion is in line with the results of Fama (1965) that could not reject the random walk behavior of stock prices (E. Fama). Shiller (1989) studied this theory further and proved there are reasons the null hypothesis of stock prices following random should hold (Shiller).

4.2.3 Egypt

To determine whether Egypt's stock market and interest rate are cointegrated, we use Johansen's approach. We determine lag length using the VAR lag length criterion. According to the AIC, the maximum numbers of lags is 4. Therefore we test for cointegration with (n-1) = 3 lags. Since the graph of both series doesn't show any tendency for an upward trend over time, we use the Johansen with no intercept and no trend. Trace statistics indicates the presence one cointegrating vector at the 5% confidence level.
To be on the safe side we test for cointegration again with intercept but no trend; we get the same results (Appendix 2).
We have therefore found that there is a long run relationship between the two parameters in Egypt. As a result, the error correction model is estimated (VECM outputs for both assumptions in Appendix 3). The estimated coefficients of the lagged interest rate are negative as expected, showing a negative relationship between the variables. The t-values of the coefficients are however insignificant, which indicates a minimal influence of the interest rate on stock market return on the short-run. The small R^2 of the regression reveals a low explanatory power of the model.
We proceed by checking if this long run relationship is reinforced by a short run relationship via granger causality in the context of the VEC model. We test the null

hypothesis that the independent variable does not granger cause the dependant variable at the 5% confidence level. The results are summarized in the table below:

Table 10: Causality Test Results - Egypt

Granger Causality / Block exogeneity Wald test		
Dependent Variable	**Independent Variable**	**Chi-Square**
D(EINTEREST)	*D(EGX30)*	10.46 (0.0150)
D(EGX30)	*D(EINTEREST)*	4.133 (0.2474)

*The probabilities of the chi-square are in parentheses

We conclude that the stock index EGX30 granger causes the interest rate, but the inverse doesn't hold. The granger causality is unidirectional but not in line with the theory that interest rates have an impact on stock market activity in the short run.

Since we found evidence of a long run relationship between interest rates and stock markets, we proceed by analyzing the impulse response function in the context of the VECM as well. The results using the Cholesky one standard deviation are presented in the figure below.

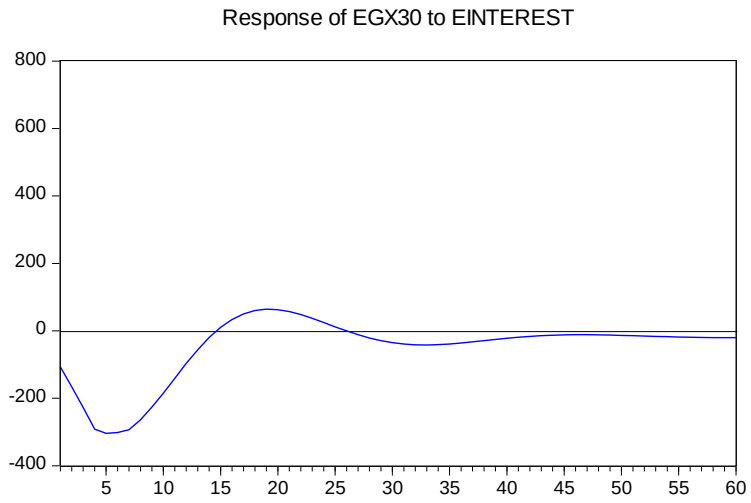


Figure 25: Orthogonalized impulse response of EGX 30 to a shock in EINTEREST

A shock to the interest has a significant impact on the stock market. This impact goes from negative to positive and lingers for about 45 periods (months) before reverting to the origin. This result supports the cointegration results of a long-run relationship between the two parameters. The significant negative impact we can witness in the first periods support the theory of Jefferis and Okeahalam (2000) that higher interest rates would depress stock prices due to the substitution effect.

We move to the forecast error variance decomposition to determine the proportion of the movement in the stock market due to its own shock versus shocks to the interest rate. The time horizons are chosen up to 40 months ahead in order to look at various forecast horizons as suggested by Enders (Walter). The results are summarized in the table below:

Table 11: Variance Decomposition Results

Variance Decomposition Results				
	Period	**S.E**	**DEINTEREST**	**DEGX30**
Variance Decomposition of ***DEGX30***	1	591.8604	3.281937	96.71806
	10	2365.461	10.71374	89.28626
	20	2917.167	7.608663	92.39134
	30	3333.807	5.918922	94.08108
	40	3758.556	4.745558	95.25444

At the first horizon, 96.7% of the variability in the error of forecasting of EGX30 is explained by its own variation and 3.2% is explained by the interest rate. As the horizon expands, a higher proportion is attributed to the interest rate reaching 10% in the 10^{th} period. Those numbers fluctuate a lot as shown in Appendix 4, proving furthermore the long-run relationship between the variables.

4.2.4 Morocco

We use Johansen's approach for the variables in Morocco as well to determine whether they are cointegrated or not. According to the AIC, the maximum numbers of lags is 1, denoting that no relationship is found between the variables. We assume we have 3 lags and test for cointegration to be on the safe side. Trace statistics show no evidence of cointegrating vectors for all 5 sets of assumptions at 1 and 3 lags. There two parameters are therefore not related on the long run.

We proceed with granger causality testing in the context of VAR to determine whether there is a short run relationship between the variables.

We estimate the VAR model with 3 lags on the stationary variables (output in Appendix 5). The estimated coefficients of the lagged interest rate are negative in this case as well and the t-values of the coefficients are also insignificant. We would therefore expect to find no evidence of granger causality.

We test the null hypothesis that the independent variable does not granger cause the dependant variable. The results are summarized in the table below.

Table 12: Causality Test Results - Morocco

Granger Causality / Block exogeneity Wald test		
Dependent Variable	**Independent Variable**	**Chi-Square**
DMINTEREST	*DMCSINDEX*	2.11 (0.54)
DMCSINDEX	*DMINTEREST*	1.83 (0.60)

*The probabilities of the chi-square are in parentheses

At the 5% level of significance, we find no granger causality effects between the two variables. The stock market and interest rates in Morocco move independently, and a shock to one does not affect the other on any time horizon.

CHAPTER 5

CONCLUSION

This paper studies the impact of interest rate fluctuations on stock markets in Egypt and Morocco. After exploring the characteristics of monetary policies and stock market development in the MENA region and then closely looking and the macroeconomic fundamentals of both countries, a dynamic model is used to study empirically the relationship between the two parameters.

Empirical results showed different conclusions for the two countries. At the 5% confidence level the interest rate and stock market in Egypt were found to be cointegrated. This relationship was however not reinforced by a short run relationship as the Granger test showed no evidence of causality. We then turned to examine linkage and spillover effects through impulse response and variance decomposition. We found that shocks to the interested had a significant impact on stock market activity that lasted during long time horizons. This relationship went from being negative to positive before it reverted to the mean after around 50 periods (50 months). The results obtained are in line with Omran's (2003) proof of significant long and short-run relationships between real interest rates and the stock market performance in terms of market activity and liquidity (Omran). The results are intuitive since Egypt's market is open to international investments. In an open market economy, movement of capital between countries has an impact on the interest rate. Capital inflow leads to a higher money supply with which the interest rate decreases. This in turn tends to boost the demand for equity in the country, boosting the stock prices (Muktadir Al Mukit).

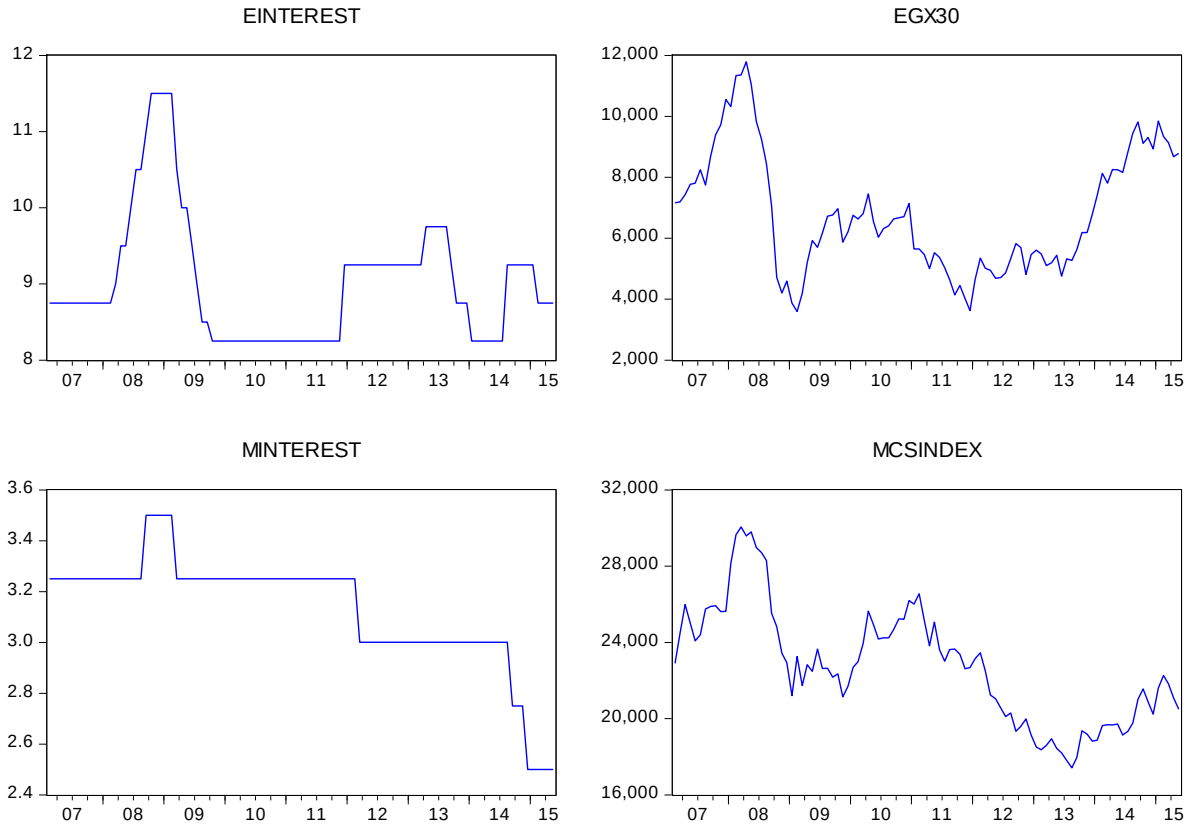
In Morocco however, the interest rate and stock market seem to move independently. Cointegration and granger causality testing proved no evidence of any long run or short run relationship. Those results support Husain et al. (2014) and Ouma and Muriu (2014) findings of no association between the parameters. This can be explained by the fact that the financial market in Morocco remains shallow with a lot of government intervention and that foreign participation is still low; local investors might not be sensitive to interest rate changes. On the other hand, restrictions have been imposed on capital movements and dirham convertibility since the country's independence in 1956 (Hufbauer and Brunel). FDIs require prior approval and Moroccan nationals are not allowed to hold foreign assets. These limitations would therefore not allow investors to react to shocks in the interest rate; which would explain the lack of correlation between the parameters.

Studying the financial markets in the Middle East and North Africa is more complicated than looking at international countries. The region is still relatively underdeveloped with a great deal of investment restrictions on national grounds. Foreign investment regimes for example vary widely among different countries. Thirteen countries (Egypt, Tunisia, Libya, Djibouti, Lebanon, Bahrain, Jordan, Kuwait, Iraq, Oman, Qatar, Saudi Arabia and the United Arab Emirates) allow free capital movement while Algeria, Morocco, Syria and Yemen impose many restrictions (The Organisation for Economic Co-operation and Development). Monetary policies differ as well as some exchange rate arrangements work against monetary policy frameworks.

The results of any study conducted in the region should therefore account for those factors as we could fail to provide evidence for economic theories because of extensive market regulations.

On the other hand, there is a relative lack of information in MENA countries. While some of them provide detailed reports and relevant information about laws and regulations as well as financial data, others still don't make any information available publicly. A big part of national government websites supply no relevant information whether in English, Arabic or any other language. It would be problematic to broaden the scope of a study as including more countries could come at the cost of evenly presenting information under specific topics.

Appendix 1 – Graphs of the Variables



Appendix 2 – Cointegration Results

- **Egypt**

Trend assumption: No deterministic trend
Series: EINTEREST EGX30
Lags interval (in first differences): 1 to 3

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.133191	13.72261	12.32090	0.0289
At most 1	7.46E-06	0.000716	4.129906	0.9864

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Trend assumption: Linear deterministic trend
Series: EINTEREST EGX30
Lags interval (in first differences): 1 to 3

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.183028	22.45053	15.49471	0.0038
At most 1	0.031211	3.044036	3.841466	0.0810

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

- **Morocco**

Series: MINTEREST MCSINDEX
Lags interval: 1 to 1

Selected (0.05 level*) Number of Cointegrating Relations by Model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	0	0	0	0	0
Max-Eig	0	0	0	0	0

*Critical values based on MacKinnon-Haug-Michelis (1999)

Lags interval: 1 to 3

Selected (0.05 level*) Number of Cointegrating Relations by Model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	0	0	0	0	0
Max-Eig	0	0	0	0	0

*Critical values based on MacKinnon-Haug-Michelis (1999)

Appendix 3 – VECM Output

- No Trend, No Intercept

Cointegrating Eq:	CointEq1	
EINTEREST(-1)	1.000000	
EGX30(-1)	-0.000289	
	(0.00012)	
	[-2.38474]	
C	-7.079345	
Error Correction:	D(EINTEREST)	D(EGX30)
CointEq1	-0.107908	41.86262
	(0.02432)	(63.9490)
	[-4.43755]	[0.65463]
D(EINTEREST(-1))	0.192652	-255.0022
	(0.09551)	(251.176)
	[2.01706]	[-1.01523]
D(EINTEREST(-2))	0.013433	-251.7717
	(0.09731)	(255.895)
	[0.13805]	[-0.98389]
D(EINTEREST(-3))	0.244830	-240.3555
	(0.09575)	(251.814)
	[2.55687]	[-0.95449]
D(EGX30(-1))	-8.45E-05	0.113557
	(4.2E-05)	(0.11045)
	[-2.01274]	[1.02816]
D(EGX30(-2))	-3.99E-06	0.033849
	(4.3E-05)	(0.11357)
	[-0.09247]	[0.29803]
D(EGX30(-3))	-0.000111	0.117672
	(4.3E-05)	(0.11377)
	[-2.57050]	[1.03431]
C	0.003689	5.735988
	(0.02301)	(60.5213)
	[0.16029]	[0.09478]
R-squared	0.327200	0.108764
Adj. R-squared	0.273682	0.037870
Sum sq. resids	4.457297	30826292
S.E. equation	0.225058	591.8604
F-statistic	6.113821	1.534180
Log likelihood	11.13257	-744.8356

Akaike AIC	-0.065262	15.68407
Schwarz SC	0.148434	15.89777
Mean dependent	0.000000	10.55125
S.D. dependent	0.264077	603.3960

Determinant resid covariance (dof adj.)	17160.71
Determinant resid covariance	14419.76
Log likelihood	-732.1012
Akaike information criterion	15.62711
Schwarz criterion	16.10792

* Standard errors ( ) and t-stat [ ]

- Intercept, No Trend

Cointegrating Eq:	CointEq1	
EINTEREST(-1)	1.000000	
EGX30(-1)	-0.000297	
	(0.00017)	
	[-1.75285]	
C	-7.024330	
Error Correction:	D(EINTEREST)	D(EGX30)
CointEq1	-0.078175	11.43361
	(0.02421)	(59.3672)
	[-3.22888]	[0.19259]
D(EINTEREST(-1))	0.195372	-256.3134
	(0.10194)	(249.967)
	[1.91649]	[-1.02539]
D(EINTEREST(-2))	0.106872	-346.8707
	(0.10113)	(247.985)
	[1.05674]	[-1.39876]
D(EGX30(-1))	-9.68E-05	0.127573
	(4.5E-05)	(0.10956)
	[-2.16700]	[1.16440]
D(EGX30(-2))	-1.25E-05	0.042006
	(4.6E-05)	(0.11324)
	[-0.27111]	[0.37094]
C	0.001732	11.16250
	(0.02450)	(60.0702)
	[0.07070]	[0.18582]
R-squared	0.202119	0.084006
Adj. R-squared	0.158279	0.033677
Sum sq. resids	5.285962	31781875
S.E. equation	0.241013	590.9749
F-statistic	4.610419	1.669128
Log likelihood	3.481299	-753.5723
Akaike AIC	0.051932	15.66128
Schwarz SC	0.211192	15.82054
Mean dependent	0.000000	13.96247
S.D. dependent	0.262698	601.1846
Determinant resid covariance (dof adj.)		19224.40
Determinant resid covariance		16919.68
Log likelihood		-747.4814
Akaike information criterion		15.70065
Schwarz criterion		16.07225

* Standard errors ( ) and t-stat [ ]

Appendix 4 – Variance Decomposition

Variance Decomposition of EGX30: Period	S.E.	EINTEREST	EGX30
1	591.8604	3.281937	96.71806
2	888.2028	4.953087	95.04691
3	1133.328	7.050238	92.94976
4	1382.437	9.184439	90.81556
5	1604.616	10.39961	89.60039
6	1800.777	11.06237	88.93763
7	1976.842	11.37858	88.62142
8	2128.120	11.35326	88.64674
9	2256.394	11.09986	88.90014
10	2365.461	10.71374	89.28626
11	2457.256	10.25532	89.74468
12	2534.730	9.782450	90.21755
13	2601.040	9.336401	90.66360
14	2658.614	8.942000	91.05800
15	2709.616	8.609998	91.39000
16	2755.883	8.338240	91.66176
17	2798.792	8.116769	91.88323
18	2839.428	7.931151	92.06885
19	2878.660	7.766064	92.23394
20	2917.167	7.608663	92.39134
21	2955.501	7.449873	92.55013
22	2994.115	7.284795	92.71520
23	3033.360	7.112368	92.88763
24	3073.486	6.934275	93.06573
25	3114.636	6.753713	93.24629
26	3156.846	6.574313	93.42569
27	3200.051	6.399295	93.60071
28	3244.098	6.230997	93.76900
29	3288.769	6.070738	93.92926
30	3333.807	5.918922	94.08108
31	3378.940	5.775278	94.22472
32	3423.905	5.639144	94.36086
33	3468.467	5.509720	94.49028
34	3512.431	5.386243	94.61376
35	3555.649	5.268090	94.73191
36	3598.022	5.154807	94.84519
37	3639.496	5.046088	94.95391
38	3680.058	4.941735	95.05826
39	3719.730	4.841603	95.15840
40	3758.556	4.745558	95.25444

Cholesky Ordering: EINTEREST EGX30

Appendix 5 – VAR Output

	DMINTEREST	DMCSINDEX
DMINTEREST(-1)	-0.019082	-2005.426
	(0.10423)	(1604.12)
	[-0.18308]	[-1.25017]
DMINTEREST(-2)	-0.040158	-903.0217
	(0.10504)	(1616.69)
	[-0.38231]	[-0.55856]
DMINTEREST(-3)	0.178496	-212.4217
	(0.10424)	(1604.29)
	[1.71242]	[-0.13241]
DMCSINDEX(-1)	-9.11E-06	0.038668
	(6.8E-06)	(0.10518)
	[-1.33344]	[0.36762]
DMCSINDEX(-2)	2.23E-06	0.035192
	(6.8E-06)	(0.10468)
	[0.32837]	[0.33621]
DMCSINDEX(-3)	-3.20E-06	-0.090046
	(6.6E-06)	(0.10196)
	[-0.48314]	[-0.88317]
C	-0.007305	-68.95519
	(0.00603)	(92.8671)
	[-1.21060]	[-0.74252]
R-squared	0.057029	0.033312
Adj. R-squared	-0.006542	-0.031858
Sum sq. resids	0.289153	68494528
S.E. equation	0.056999	877.2693
F-statistic	0.897084	0.511151
Log likelihood	142.4289	-783.1581
Akaike AIC	-2.821436	16.46163
Schwarz SC	-2.634452	16.64861
Mean dependent	-0.007813	-46.91814
S.D. dependent	0.056814	863.6204
Determinant resid covariance (dof adj.)		2491.207
Determinant resid covariance		2141.152
Log likelihood		-640.5530
Akaike information criterion		13.63652
Schwarz criterion		14.01049

* Standard errors ( ) and t-stat [ ]

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