International Journal of Business, Economics and Management
2024 Vol. 11, No. 1, pp. 1-18
ISSN(e): 2312-0916
ISSN(p): 2312-5772
DOI: 10.18488/62.v11i1.3633

The impact of macroeconomic variables on stock market returns: Evidence from a sample of Arabic countries facing political and economic instability

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Article History
Received: 27 November 2023
Revised: 11 January 2024
Accepted: 24 January 2024
Published: 6 February 2024

Keywords
Arab countries
Financial markets
Structural breaks
Macroeconomics
Political and economic instability
Stock market return.

JEL Classification:
E44; G01.

ABSTRACT

The main purpose of this study is to determine the presence and timing of the structural breaks in the stock market returns and investigate their impact on the relationship between the macroeconomic variables (namely the inflation rate, the exchange rate, the oil prices) and the stock market returns of a sample of Arab countries facing political and economic instability, namely (Syria, Egypt, Tunisia and Bahrain), during the period (2010-2020). CUSUM test is performed in order to test the presence of structural breaks in stock market indexes. In case there is evidence of structural breaks, Bai and Perron Multiple Breakpoints test is used to identify points in time where significant changes may have occurred. The timing of structural breaks is used as a control variable to examine the impact of the macroeconomic variables on the stock market returns through applying Johansen cointegration test. The results provide evidence of the presence and timing of the structural breaks in the Arab stock markets under study and their role in impacting the relationship between the macroeconomic variables and stock market returns. The study concluded that the dynamics of how the macroeconomic variables affecting the stock market returns depends on the nature and timing of the structural break.

Contribution/Originality: This study investigates the occurrence of structural breaks in a sample of Arab countries characterised by unstable political, social, and economic conditions. The study also utilizes the dates of these structural breaks as control variables to estimate the influence of macroeconomic variables on stock market returns.

1. INTRODUCTION

Political, social and economic instability is one of the major challenges affecting economies and financial markets around the world. In the context of Arab countries that have been exposed to political, social and economic instability since 2010, understanding the impact of such structural breaks or changes on the relationship between macroeconomic variables and stock market returns considers an important topic for research.

The financial markets of some Arab countries are characterized by extreme fluctuations in their returns, which represents a source of concern for them. They are also characterized by the concentration of trading in limited shares, reliance in financing on issuing more shares, the weakness of the supervisory and regulatory framework for some Arab markets, and the weak role played by the institutional investor in Arab stock markets (Arab Planning Institute, 2009 and 2010). Also, some Arab financial markets are relatively new (such as the Damascus Stock Exchange and the Libyan Stock Market).

Despite the developments that many Arab countries' financial markets have witnessed in terms of their legal and regulatory frameworks, they still suffer from instability in their market returns. What has increased this degree of instability is the political, economic and social instability that these countries have experienced during the past decade. This had a negative impact on the economies of these countries and thus on financial market indicators, as most Arab financial markets witnessed a noticeable decline in their performance in 2011 as a result of the instable environment. In its turn, the instable environment generated fears among investors (Arab Monetary Fund, 2011) and their confidence in the markets decreased, causing capital outflows, a decline in credit ratings and a decline in financial market indicators according to the International Monetary Fund (2013). Changes in stock returns during the period of instability and uncertainty were also accompanied by fluctuations in exchange rates and local inflation rates in many countries.

Therefore, the current study aims to determine the presence and timing of the structural breaks in the stock market returns of a sample of Arab countries using CUSUUM test and Bai and Perron (2003) Multiple Breakpoints test. In addition, this study contributes to the literatures by examining the impact of macroeconomic variables (exchange rate, inflation rate, and oil prices) on the stock market returns of Arab stock markets that have been subjected to political and economic turmoil since 2010, namely (Syria, Egypt, Tunisia, Libya, Bahrain) with taking into account the identified structural breaks dates as control variables in studying the relationship between the macroeconomic variables and stock market returns.

2. LITERATURE REVIEW

Until recently, there has been a significant number of empirical studies that modeled the relationship between stock market returns and macroeconomic variables, however there has been lack of research applying on Arab stock markets during political and economic instability. This section presents a survey of the studies applied on both developing and Arab countries.

There are many researchers who investigated the relationship between macroeconomic variables and developing stock markets. For example, Naik and Padhi (2012) investigated relationship between stock market index, money supply and ERs in the case of India. Researchers used Johansen's co-integration and Vector Error Correction Model (VECM) to determine the long run equilibrium between variables. According to the results, there was a long run equilibrium relationship between the variables. The results showed a positive relationship between MS and stock market index. However, the study failed to show a significant relationship between stock market index and ER. Other study Jamaludin, Ismail, and Ab Manaf (2017) examined the effect of macroeconomic variables namely inflation, money supply (MS), and exchange rate (ER) on both conventional and Islamic stock market returns in three selected countries of the Association of Southeast Asian Nations (ASEAN) countries (Singapore, Malaysia, Indonesia) by utilizing monthly data over the period of January 2005 to December 2015. Applying the panel least square regression techniques, the results showed that both stock market returns are significantly affected by the ER and inflation rate. MS is found to be insignificant. The findings of this paper also conclude that inflation has a greater effect and inversely related to the stock market returns. In this case, there is a need for amendment in monetary policy to ensure that inflation rate is set at a low level, since the results would be able to bring an impact to boost the capital market in the selected ASEAN countries. Ndlovu, Faisa, Resatoglu, and Türsoy (2018) assessed the association of macroeconomic variables: inflation (INF), Money supply growth (M3), Interest rates (IR) and exchange rate (EX) using quarterly data from the year 1981Q1 to 2016 Q4 on stock price for the Johannesburg Stock Exchange South Africa. The study employed co-integration tests, vector error correction model, a variance decomposition and an impulse response function to understand the relationship of the variables. In the long run, interest rates, money supply and inflation have a positive relationship with the share price while the exchange rate have a negative effect to the stock prices. Unidirectional causality was found running from exchange rates and interest rates to the share price and also the interest rates and the exchange rates have a causality to the money supply. The variance decompositions established

that shocks to the share price account for majority of the changes in itself for all periods during the short run and long-run while also cementing results of the causality shocks in the stock price and exchange rate shocks have an impact on changes in themselves, also the impulse response function further confirmed causal relationships between the variables and the stock price.

A number of studies have also tested the relationship between macroeconomic variables and stock market returns for a sample of Arab countries, including the Arab countries under study. The study of Ismaiel and Al-Ahmad (2014) aimed to test the relationship between stock prices and exchange rates in a sample of Arab countries facing political crises, namely (Syria, Tunisia, Egypt, Bahrain). The study used monthly time series data for nominal and real effective exchange rates and stock price indices during the period from January 2003 to July 2013. The study applied Johansen cointegration test, VECM error correction model, and Granger causality test. The results showed that there was no relationship between stock prices and exchange rates in Tunisia, while for the rest of the countries the results varied depending on the period studied and the exchange rate measure used. Overall, the study showed a difference in results in the post-crisis period compared to the pre-crisis period, and that using the effective real exchange rate generated different results than using the effective nominal exchange rate. Hasseeb (2015) study also aimed to test the impact of macroeconomic variables on stock market performance in 15 Arab countries using Panel data during the period 1995-2014. Financial market performance was measured by market capitalization, while the macroeconomic variables that were addressed ae: economic freedom, remittances, gross domestic product, investments, inflation rate, credit, and trading volume. In order to test the relationship between variables, the study estimated the relationship using a fixed effects model and a random effects model. The study finds that domestic credit, Gross Domestic Product (GDP), economic freedom, and remittances have a negative impact on market capitalization. In contrast, the volume of investments, trading volume, and inflation rate had a positive impact on market capitalization. Khalil (2015) study aimed to test the impact of monetary variables on stock returns for three emerging financial markets (Turkey, Egypt, and Syria) using time series data. The study period varied according to the market studied, Syria (2010-2013), Egypt (2005-2012), Turkey (2002-2014). The study used four monetary variables: (inflation rate, exchange rate, money supply, and short-term interest rate). The study applied a set of descriptive statistics and the unit root test, and a multiple regression model was estimated using the least squares method to test the impact of monetary variables on the returns of the studied market indices. With regard to the Egyptian Stock Exchange, the study found that there is a direct relationship between the exchange rate and money supply on the one hand with stock returns, while there is an inverse relationship between the interest rate and stock returns. On the other hand, the inflation rate did not have a significant impact on stock returns. As for the Damascus Stock Exchange, the study found that there is no significant relationship between the exchange rate and the inflation rate on the one hand, and stock returns on the other hand. Barakat, Elgazzar, and Hanafy (2016) study tested the impact of a number of macroeconomic variables (interest rate, inflation rate, exchange rate, and money supply) on stock market returns by applying it to two emerging economies (Tunisia and Egypt). The study used monthly data over the period from January 1998 to January 2014. With regard to Egypt, the study found that the inflation rate, exchange rate, and money supply have a positive and significant impact on the Egyptian stock index, while the interest rate has a negative and significant impact on the market index. . For Tunisia, the study found that the inflation rate has a negative and significant impact on the Tunisian Stock Exchange index, while the exchange rate has a positive and significant impact on the Tunisian Stock Exchange index. On the other hand, the interest rate and money supply did not have a significant impact on the Tunisian Stock Exchange index. The study by Kelikume and Muritala (2019) tested the impact of changes in the price of oil on stock market returns by applying to five African countries (Nigeria, South Africa, Tunisia, Ghana and Egypt). The study used quarterly data from the first quarter of 2010 until the fourth quarter of 2018. The study employed a regression model using cross-sectional panel time series data. The study also used a number of macroeconomic variables as control variables (real output growth rate, exchange rate). The study found that the growth rate in real output has a

positive and significant impact on stock market returns for the countries studied. While the oil price and exchange rate did not have a significant impact on stock market returns for the countries studied.

Besides the above studies, a number of studies used timeseries data to examine the relationship between macroeconomic variables and stock market returns by applying it to one of the countries under study (Syria, Egypt, Libya, Tunisia, and Bahrain).

As for the applied studies that focused on the case of Syria, the study of Al-Ammar and Asaad (2016) aimed to test the relationship between a set of macroeconomic variables (inflation rate, rate of export coverage of imports, effective nominal exchange rate, and money supply) and the Damascus Stock Exchange index. The study used time series data with monthly frequencies covering the period from January 2010 to December 2011. The study applied a set of tests, such as the unit root test, Johansen cointegration test, error correction model, Granger causality test, response functions, and analysis of variance components. The study found that there is a long-term equilibrium relationship between the macroeconomic variables studied and the Damascus Stock Exchange index. All variables have a positive and significant impact on the Damascus market index in the long term. The results also showed that there is a one-way causal relationship between the effective nominal exchange rate index and the Damascus Stock Exchange index, and the direction of this relationship suggests that the effective nominal exchange rate is considered a cause of fluctuations in the Damascus Stock Exchange index. It was also found that there is a two-way causal relationship between the Damascus Stock Exchange index and the money supply. Hamdouche (2017) study also tested the impact of inflation on the return of the Damascus Stock Exchange index using monthly data during the period 2010-2013. The study used descriptive statistics and a binary correlation matrix and estimated a simple linear regression model to test the effect of inflation on the Damascus market index. The study found that there is a weak, positive but statistically insignificant correlation between the inflation rate and the market index return during the period studied.

As for the applied studies that focused on the case of Egypt, the study by Omran and Pointon (2001) aimed to test the effect of the inflation rate on the performance of the Egyptian stock market. The study period included the years from 1980 to 1998. The performance of the Egyptian Stock Exchange was measured through several indicators (trading value, trading volume, number of deals, number of traded companies, and value of new issues). The study applied regression models using the ordinary least squares method. The study found that the inflation rate has a negative and significant impact on all performance indicators of the Egyptian Stock Exchange in the long term. The study by Zaki, Elgammal, and Husssainey (2016) also aimed to test the impact of a number of macroeconomic variables (oil price, interest rate, inflation rate, and real effective exchange rate) on stock returns in the Egyptian market. Monthly data were used for the period from January 1999 to June 2015. The study applied a vector autoregressive VAR model. The results showed that the oil price has a positive and significant impact on stock returns on the Egyptian Stock Exchange, while the exchange rate has a negative and significant impact on stock returns. On the other hand, the interest rate and inflation rate did not have a significant impact on stock returns. Abdel-Gawad and Radi (2020) study also tested the impact of the exchange rate and inflation rate on stock market performance in Egypt. The study used monthly data during the period (2000-2020), and the study used a distributed autoregressive model with lag periods to test the co-integration relationship between the studied variables, in addition to the generalized autoregressive model conditional on the non-stationarity of the error term variance. The results showed that both the exchange rate and inflation rate have a positive impact on the performance of the Egyptian Stock Exchange in the long term.

As for the applied studies that focused on the case of Tunisia, the study by Ben Yaala and Henchiri (2016) tested the impact of macroeconomic variables (budget deficit, money supply, interest rate, inflation rate, real exchange rate, and production index) on the stock market in Tunisia. The study used monthly data over the period from January 2008 to December 2014. The study applied the vector autoregressive with distributed lags (ARDL) methodology. The study found that the budget deficit and inflation rate have a negative and significant impact on stock prices on

the Tunisian Stock Exchange, while money supply has a positive and significant impact on stock prices. On the other hand, the interest rate, the real exchange rate, and the output index did not have a significant impact on the stock market in Tunisia.

As for the applied studies that focused on the case of Bahrain, Abdelbaki (2013) study tested the relationship between macroeconomic variables (Macroeconomic stability, income level, banking system development, stock market liquidity, private capital flow, investment and saving rates) and the Stock market development in Bahrain. The study applied the vector autoregressive distributed lag periods (ARDL) methodology and found that inflation rate, investment rate, and money supply have a positive and significant impact on the performance of the Bahrain Stock Exchange.

3. DATA AND RESEARCH METHODS

3. 1. Data & Model

This study uses monthly timeseries data, for each of the countries under study, covers the period (2010-2020[1]). The chosen period comes from the limitations of the data prior to 2010[2] regarding the stock market indexes for the countries under study, but also to focus on the period of instability that the Arab countries have experienced since 2010 and therefore avoiding the financial crisis of 2008.

In this study the impact of the macroeconomic variables (exchange rate, inflation and oil prices) on the stock market returns will be examined with taking into account a control variable of the structural breaks dates measured as dummy variable. The study model is presented as follows:

$$SMR_t = \beta_1 + \beta_2 INF_t + \beta_3 EX_t + \beta_4 OIL_t + \beta_5 CRISIS_t + e_t \quad (1)$$

Table 1 shows a description of the variables included in the model along with the measurement and the data source.

Table 1. Data description.

Variables	Code	Measurement	Data source
Stock market returns (SMR) which can be one of the following:			
Damascus stock market return	DWX	The natural logarithm of stock market index	http://dse.gov.sy/user/?page=index_info
Egypt stock market return	EGX	The natural logarithm of stock market index	https://www.investing.com/indices/
Tunisia stock market return	TUNINDEX	The natural logarithm of stock market index	https://www.investing.com/indices/
Bahrain stock market return	BAX	The natural logarithm of stock market index	https://www.investing.com/indices/
Macroeconomic variables			
Inflation rate	INF	The consumer price index (2010=100)	Trading economics https://ar.tradingeconomics.com/libya/inflation-cpi
Exchange rate	EX	The nominal effective exchange rate against 51 trade partners (2010=100)	BRUEGEL http://bruegel.org/
Oil prices	OIL	The oil price measured as the simple average of three spot prices; Dated Brent, West Texas intermediate, and the Dubai Fateh (2010=100)	IMF https://www.imf.org/en/Research/commodity-prices
Control variable			
Structural break	CRISIS	Dummy variable takes 1 in the occurrence of the structural break and 0 for rest	

[1] For Syria the period is limited to (01/2010- 09/2018) due to availability of NEER until 09/2018.

[2] Damascus Securities Exchange has been launched end 2009, and therefore no data will be available before that point.

3.2. Research Methods

This section outlines the approach used to investigate the presence of structural breaks and the date points of these structural breaks in the stock market indexes of the Arab countries under study. The analysis involves utilizing unit root tests, Cumulative Sum (CUSUM) tests, and the Bai-Perron test to identify and assess the significance of structural breaks. The research method is illustrated in the Figure 1, where the start point is to test the unit root of the stock market indexes and then performing CUSUM test to test the presence of structural breaks in these indexes. In case there is an evidence of the presence of structural breaks we move to identify points in time where significant changes may have occurred using Bai & Perron test. These point of structural breaks will be included later in the regression models as dummy variables to examine the impact of the macroeconomic variables on the stock market returns.

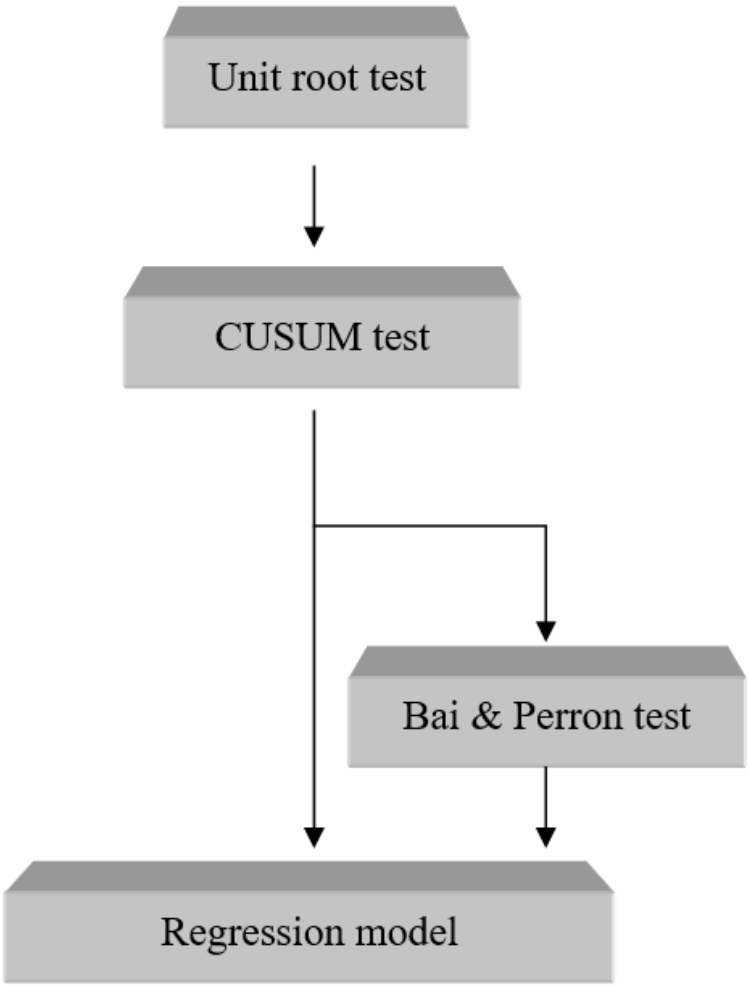

Figure 1. Research method.

The following subsections describe each step of the methodology.

3.2.1. Unit Root Test

When dealing with timeseries date, as the case in this study, it's important to test the stationarity of this data. A series is said to be stationary if the mean and autocovariances of the series do not depend on time (EViews 12, 1994).

A widely used unit root test is the Augmented Dickey Fuller (ADF) test. This ADF test consists of estimating the following regression model (Gujarati & Porter, 2009):

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-i} + \varepsilon_t$$

Where: εt is a pure white noise error term and where Yt-1 = (Yt-1 - Yt-2), Yt-2 = (Yt-2 - Yt-3), etc.

The number of lagged difference terms to include is often determined empirically, the idea being to include enough terms so that the error term in the equation above is serially uncorrelated, so that we can obtain an unbiased estimate of δ, the coefficient of lagged Yt-1.

EViews 12 has an option that automatically selects the lag length based on Akaike, Schwarz, and other information criteria. In ADF we still test whether δ = 0 and the ADF test follows the same asymptotic distribution as the DF statistic, so the same critical values can be used.

3.2.2. CUSUM Test

Once we have established the stationarity status of the time series data we proceed with investigating breaks. The CUSUM test proves to be a tool in identifying shifts in other significant changes within a time series, and are commonly used in econometrics and statistics to assess whether there are structural breaks in the regression model (Dao, 2021).

The Brown, Durbin, and Evans (1975) proposed a test known as CUSUM test, which is based on the cumulative sum of the recursive residuals. The test statistic W_t is given by El-Shagi and Giesen (2013):

$$W_t = \frac{1}{\hat{\sigma}\sqrt{T-k}} \sum_{i=k+1}^{t} \hat{\varepsilon}_i,$$

Where $\hat{\sigma}$ is defined as:

$$\hat{\sigma} = \sqrt{\frac{\sum_{t=k+1}^{T} \hat{\varepsilon}_t}{T-k}}.$$

In the traditional CUSUM test $\hat{\varepsilon}$ is given by the series of recursive errors that are adjusted for the size distortion:

$$\hat{\varepsilon}_t = \frac{y_t - x_t' \hat{\beta}_{t-1}}{\sqrt{1 + x_t'(X_{t-1}' X_{t-1})^{-1} x_t}},$$

Where $\hat{\beta}t\text{-}1$ is the estimate of β using data up to point t - 1 and Xt-1 is the corresponding matrix of exogenous variables.

3.2.3. Bai Perron Multiple Breakpoints Test

To determine the dates and significance of breaks identified through the CUSUM test an extensively employed technique is the Bai Perron test. This test plays a role, in analyzing and identifying these breaks.

Bai and Perron (2003) test procedure for multiple unknown breakpoints is applied due to the poor power of CUSUM approach to detect the breakpoints. This test determines the number of breaks and break dates endogenously, and this approach displays substantial power in locating multiple unknown structural breaks. BP test treats the breakpoints as unknown and estimates them by using a standard linear regression model with T periods and m potential breaks.

The applied regression model is as follows (Islam, Akter, & Md, 2020):

$$y_t = X_t \beta + Z_t \delta_j + \epsilon_t,$$

$$\text{for the observations } T_j,\ T_{j-1} \ldots\ldots\ T_{j+1} - 1 \text{ in regime } j\ (j = 0, \ldots, m).$$

Here, X variables are those whose coefficients do not vary across regimes, while the parameters of Z variables are regime specific. β and denote vectors of coefficients associated with X and Z variables respectively. The break dates are denoted by (T1, …, Tm) and represents the white noise error term.

3.2.4. Cointegration Test

After defining the dates of the structural breaks, the next move is to estimate the relationship between the macroeconomic variables and stock market returns using Johansen cointegration test after checking that all variables under study are stationary after taking the first difference I(1).

The Johansen co-integration test takes the following form (Ndlovu et al., 2018):

$$X_{m,t} = \propto_m + \omega_1 Z_{1,t} + \omega_2 Z_{2,t} + \cdots + \omega_p Z_{p,t} + \epsilon_{m,t}$$

Where Johansen co-integration's Trace and Maximum Eigen value statistics are given below:

$$Maximum\ Eigen\ value: LR\ (r0;\ r0\ +\ 1)\ =\ -T\ ln\ (1\ -\ \lambda r0 + 1)$$

$$Trace\ Statistic:\ LR\ (r0;\ n)\ =\ -T \sum_{i=r0+1}^{n} \ln(1 - \lambda i)$$

With LR (r0; r0 + 1); LR (r0; n) being the likelihood ratio test statistic, T is the observations, λ is the estimated values of characteristic roots.

4. RESULTS AND DISCUSSION

This section shows the results of our study, where the first part deals with defining the structural breaks date points that will be included in the regression models in the second part to estimate the impact of the macroeconomics on the stock market returns.

4.1. Determining the Structural Breaks in the Stock Market Indexes

In this sub-section we start with descriptive statistics of the development of the stock market indexes, and then testing the unit root and applying CUSUM test to determine the presence of the structural breaks in the timeseries data, after that the structural breaks date points will be determined using Bai Perron Multiple Breakpoints test.

4.1.1. Descriptive Statistics

Table 2 presents the descriptive statistics of the stock market indexes of the Arab countries under study (Syria, Egypt, Tunisia and Bahrain).

I can be noticed by looking at the mean and median values that these deviate in values especially for Damascus Securities Exchange Weighted Index (DWX), which implies that the distribution is asymmetric and indicates a high volatility in the stock market index which is logic due to the period under study where these four Arabic countries faced political, social and economic instability at the beginning of 2011 which can be seen in Figure 2 where all the indexes faced decline in their values.

It can be noted as well that all indexes have witnessed an improvement in the period 2016-2017 due to the relative stable oil prices and the economic reforms besides the global economic recovery.

Table 2. Descriptive statistics of stock market indexes.

Statistics:	DWX_INDEX	EGX_INDEX	TUNINDEX_INDEX	BAX_INDEX
Mean	1085.165	1294.869	1095.477	919.759
Median	729.448	1146.930	1041.980	927.420
Maximum	3635.523	2561.640	1646.640	1159.340
Minimum	447.692	507.180	793.840	732.280
Std. dev.	868.152	526.009	204.596	98.915
Skewness	2.013	0.473	0.723	0.028
Kurtosis	5.748	1.943	2.466	2.252
Jarque-Bera	103.968	10.991	13.073	3.092
Probability	0.000	0.004	0.002	0.213
Sum	113942.3	169627.8	144603.0	121408.1
Sum sq. dev.	78383503	35969121	5483614	1281727
Observations	105	131	132	132

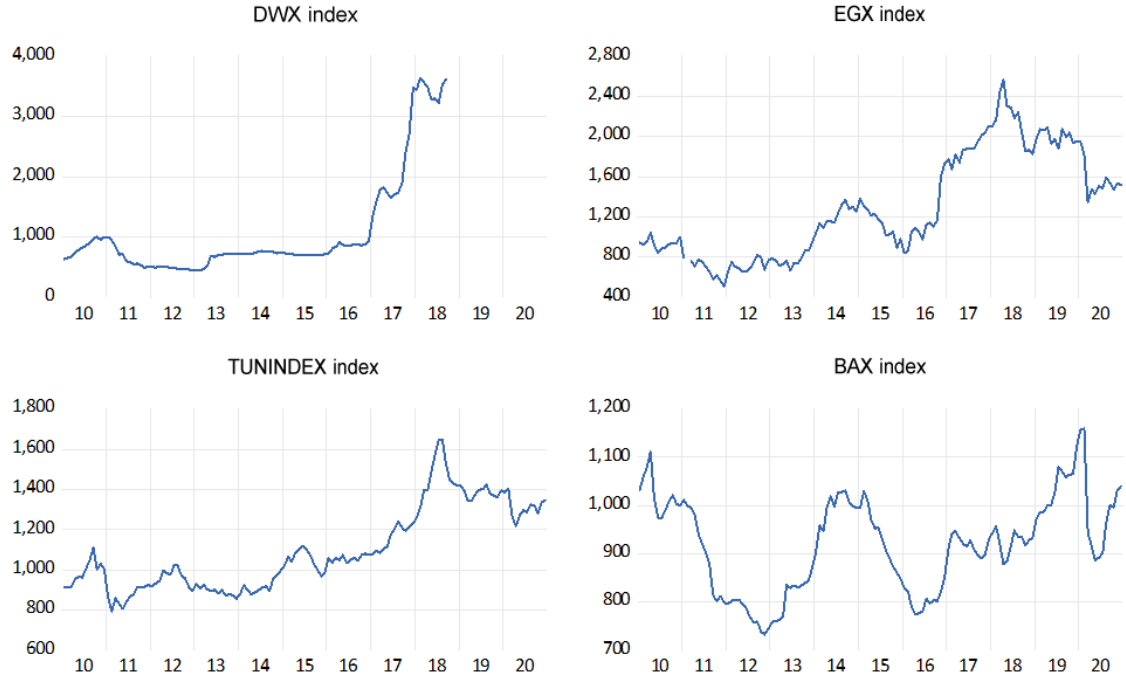

Figure 2. Charts of stock market indexes.

4.1.2. Unit Root Test

The ADF unit root test is applied on the monthly stock market indexes to test if these indexes are stationary. Table 3 shows the results of the unit root test and it can be noted that all stock market indexes are not stationary at level and have a unit root, which implies that these indexes might have a stochastic trend. However, the stock market indexes become stationary after taking the first difference.

Table 3. ADF unit root test of stock market indexes.

Stock market index	At level			At 1st difference			Decision
	Intercept	Trend & intercept	None	Intercept	Trend & intercept	None	
DWX	2.549	0.871	3.103	-1.489	-6.727***	-1.305	I(1)
BAX	-2.475	-2.818	-0.312	-8.754***	-8.816***	-8.787***	I(1)
TUNINDEX	-1.179	-2.494	0.578	-9.476***	-9.443***	-9.454***	I(1)
EGX	-1.204	-1.768	0.016	-11.367***	-11.331***	-11.381***	I(1)

Note: DWX: Stock market index of Syria, BAX: Stock market index of Bahrain, TUNINDEX: Stock market index of Tunisia, EGX: Stock market index of Egypt. Schwarz criterion (SIC) is used for the automatic selection of the lag length. *** refers to the significance level 1% respectively.

4.1.3. CUSUM Test

After testing the unit root and having the stock market indexes non-stationary, a CUSUM test is applied to investigate the nature of the changes and identify the presence of the structural breaks in the stock market indexes of the countries under study. Figure 3 shows the results of the CUSUM test for each of the stock market indexes. It can be noticed that the CUSUM lines goes beyond the critical bands of 5%, which indicates the presence of structural breaks in the stock market indexes of the Arab countries under study.

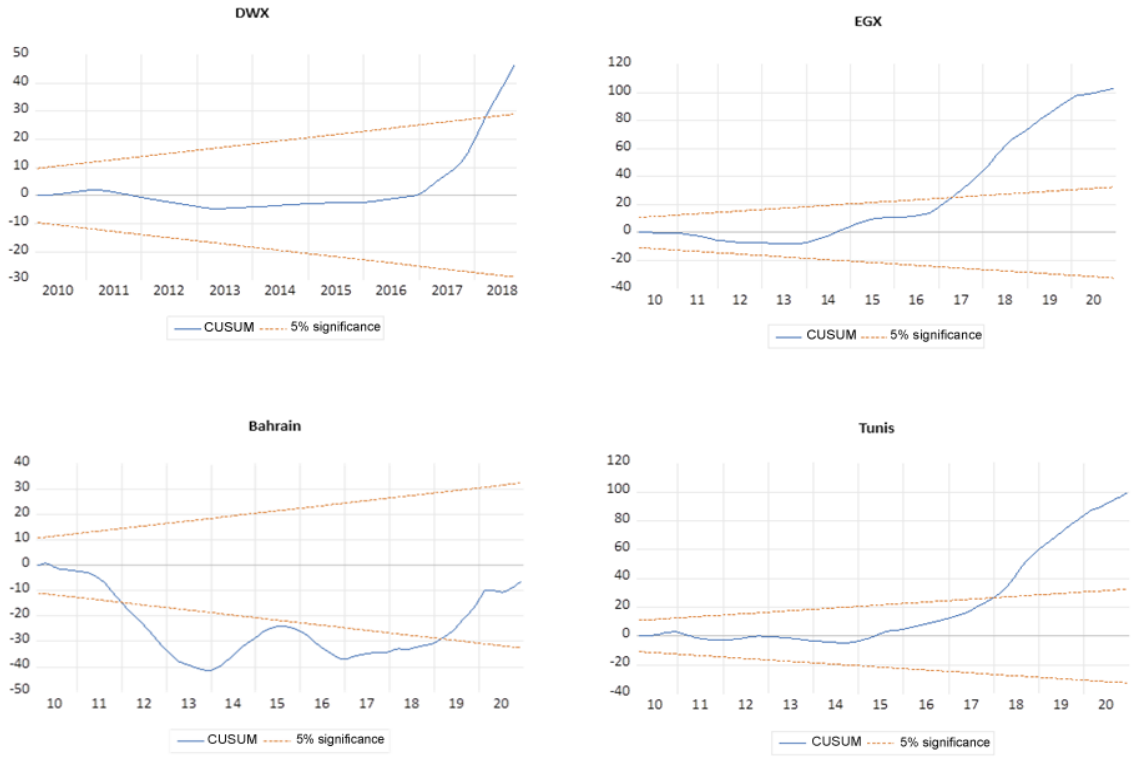

Figure 3. CUSUM test of stock market indexes.

4.1.4. Bai Perron Multiple Breakpoints Test

After having an evidence of the presence of structural breaks in the stock market indexes, we move to identify points in time where significant changes may have occurred using Bai & Perron Multiple Breakpoints test. Table 4 summarizes the output of Bai Perron test for all four stock market indexes under study.

It can be noted from the table that all stock markets have witnessed two or more breakpoints during the study period, where the exact breakpoints for each of the markets are defined according to Bai and Perron (2003). These dates will be included later in the regression models as dummy variables to estimate the impact of macroeconomic variables on the stock market returns.

Table 4. Bai and Perron multiple breakpoints test of stock market indexes.

Stock market index	Number of breakpoints*	Breakpoints dates
DWX	2	2016M04, 2017M07
BAX	5	2011M08, 2014M01, 2015M08, 2017M03, 2019M01
TUNINDEX	3	2014M12, 2016M07, 2018M02
EGX	3	2014M01, 2016M11, 2019M06

Notes: DWX: Stock market index of Syria, BAX: Stock market index of Bahrain, TUNINDEX: Stock market index of Tunisia, EGX: Stock market index of Egypt.
* Schwartz criterion is used for the selected breaks, and the global information criteria is selected as method for testing.

Table 5. ADF unit root test of macroeconomic variables.

Country	Variable	At level			At 1st difference			Decision
		Intercept	Trend & intercept	None	Intercept	Trend & intercept	None	
Syria	NEER 51	-2.588	-2.238	-2.862***	-10.428***	-10.612***	-10.315***	I(1)
	OIL index	-1.496	-2.005	-0.261	-7.474***	-7.437***	-7.509***	I(1)
	CPI	0.045	-3.045	2.514	-8.306***	-8.292***	-7.821***	I(1)
Bahrain	NEER 51	-1.318	-2.074	0.470	-7.874***	-7.862***	-7.879***	I(1)
	OIL index	-1.842	-2.945	-0.724	-7.841***	-7.818***	-8.080***	I(1)
	CPI	-1.307	-2.753	1.275	-14.337***	-14.330***	-14.139***	I(1)
Tunisia	NEER 51	-0.542	-2.434	-2.358	-6.807***	-6.779***	-6.306***	I(1)
	OIL index	-1.842	-2.945	-0.724	-7.841***	-7.818***	-8.080***	I(1)
	CPI	1.773	-1.576	6.508	-10.678***	-10.100***	-17.581***	I(1)
Egypt	NEER 51	-0.818	-1.706	-1.803	-9.875***	-9.840***	-9.726***	I(1)
	OIL index	-1.842	-2.945	-0.724	-7.841***	-7.818***	-8.080***	I(1)
	CPI	1.521	-1.658	6.673	-10.794***	-11.064***	-3.709***	I(1)

Note: SIC is used for the automatic selection of the lag length.
*** refers to the significance level of 1% respectively.

4.2. The Impact of Macroeconomics on the Stock Market Returns

In this sub-section we estimate the impact of macroeconomics (exchange rate, inflation, oil prices and crisis) on the stock market returns of the Arab countries under study (Syria, Egypt, Tunisia and Bahrain). The start point will be testing the stationarity of the macroeconomics timeseries data per market in order to determine which method would suit best for estimating the regression models. Then the impact of macroeconomics on the stock market returns will be estimated using the suitable method.

4.2.1. Unit Root Test

In order to test the stationarity of monthly macroeconomics timeseries data (exchange rate, inflation and oil prices), the ADF unit root test is applied. Table 5 shows the results of the unit root test and it can be noted that all macroeconomic variables for all four countries under study are not stationary at level and have a unit root, but become stationary after taking the first difference, which indicates that Johansen co-integration method is suitable to examine the relationship between these variables and the stock market returns.

4.2.2. Co-integration Test

After testing the unit root of the variables for all four countries under study, the long-term relationship is tested using Johansen cointegration test. For each of the four countries, multiple regression models will be tested depending on the number of structural break points defined based on Bai and Perron test.

4.2.2.1. Co-Integration Test – Syria

Table 6 shows the results of Johansen cointegration test applied on two regression models for Syria. In each model the dummy variable (CRISIS) is changed depending on the structural breakpoints detected by Bai and Perron test. It can be noted that there is no cointegration relationship between the macroeconomic variables and stock market returns when taking the structural break date (2016M04) into account, while there is one cointegration relationship when taking the structural break date (2017M07) into the regression model.

From the estimated model it can be noticed that the structural break in 2017 has a positive impact on the stock market returns. The year 2017 was a distinguished year in the performance of the Damascus stock market, as the Syrian economy began to adapt to the crisis, along with relative stability in economic indicators, which reflected positively on the market's performance through the interaction of investors with the market and the significant increase in trading values and volumes (Damascus Securities Exchange, 2017).

It can be observed from the regression model results that all macroeconomic variables have a positive impact on the stock market returns. This is consistent with the results of Al-Ammar and Asaad (2016).

The consumer prices index inflates the stock market which shows a positive impact. Hamdouche (2017) also found a positive impact of inflation rate on the stock market of Syria.

Regarding the exchange rate, the depreciation in the Syrian pound during the crisis caused a decline in the stock market returns due to investors 'reluctance to invest in instable environment.

4.2.2.2. Co-Integration Test – Egypt

Table 7 shows the results of Johansen cointegration test applied on three regression models for Egypt, where the dummy variable (CRISIS) is changed in each of the three models depending on the structural breakpoints detected by Bai and Perron test. It can be noted that there is no cointegration relationship between the macroeconomic variables and stock market returns when taking the structural break dates (2016M11 and 2019M06) into account, while there is one cointegration relationship when taking the structural break date (2014M01) into the regression model.

Table 6. Results of Johansen cointegration test – Syria.

Regression models - Syria	Null	Trace statistics (Critical value)	Max statistics (Critical value)
$SMR_t = \beta_1 + \beta_2\ INF_t + \beta_3\ EX_t + \beta_4\ OILt + \beta_5\ CRISIS_t + e_t$ CRISIS : 2016M04			
Conclusion: No cointegration relationship	r = 0	57.191 (69.819)	21.182 (33.877)
	r = 1	36.009 (47.856)	14.853 (27.584)
	r = 2	21.155 (29.797)	11.105 (21.132)
$SMR_t = \beta_1 + \beta_2\ INF_t + \beta_3\ EX_t + \beta_4\ OILt + \beta_5\ CRISIS_t + e_t$ CRISIS : 2017M07			
Conclusion: One cointegration relationship	r = 0	74.094** (69.819)	40.225*** (33.877)
	r = 1	33.869 (47.856)	14.782 (27.584)
	r = 2	19.086 (29.797)	13.081 (21.132)

Note: Null hypothesis is accepted, if test statistic < Critical value, Critical value considered at 5%.
, * refers to the significance level of 5% and 1% respectively.

Table 6. Continue…

CRISIS: 2017M07			
$SMR_t = 3.338\ INF + 8.815\ EX + 3.684\ OIL + 2131.718\ CRISIS$			
(0.472)	(1.577)	(1.925)	(125.586)

Note: Numbers between parentheses refer to standard error.

The breakpoint starting 2014 has a positive impact on the stock market returns, where the stock market index has experienced positive developments due to the relative stable environment after the elections in 2012 and restoring the confidence in the market.

Table 7. Results of Johansen cointegration test – Egypt.

Regression models - Egypt	Null	Trace statistics (Critical value)	Max statistics (Critical value)
$SMR_t = \beta_1 + \beta_2\ INF_t + \beta_3\ EX_t + \beta_4\ OILt + \beta_5\ CRISIS_t + e_t$ CRISIS : 2014M01			
Conclusion: One cointegration relationship	r = 0	70.660** (69.819)	31.852* (33.877)
	r = 1	38.808 (47.856)	19.614 (27.584)
	r = 2	19.194 (29.797)	11.883 (21.132)
$SMR_t = \beta_1 + \beta_2\ INF_t + \beta_3\ EX_t + \beta_4\ OILt + \beta_5\ CRISIS_t + e_t$ CRISIS : 2016M11			
Conclusion: No cointegration relationship	r = 0	66.945* (69.81889)	28.357 (33.877)
	r = 1	38.587 (47.856)	15.459 (27.584)
	r = 2	23.129 (29.797)	13.502 (21.131)
$SMR_t = \beta_1 + \beta_2\ INF_t + \beta_3\ EX_t + \beta_4\ OILt + \beta_5\ CRISIS_t + e_t$ CRISIS : 2019M06			
Conclusion: No cointegration relationship	r = 0	64.956 (69.819)	28.609 (33.877)
	r = 1	36.346 (47.856)	15.780 (27.584)
	r = 2	20.567 (29.797)	11.575 (21.132)

Note: Null hypothesis is accepted, if test statistic < Critical value, Critical value considered at 5%.
*, ** refers to the significance level of 5% and 1% respectively.

The exchange rate have negative impact on the stock market returns, which is consistent with Zaki et al. (2016) study that concluded that the exchange rate has a negative and significant impact on stock returns. On November 3, 2016, the Central Bank of Egypt decided to take several measures to correct the foreign exchange trading policy by liberalizing exchange rates (Central Bank of Egypt, 2016). As a result of the decision to liberalize the exchange rate, there was a significant decline in the value of the Egyptian pound against foreign currencies at the end of 2016. This economic reform in the exchange rate policy was accompanied by a sharp rise in the Egyptian Stock Exchange index as a result of the restoration of foreign investors to the Egyptian Stock Exchange (The Egyption Exchange, 2016).

The inflation rate played also important role, where the political and economic instability leads to higher inflation and decrease in the stock market returns. Omran and Pointon (2001) also found that the inflation rate has a negative and significant impact on all performance indicators of the Egyptian Stock Exchange.

The oil price have a positive impact on the stock market returns, which is consistent with Zaki et al. (2016) study that concluded that the oil price has a positive and significant impact on stock returns on the Egyptian Stock Exchange.

Table 7. Continue….

CRISIS: 2014M01				
SMR_t = -23.525 INF - 78.984 EX + 14.536 OIL + 1708.065 CRISIS				
	(6.804)	(17.640)	(7.309)	(432.589)

Note: Numbers between parentheses refer to standard error.

4.2.2.3. Co-Integration Test – Tunisia

Table 8 shows the results of Johansen cointegration test applied on three regression models for Tunisia, where the dummy variable (CRISIS) is changed in each of the three models depending on the structural breakpoints detected by Bai and Perron test. It can be noted that there is no cointegration relationship between the macroeconomic variables and stock market returns when taking the structural break dates (2014M12 and 2016M07) into account, while there is one cointegration relationship when taking the structural break date (2018M02) into the regression model.

The year 2018 had a negative impact on many world economies, which had a negative impact on financial markets and a decline in stock returns in many countries including Tunisia. Therefore the structural break in 2018 caused a decline in the performance of the Tunisian Stock Exchange.

Both inflation and exchange rate have negative impact on the stock market returns in Tunisia. The political and economic instability is accompanied with high inflation and decrease in the exchange rate which have both negative impact on the stock market returns. Barakat et al. (2016) also concluded that the inflation rate has a negative impact on the stock market index of Tunisia. In addition, Ben Yaala and Henchiri (2016) found that the inflation rate have a negative and significant impact on stock prices on the Tunisian Stock Exchange.

4.2.2.4. Co-Integration Test – Bahrain

Table 9 shows the results of Johansen cointegration test applied on five regression models for Bahrain, where the dummy variable (CRISIS) is changed in each of the three models depending on the structural breakpoints detected by Bai and Perron (2003) test. It can be noted that there is at least one cointegration relationship between the macroeconomic variables and stock market returns in each of the estimated regression models, which means that the economy of Bahrain faced several significant structural breaks that affected the stock market returns on the long-term.

Table 8. Results of Johansen cointegration test – Tunisia.

Regression models - Tunisia	Null	Trace statistics (Critical value)	Max statistics (Critical value)
$SMR_t = \beta_1 + \beta_2\ INF_t + \beta_3\ EX_t + \beta_4\ OILt + \beta_5\ CRISIS_t + e_t$ CRISIS : 2014M12			
Conclusion: No cointegration relationship	r = 0	66.001* (69.819)	37.409 (33.877)
	r = 1	28.592 (47.856)	17.017 (27.584)
	r = 2	11.575 (29.797)	7.950 (21.132)
$SMR_t = \beta_1 + \beta_2\ INF_t + \beta_3\ EX_t + \beta_4\ OILt + \beta_5\ CRISIS_t + e_t$ CRISIS : 2016M07			
Conclusion: No cointegration relationship	r = 0	67.133* (69.819)	25.140 (33.877)
	r = 1	41.993 (47.856)	19.059 (27.584)
	r = 2	22.934 (29.797)	14.479 (21.132)
$SMR_t = \beta_1 + \beta_2\ INF_t + \beta_3\ EX_t + \beta_4\ OILt + \beta_5\ CRISIS_t + e_t$ CRISIS : 2018M02			
Conclusion: Two cointegration relationships	r = 0	177.982*** (69.819)	126.051*** (33.877)
	r = 1	51.931** (47.856)	28.957** (27.584)
	r = 2	22.974 (29.797)	12.901 (21.132)

Note: Null hypothesis is accepted, if test statistic < Critical value, critical value considered at 5%.
*, **, *** refers to the significance level of 10%, 5% and 1% respectively.

Table 8. Continue….

CRISIS: 2018M02			
SMR_t = -9.341 INF - 3.386 EX - 4.208 OIL + 522.170 CRISIS			
(2.393)	(3.210)	(0.521)	(36.768)

Note: Numbers between parantheses refer to standard error.

From the regression models it can be noted that the dynamics of the macroeconomics impacting the stock market returns are different from one period to another depending on the breakpoint that has been taken into account whether these were positive or negative breakpoints. For instance, in the regression model where the controlling variable is the crisis in 2011, the results showed a negative impact of the crisis on the stock market, while the other macroeconomic variables showed a positive relationship with the market returns. On the other side, when controlling for a positive breakpoint such as that in 2014, the results are showing that the structural break has a positive impact on the stock market, while the consumer prices have a negative impact on the stock market returns. Both the exchange rate and oil prices showed a positive impact on the stock market in this model.

Therefore, the dynamics of how the macroeconomic variables affecting the stock market returns depends on the nature of the structural break.

Table 9. Results of Johansen cointegration test – Bahrain.

Regression models - Bahrain	Null	Trace statistics (Critical value)	Max statistics (Critical value)
$SMR_t = \beta_1 + \beta_2\ INF_t + \beta_3\ EX_t + \beta_4\ OILt + \beta_5\ CRISIS_t + e_t$ CRISIS : 2011M08			
Conclusion: Two cointegration relationship	r = 0	84.646*** (69.819)	34.773** (33.877)
	r = 1	49.873** (47.856)	26.943* (27.584)

Regression models - Bahrain	Null	Trace statistics (Critical value)	Max statistics (Critical value)
	r = 2	22.930 (29.797)	12.813 (21.132)
$SMR_t = \beta_1 + \beta_2 INF_t + \beta_3 EX_t + \beta_4 OILt + \beta_5 CRISIS_t + e_t$ CRISIS : 2014M01			
Conclusion: Two cointegration relationship	r = 0	105.08*** (69.819)	50.161*** (33.877)
	r = 1	54.920** (47.856)	30.229** (27.584)
	r = 2	24.691 (29.797)	11.969 (21.132)
$SMR_t = \beta_1 + \beta_2 INF_t + \beta_3 EX_t + \beta_4 OILt + \beta_5 CRISIS_t + e_t$ CRISIS : 2015M08			
Conclusion: Two cointegration relationship	r = 0	99.689*** (69.819)	50.885*** (33.877)
	r = 1	48.804** (47.856)	21.859 (27.584)
	r = 2	26.945 (29.797)	14.405 (21.132)
$SMR_t = \beta_1 + \beta_2 INF_t + \beta_3 EX_t + \beta_4 OILt + \beta_5 CRISIS_t + e_t$ CRISIS : 2017M03			
Conclusion: One cointegration relationship	r = 0	77.613** (69.819)	33.696 (33.877)
	r = 1	43.917 (47.856)	24.690 (27.584)
	r = 2	19.227 (29.797)	13.508 (21.132)
$SMR_t = \beta_1 + \beta_2 INF_t + \beta_3 EX_t + \beta_4 OILt + \beta_5 CRISIS_t + e_t$ CRISIS : 2019M01			
Conclusion: One cointegration relationship	r = 0	730.449** (69.819)	33.118* (33.877)
	r = 1	40.331 (47.856)	19.977 (27.584)
	r = 2	20.355 (29.797)	12.540 (21.132)

Note: Null hypothesis is accepted, if test statistic < Critical value, critical value considered at 5%
*, **, *** refers to the significance level of 10%, 5% and 1% respectively.

Table 9. Continue…

CRISIS : 2011M08
SMR_t = 88.376 INF + 15.675 EX + 7.592 OIL – 3363.163 CRISIS (63.833) (77.149) (15.232) (574.032)
CRISIS : 2014M01
SMR_t = -36.134 INF + 17.124 EX + 11.445 OIL + 764.322 CRISIS (14.214) (14.028) (2.845) (123.492)
CRISIS : 2015M08
SMR_t = 35.707 INF -158.901 EX -18.524 OIL + 1363.425 CRISIS (28.141) (29.979) (5.586) (286.703)
CRISIS : 2017M03
SMR_t = -23.714 INF -37.621 EX -14.734 OIL + 436.006 CRISIS (18.112) (17.532) (3.183) (112.331)
CRISIS : 2019M01
SMR_t = 36.405 INF -61.930 EX -12.153 OIL + 95.603 CRISIS (10.534) (12.484) (2.382) (71.2863)

Note: Numbers between parentheses refer to standard error.

5. CONCLUSION

The main purpose of this study is to determine the presence and timing of the structural breaks in the stock market returns and investigate their impact on the relationship between macroeconomic variables, namely the

inflation rate, the exchange rate, the oil prices, and the stock market returns of a sample of Arab countries facing political and economic instability (namely Syria, Egypt, Tunisia and Bahrain) during the period (2010-2020).

CUSUM test is performed in order to test the presence of structural breaks in stock market indexes, and Bai and Perron (2003) Multiple Breakpoints test is used to identify points in time where significant changes may have occurred. These point of structural breaks have been included later in the regression models as dummy/control variables to examine the impact of the macroeconomic variables on the stock market returns using Johansen cointegration test.

Both inflation rate and exchange rate proved to have important effect on the stock market returns of the countries under study. In case of Syria, the depreciation in the Syrian pound during the crisis caused a decline in the stock market returns due to investors' reluctance to invest in instable environment, while the inflation rates have negative effect on the stock market returns of Egypt and Tunisia. In case of Bahrain, the dynamics of the macroeconomics impacting the stock market returns are proved to be different from one period to another depending on the structural break that has been taken into account whether these were positive or negative breakpoints.

As a conclusion, the dynamics of how the macroeconomic variables affecting the stock market returns depends on the nature and timing of the structural break and differs from country to another.

Funding: This study received no specific financial support.
Institutional Review Board Statement: Not applicable.
Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Data Availability Statement: The corresponding author can provide the supporting data of this study upon a reasonable request.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.

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