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UNIVERSITY OF PLYMOUTH

TESTING MARKET EFFICIENCY OF MENA EQUITY RETURNS

by

MOHAMED SAMY SAADEDEEN AHMED SHEHATA

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in partial fulfilment for the degree of

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Last but not least, I thank my friends and colleagues for their continuous support and inspiration.

Mohamed S.S.A. Shehata

Dedication

"I dedicate this thesis to my parents, wife and family who taught me that seeking knowledge is a continuous obligation requiring hard work and dedication."

Author's Declaration

At no time during the registration for the degree of Doctor of Philosophy has the author been registered for any other University award without prior agreement of the Doctoral College Quality Sub-Committee.

This thesis has been proofread by a third party; no factual changes or additions or amendments to the argument were made as a result of this process. A copy of the thesis prior to proofreading will be made available to the examiners upon request.

Work submitted for this research degree at the University of Plymouth has not formed part of any other degree, either at the University of Plymouth or at another establishment.

This research has been conducted under a formal agreement with the University of Plymouth, for which a joint award will be awarded.

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Abstract

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Title: Testing Market Efficiency of MENA Equity Returns

This study focuses on the MENA region, which comprises Bahrain, Egypt, Israel, Jordon, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, Lebanon, Tunisia, and Morocco. Although the MENA countries have overseen many reforms throughout the years after forming financial markets, the efficacies of these markets remain uncertain. To address this lacuna in the literature, this study explores the market efficiencies of the MENA financial markets by comparing and contrasting the impact of reforms on market efficiencies, studying the most effective macroeconomic variables and the impact of economic policy uncertainty, and transparency on stock returns. The study also investigates how Stock Market Efficiency responds asymmetrically to different macroeconomic policies, transparency, and economic policy uncertainty.

The study measures the efficiency of stock exchanges in 14 countries in the MENA region through momentum, short-term reversal, delay, autocorrelation and variance ratio tests following Griffin et al. (2010) and Jegadeesh (1990).

Using data from the MENA region, the study analyses the effect of macroeconomic variables (MEV), the economic policy uncertainty and transparency variables on stock returns in the MENA countries. The SVAR model is employed to capture the interrelations and the dependencies of MEV on stock returns. Variance decomposition and impulse response function techniques are developed to analyse the reaction and percentage contribution of the dynamic system in response to shocks. Bai-Perron (1975) is employed to control the multiple break months in market efficiency variable. Results show that there is an impact of macroeconomic variables on Stock Market

Efficiency before and after the breakpoint. Results show that the stock return responds differently to the MEV shocks depending on the economic conditions.

The study uses a nonlinear autoregressive distributed lag (NARDL) framework to examine the asymmetric long and short run relation between the momentum investing strategy shock that supervises the efficiency of the stock market and macroeconomic variables (fiscal and monetary policies). These results suggest that investors should adjust their investment strategies to the changes in the instruments of fiscal and monetary policies and consider the asymmetry when forecasting and managing the negative effects of unexpected events.

Table of Contents

ACKNOWLEDGEMENTS ..... **I**

DEDICATION ..... **II**

AUTHOR'S DECLARATION ..... **III**

ABSTRACT ..... **IV**

INTRODUCTION **1**

CHAPTER 1: STOCK MARKET EFFICIENCY AND MACROECONOMIC VARIABLES **5**

1.1 Stock Market Efficiency Overview 5

1.2 Indications of Market Inefficiencies 8

1.2.1 Trading Strategy 8
1.2.1.1 Momentum Strategy 8
1.2.1.2 Short-term Reversal 8
1.2.2 Traditional / Common Efficiency Measures 9
1.2.2.1 Auto Correlation 9
1.2.2.2 Delay 10
1.2.2.3 Variance Ratio 10

1.3 Impact of Macroeconomic Variables on Stock Return 10

1.3.1 Monetary Policy Overview 10
1.3.1.1 The Impact of Money Supply 11
1.3.1.2 The Impact of Interest Rates 12
1.3.2 Fiscal Policy Overview 12
1.3.2.1 The impact of government expenditure 13
1.3.2.2 The impact of tax revenue 13
1.3.3 The Impact of Transparency 14
1.3.4 The Impact of Economic Policy Uncertainty 14

1.4 Middle East and North Africa (MENA) 15
1.4.1 MENA Overview 15
1.4.2 MENA Actions/Reforms 15

1.5 Conclusion.....27

CHAPTER 2: STOCK MARKET EFFICIENCY: EVIDENCE FROM MENA.....28

2.1 Introduction 28

2.2 Literature Review 30

2.3 Data Overview.....35
2.3.1 Market efficiency descriptive statistics 36

2.4 Methodology 36
2.4.1 Momentum Strategy 37
2.4.2 Short-term Reversal Strategies 41
2.4.3 Delay 41
2.4.4 Autocorrelation.....48
2.4.5 Variance Ratios 49

2.5 Conclusion.....52

CHAPTER 3: THE EMPIRICAL ANALYSIS OF THE IMPACT OF MACROECONOMIC VARIABLES (MEV) ON THE STOCK MARKET RETURNS IN MENA COUNTRIES.....53

3.1 Introduction 53

3.2 Literature 55
3.2.1 Macroeconomics Variables 55
3.2.2. Economic Policy Uncertainty.....60
3.2.3. Transparency 63

3.3 Data and Methodology.....65
3.3.1 Data 65
3.3.2 Methodology 67
3.3.2.1 Stationary test 67

3.3.2.2 Lag length criteria 68
3.3.2.3 Structure Vector Autoregressive (SVAR) Model 70
3.3.2.4 Variance Decomposition 73
3.3.2.5 Impulse Response Function (IRF 75

3.4 Conclusion 81

CHAPTER 4: THE EMPIRICAL ANALYSIS OF MACROECONOMIC VARIABLES AND STOCK MARKET EFFICIENCY 82

4.1 Introduction 83

4.1 Breakpoints Effects (Factors) 86

4.2 Literature 96

4.3 Methodology and Data 102
4.3.1 Structural Break Tests 103
4.3.2 Bai-Perron Multiple Breakpoints Test 105
4.3.3. Least Square with Breakpoint 109
4.3.4 Asymmetric Responses of Market Efficiency 111

4.4 Conclusion 122

CONCLUSIONS 124

REFERENCES 129

APPENDICES 151

Appendix A: ADF and PP stationarity tests 151

List of Tables

Table 2.1 Descriptive Statistics of MENA Stock Markets 38

Table 2.2 Descriptive Statistics of MENA Stock Markets 39

Average Return of Momentum Strategy 39

Table 2.3 Portfolio Based on Past Return Momentum, Panel A 40

Table 2.4 Portfolio Based on Past Return Momentum, Panel B 40

Table 2.5 Descriptive Statistics of MENA Stock Market. Average Return of Short-Term Reversal Strategy. Panel A 44

Table 2.5 Descriptive Statistics of MENA Stock Markets. Average Return of Short-Term Reversal Strategy. Panel B 45

Table 2.6 Portfolio Based on Past Return Short-Term Reversal. Panel A 46

Table 2.6 Portfolio Based on Past Return Short-Term Reversal. Panel B 46

Table 2.7 Descriptive Statistics of MENA Stock Market Delay Strategy 47

Table 2.8 Summary of Portfolio Level on a Weekly Basis 47

Table 2.9 Descriptive Statistics of MENA Stock Market Autocorrelation 49

Table 2.10 Descriptive Statistics of MENA Stock Market VRs Strategy 51

Table 3.1 Diagnostic Tests for Structural Vector Autoregressive (SVAR) 69

Table 3.2 Estimate for Structural Vector Autoregressive (SVAR) Model 73

Table 3.3 Variance Decomposition to Stock Returns 75

Table 4.1 Least Square Breakpoint of the MENA Region 111

Table 4.2 Nonlinear ARDL estimation 117

Table 4.3 Nonlinear ARDL bounds test results 118

Table 4.4 Wald test of long and short-run asymmetry 118

List of Figures

Figure 3.1 The Most Effective Variable on Stock Returns 74

Figure 3.2 Impulse Response Function, Panel (A) 78

Figure 3.2 Impulse Response Function, Panel (B)..... 79

Figure 3.2 Impulse Response Function, Panel (C)..... 80

Figure 4.2 Bai-Perron Multiple Breakpoints Test for SME in the MENA Region 107

Figure 4.3 Asymmetric Dynamic Multiplier impacts, Panel (A)..... 119

Figure 4.3 Asymmetric Dynamic Multiplier impacts, Panel (B),..... 120

Figure 4.3 Asymmetric Dynamic Multiplier impacts, Panel (C)..... 121

List of Abbreviations

A	Average (normal returns)
ADF	Augmented Dickey-Fuller
APT	Arbitrage Pricing Theory
EMH	Efficient Market Hypothesis
EP	Economic Policy Uncertainty
GCC	Gulf Cooperation Council
IRF	Impulse Response Function
L	loser (low or negative returns)
LM	Lagrange Multiplier
MENA	Middle East and North Africa
MEV	The Macroeconomics Variables
MOM	Momentum
MSCI	Morgan Stanley Capital International
NARDL	Nonlinear Autoregressive Distributed Lag
OECD	Organization for Economic Co-operation and Development
QFI	Qualified Foreign Investors
SD	Standard Deviation
SME	Stock Market Efficiency
SMEs	Small and Medium Enterprises
SVAR	Structural Vector Autoregressive
UAE	United Arab Emirates
UK	United Kingdom of Great Britain and Northern Ireland
US	United States of America
VRs	Variance Ratios
VMA	Vector Moving Average
W	Momentum Winner (high returns)
WML	Winner Minus Looser

Introduction

This study outlines the objectives and expresses the gaps in investigating the asymmetric impact of macroeconomic variables in terms of monetary and fiscal instruments in addition to economic policy uncertainty (EP) and transparency on Stock Market Efficiency (SME) in the Middle East and North Africa (MENA) region. It does so by making economic assumptions to find out the effect of various factors on its own economy. In real-world conditions, almost all the microeconomic variables such as individual expenditure, wages, consumption, production, and macroeconomic variables like inflation, unemployment, exchange rate, budget deficit experience dynamic changes affecting larger populations and are sometimes unpredictable. The business cycle helps us understand the movement of these variables. For example, when the unemployment rate reduces or the budget surplus, and Gross Domestic Product (GDP) rises, these are signs of economic expansion. In contrast, when inflation falls, GDP reduces, or unemployment increases, these are signs of economic recession. In short, changes in macroeconomic variables affect the economy.

Financial markets are crucial for economic development as it affects the wealth of individual investors, business firms and the economy. Financial markets set the price of their securities based on demand and supply. Researches have shown that these macroeconomic variables significantly influence the financial market, particularly the stock market. The economy is in equilibrium when its aggregate demand equals its aggregate supply. However, the significance level varies with the strength of the changes in the

variable and other factors. Many statistical tools are used to conclude if the changes in the macroeconomic variables affected the stock market performance. To reduce the impact of these macroeconomic variables that could affect the functioning of the economy, the government introduced policies, namely monetary and fiscal policies. Monetary policies relate to the money supply that addresses the problem of inflation by adjusting the interest rates and controlling the money supply in the market. The most extensively used fiscal policy is the tax policies set by the government and adjusting government spending according to their economic condition.Stock Market Efficiency in the MENA region has recently faced many challenges, such as poor liquidity, political instability, and thin trading. These markets have been subject to reform in recent years to improve performance and efficiency. As the OECD (2005, p. 13) observed, 'Countries in the MENA region have been attempting to strengthen their regulatory and institutional infrastructure for capital markets'. Several studies examined the MENA stock market efficiency (Abdmoulah, 2010; Antoniou, Ergul and Holmes, 1997; Butler and Malaikah, 1992). However, Bekeart and Harvey (1998) found that informational efficiency provides a crucial link between stock markets and economic growth in emerging economies, which makes it of considerable importance to policymakers in such countries where limited studies have considered stock market liquidity and its direct relationship with macroeconomic variables (namely, money supply, interest rate, government expenditure and taxes). This issue needs to be incorporated in analysing the

asymmetric impact of macroeconomic policy combination (fiscal and monetary policy) on the MENA stock market efficiency.

Macroeconomic Policy Combination (fiscal and monetary policy) can have different effects over the business cycle. It can be less or more effective as a policy instrument depending on the state of the economy. For example, Blanchard and Perotti (2002) find that fiscal policy might be more effective in mitigating economic slumps than in muting booms. Alternatively, it might be less effective at lengthening expansions than at shortening recession. On the monetary side, Cover (1992) illustrates an apparent asymmetric effect of monetary policy on aggregate output for the USA, with monetary contractions having a greater effect on output than equally sized monetary expansions. However, very little literature has been devoted to testing the existence of such an asymmetry in response to monetary and fiscal policy on stock market efficiency (SME). Therefore, this study will use MENA data to investigate whether stock market efficiency responds similarly to different macroeconomic policies. Other significant relationships were highlighted in past research regarding their related stock prices to economic policy (EP) uncertainty and transparency. The EP uncertainty has become significant during the global financial crisis as the U.S. and European policies have contributed to the vast economic declines during 2008-2009 (Baker et al., 2016). Research also suggests that EP uncertainty depresses the firms' investment decisions and affects market volatility (Kang et al., 2014; Wang et al., 2014; Liu and Zhang, 2015). Regarding transparency, it is assumed that, with sufficient transparency in the market environment, stock prices reflect

more information about future events (Dasgupta et al., 2010). Most researchers focused on transparency through environmental, governance and social disclosures that are mandatory and voluntary and examined its effect on firm performance (Serafeim and Grewal, 2017; Yu et al., 2018). However, limited research examined the relationship between transparency and stock returns.

The thesis introduces the research background, summarises previously published research in this field, and outlines the overall structure. Chapter 1 provides a clear definition of market efficiency, macroeconomic variables, and the MENA region as a case study. Chapter 2 is an empirical analysis to estimate the improvements or deteriorations in stock market efficiency in the MENA region. Chapter 3 is another empirical analysis examining the impact of macroeconomic variables on MENA countries' stock returns. It summarises the most important variables that significantly affect stock returns. Chapter 4 is also an empirical analysis that shows the extent to which market efficiency in these stock markets is improved or deteriorated during various sub-periods through the structural approach. Further works in chapter 4 are empirically utilized to examine the asymmetric impact of macroeconomics mix on stock market efficiency through Non Linear Autoregressive Lag (NARDL) estimation Bound and Wald tests. The study concludes by summarising the dissertation's findings, primary contributions, policy implications/recommendation, and highlights the limitations of the study.

Chapter 1: Stock Market Efficiency and Macroeconomic Variables

This chapter offers a brief explanation of stock market efficiency, the methods used to estimate the improvements or deteriorations in stock market efficiency and an overview of the capital markets and reforms undertaken in the MENA countries. This chapter also discusses the macroeconomic variables specifically monetary and fiscal policy instruments that influence the financial market, particularly the stock market. Other significant relationships are also discussed related to economic policy (EP) uncertainty and transparency.

1.1 Stock Market Efficiency Overview

The most common description given to market efficiency is that it refers to "prices fully reflect all available information is shorthand for the empirical claim that available information does not support profitable trading strategies or arbitrage opportunities" (Gilson, 1984, p.554). This is explained under the concept of efficient market hypothesis (EMH), which infers that at a point in time, the market price should integrate and produce all the information pertaining to the securities. Since various types of information affect the information available for each security value, scholars differentiated the market efficiency based on the amount and type of information available on security values. These are strong efficiency, semi-strong efficiency, and weak form efficiency. The strong type of EMH is when there is full information available, private and public, about current stock prices. The semi-strong

EMH suggests that the current stock price completely provides all freely accessible data, e.g., past costs, the information detailed in a company's financial statements, profit, declared merger plans, and desires regarding macroeconomic variables.

Further, this publicly available information does not need to be entirely monitored. In case markets are semi-strong proficient, then prices will alter instantly to reflect freely accessible data. Just like the frail frame of the effective showcase speculation, the semi-powerful shape still attests that one ought not to benefit using something that everybody knows, as the data is open. This open data may be moderately troublesome to assemble and expensive to prepare. Major newspapers and company-produced distributions may not be adequate sources. Many researchers have found experimental proof that is overwhelmingly steady with the semi-strong type of EMH. There is a slight difference between the strong form of EMH and the semi-strong form of EMH, such that semi-strong prevents anyone from systematically generating profits. In contrast, a strong EMH predicts future improvements unbiasedly, thus incorporating both private and public information concisely. Finally, the weak form of EMH emphasises past information of the current stock price. This means that an investor cannot reap the benefits of the stocks with the publicly available information (Gilson, 1984). The two main tenets that make up the EMH and emphasise information available to the public are simultaneously reflected in the asset prices. This public information positively or negatively affects the future price of any financial instrument and is affected by the price of assets today (Malkiel, 2011).

This study is focused on the analysis of the markets in the MENA region. It is noted that Israel is considered a developed market (Kosenko, K. 2007), while the rest of the MENA countries are considered to be emerging. In chapter 2, the study infers evidences of the three types of market efficiency by testing the momentum investing strategy, short reversal, delay, autocorrelation and variance ratios following (Griffin et al., 2010) . Each measure has been reported to show a relation to returns and, hence, stock market efficiency from the prospect of emerging and developed markets. Griffin's study believes that the notion of weak form efficiency or semi-strong efficiency is too constricted and simplistic. He describes how his data is inconsistent with the common belief that emerging markets are more profitable than developed markets. The momentum strategy showed that though there are higher returns in developed markets, they are deemed insignificant, meaning that developed markets are not significantly weak. In addition, the measure of delay suggested that emerging markets are able to incorporate past returns into prices more efficiently than developed markets according to (Griffin et al., 2010). Afego, P. N. (2015) outlines that the type of weak form efficient is used in most applied literatures in Afric, while in developed countries, the semi-strong efficient is utilized. (Lagoarde-Segot, et al., 2008) links the institutional and market development in MENA region with the weak form efficient hypothesis by using a comparative analysis. Findings indicate that the weak form efficient hypothesis is basically illustrated by changes in stock market magnitude.

1.2 Indications of Market Inefficiencies

1.2.1 Trading Strategy

1.2.1.1 Momentum Strategy

The momentum strategy is one of the most researched strategies which rely on past returns and is also known as the momentum effect. We can define it as the ability of the stocks with low past returns to underperform compared to the broader market. Similarly, the stocks with high past returns outperform the broader market. These are very popular among investors and traders, since this strategy takes a long position in past winners and a short position in past losers (Griffin et al., 2010). Studies have proved that momentum strategy has been quite profitable across many classes of securities and several countries. However, momentum strategies are likely to display crashes (losses) in certain situations due to the leverage dynamics of stocks (Daniel et al., 2012). Literature shows that the types of market efficiency and momentum strategy differ from market to market. The achievement of market efficiency and momentum returns depend on conditions like liquidity and crises (Lekhal, M., & El Oubani, A. 2020). Elias et al. (2014) finds significant return in momentum industry strategy due to systematic risk in Malaysian market as evidence of not weak form efficient.

1.2.1.2 Short-term Reversal

The Short term reversal strategy is one of the most widely used trading strategies in most literatures to measure inefficiencies in the U.S and an

indicator of market efficiency (Griffin et al., 2010). Under this strategy, a past return strategy is ranked over periods of weeks. Based on this ranking, the winners and losers are inferred and an investment period of weeks in which short and long stock position is taken. The key concept of the short-term reversal strategy is that once the stock price is forced in a particular direction, the stocks revert (Griffin et al., 2010), resulting in short past winners. This suggests that a short-term reversal strategy creates an overreaction to information from the investors or cognitive mistakes based on investor sentiments. Another probable reason for the short-term profits could be the pressure build-up of the price because of a demand for stock descending or the supply increasing, also known as liquidity based reactions by investors (Da et al., 2014).

1.2.2 Traditional / Common Efficiency Measures

1.2.2.1 Auto Correlation

One of the common measures of market efficiency is using autocorrelations. Significant work has been undertaken on market efficiency, concluding that stocks with high information follow a random walk. This premise used autocorrelation tests (Griffin et al., 2010). Solnik (1973) that tested the stocks of certain European markets and found an increased number of departures from random walk in the European markets as compared to the U.S. market. Other studies found that most developing markets are not as weakly efficienct compared to the developed markets but are comparable to the micro-European markets to a great extent (Erunza and Losq, 1985).

1.2.2.2 Delay

Delay is another measure used to test market inefficiency through R-squared, which measures the present returns' sensitivity based on the previous market information. It is calculated as the difference between the R-squared of a restricted model with no lags and an unrestricted model with lags of four weekly intervals. (Griffin et al., 2010; Mech, 1993) measure the Delay as the difference between adjusted R-squared (unrestricted model) and adjusted R-squared (Restricted model).

1.2.2.3 Variance Ratio

Similar to the autocorrelation tests, another measure of market efficiency is variance ratio. The variance tests state that the null hypothesis variance ratios are supposed to be 1 at all lags. A variance ratio above the level of 1 suggests a positive correlation, and a variance ratio below the level of 1 suggests a negative autocorrelation. Since the measures of variance ratio above and below 1 show departure from random walk, we use an absolute value of variance ratio statistic subtracted by 1 as a measure of relative efficiency. This is useful as this measure would capture stocks of both types that exist in a market, i.e., under and over reaction to past returns (Griffin et al., 2010).

1.3 Impact of Macroeconomic Variables on Stock Return

1.3.1 Monetary Policy Overview

There is a deep association between the capital stock markets and the country’s economy such that the stock market reacts sensitively to any change

in the economy. Policies pertaining to the country's monetary system are established/modified to ensure stability in the country's economy. These changes in policies can be restrictive or expansive based on the policies undertaken in such cases. The main variables influencing the monetary policy of any country relate to money supply and interest rates. The value of the stock is determined by predicting the prospective cash flows of the stocks and their discount factors at suitable interest rates that are based on the best estimate of the general economic condition. When there is a period of growth in the economy, the stock prices are high, eventually reducing the interest rates and boosting the economy. When there is a decline in the economy, the stock prices reduce because of the increased interest rates, increasing the discount factors further on the future cash flows based on which decisions are made in the current period (Bissoon et al., 2016). Therefore, the monetary policy serves as a significant factor in determining and influencing the stock returns in any economy. The sections below discuss the crucial parts of monetary policy pertaining to money supply and interest rates.

1.3.1.1 The Impact of Money Supply

To understand the influence of money supply on stock returns, it is essential to review the studies with evidence of such findings. Sheng (2007) revealed that there is a direct relationship between money growth (M2) and stock prices, such that an increase in the money growth leads to an increase in stock prices and vice versa. Similarly, Hasan & Nasir (2008) found a positive and significant relationship between money supply and stock prices in Pakistan.

Similarly, Kandir (2008) found a positive and strong correlation between money supply and stock prices in Sri Lanka.

1.3.1.2 The Impact of Interest Rates

To understand the influence of interest rates on stock returns, it is essential to review studies with evidence of such findings. Some studies found that interest rates affect stock prices (Ali et al., 2014). One study researched the long and short-term influence of interest rates over the stock prices and found that for European markets, the interest rates influence the stock prices in both the long and the short-term (Stoica & Diaconasu, 2012). Similarly, Gerald and Robert (1995) found an opposite relationship between interest rates and stock returns in the U.S. Sheng (2007) found that there is an inverse relationship between the interest rates and stock prices, such that an increase in the interest rate would cause a drop in stock prices and vice versa. In contrast, Hasan & Nasir (2008) found that there is a negative relationship between interest rate and stock returns.

1.3.2 Fiscal Policy Overview

Fiscal policy refers to the use of government expenditures and tax-related policies that affect a country’s macro-economy. This can have a direct and indirect impact on capital markets. Since the government can affect the bonds by retiring or issuing them as public debt, this can directly impact the economy. The government can hold their spending while their taxes keep increasing. This will reduce government debt. The government's public debt bond prices would increase, whereas their returns would have a negative

effect and fall. The perceptions of investors and short or long-term tax rates significantly impact the expected returns from the stocks (Tavares & Valkanov, 2001). The fiscal policies can also have an indirect impact on the economy, such that any change in the fiscal policy creates a shock that would affect the future cash flow's expectations. These affect stock prices in the capital markets.

1.3.2.1 The impact of government expenditure

Government spending as part of the fiscal policy has significant power influencing the stock and bond returns. As mentioned earlier, the government can vary spending by holding it constant and lowering the supply of public debt. This would decrease the returns. Subsequently, Tavares & Valkanov (2001) studied the impact of government spending and tax revenue on stock returns. They found that government spending is positively related to the stock and bond returns but has an insignificant effect on returns.

1.3.2.2 The impact of tax revenue

Tax revenues are an important part of the fiscal policy that affects the returns in the capital market. The government maximises their tax revenues while holding constant spending in order to manipulate the returns. As mentioned previously, government spending has a positive, yet insignificant, impact on returns. In contrast, the tax revenue has a significant impact on the economy such that the tax rate would significantly affect the future expected returns over a one-year period (Tavares & Valkanov, 2001). They also concluded that the effect of a tax is similar for both stock and bond returns.

1.3.3 The Impact of Transparency

The concept of transparency has remained vague, however the transparency promotes the information available to traders and increases their price-setting efficiency.. The effect of transparency on market efficiency is also not very clear. Some researchers state that market size, stock price, identity, quote and other trade data are part of transparency. They also suggest that transparency is essential as traders have more information on trade patterns, buy and sell imbalances, etc. This will assist them in understanding the current market and, as a result, they can set their prices efficiently. Thus, it can be said that transparency promotes the information available to traders and increases their price-setting efficiency (Bloomfield, 1999).

1.3.4 The Impact of Economic Policy Uncertainty

The uncertainty in economic policy creates a state of risk averseness among consumers and investors, hindering economic growth. This is because of the reluctance of investors to spend when the economy is ambiguous. As a result, investors with projects and investments in a certain economy would pause or halt their investment decision during times of economic uncertainty (Bernanke, 1983). This leads to several negative effects on the economy, such as the contraction of the economy causing a recession, an increase in the cost of finance, thus further reducing the investment and hindering economic growth. This is also clear from several studies that found a negative relationship between economic policy uncertainty and investors' investment

decisions (Julio & Yook, 2012). Economic uncertainty also negatively affects stock prices, as found by Ozoguz (2009) and Sum (2012).

1.4 Middle East and North Africa (MENA)

1.4.1 MENA Overview

The literature on the transitions in the economy, profitability, efficiencies and capital investments is limited in the MENA region. Some studies focused on the MENA region but failed to provide in-depth analysis. One reason could be the slow progression of MENA countries in terms of development. Most developing countries have adopted privatisation to improve their economies. However, the poor private sector, regulatory weaknesses and initial stages of financial markets hinder strong privatisation in this region. Similar to other regions, the first emphasis on privatisation in the MENA region was on SMEs (Small and Medium Enterprises). MENA countries with the highest rate of privatisation of industrial sectors included Turkey and Egypt. Egypt privatised by selling shares through the stock market, selling stakes to investors, and so on (Rejichi & Aloui, 2012). Further sections will include a detailed analysis of MENA countries regarding their reforms and actions taken by their governments to improve their economy.

1.4.2 MENA Actions/Reforms

Kuwait: The stock market in Kuwait was established in the year 1961, soon after independence from the British. However, it was not long before the stock exchange faced several collapses because of weak regulations and speculative

trading activities. The Kuwaiti stock exchange saw very slow development and growth as the GCC citizens limited the market. Majority of the activity remained under the control of the government, the ability to lend and borrow securities did not exist, and there were limited market players. In order to provide effective oversight over the capital market, the government passed a Capital Market Authority Law in the year 2010. The primary purpose of this law was to govern all modes of market manipulation techniques to ensure an efficient market. Because of several issues faced by the Capital Market Authority Law in 2010, it was revised and issued again in the year 2014 and later in 2015. Some of the important reforms introduced in the Kuwaiti capital market were, "independent regulatory body, comprehensive change in the standards of licensing for all market participants, a new set of provisions that criminalise and punish many market abuse, new restrictions on dealers, new corporate governance rules, and the privatisation of Kuwait Stock Exchange" (Bouresli & Abdulsalam, 2019, p.48).

New reforms were introduced to the stock market to ensure safe trade, fairness and increased trust among investors. They also sought to improve market efficiency and performance. In order to measure the effectiveness of the reforms introduced in Kuwait, Boresli and Abdulsalam (2019) tested the liquidity measures of the companies in the Kuwait Stock Exchange and compared the pre-Capital Market Authority Law implementation period and post-Capital Market Authority Law implementation period. They found that despite introducing reforms to improve capital market efficiency, the regulations in emerging markets adversely affected market efficiency,

especially with small firms. Hence, policymakers should review the law and regulatory actions, as some studies suggest blurred laws create inefficiencies in trade for investors and hurt their confidence in the capital markets (Cumming et al., 2011).

Qatar: they established the stock market of Qatar in the year 1995 with only 17 companies listed. Similar to other GCC nations, only local citizens could invest in listed companies. However, from the year 2005 onwards, foreigners have been allowed to invest in listed companies, which led to rapid growth in the economy. There have been tremendous changes thereafter in the Qatar Stock Exchange, such as linking the Qatari brokers with the New York Stock Exchange as a global trade platform in 2010 to become the first trading platform in the Gulf region. This enhanced foreign participation in the trading platform. Their system was enhanced further in the year 2012, as the companies listed on the stock exchange were categorised into a wide range of activities. Considering the various sectors in the Qatari Market, the financial sector that includes banks and insurance companies holds the maximum occupancy. It is followed by industrial companies, then telecom service companies and then utilities and energy sector (Oxford Business Group, n.d.). The Qatar Stock exchange is continually working towards improving foreign investments, improving market makers and raising awareness among the investors.

Considering the changes made by policymakers for the Qatar Stock Exchange, the results have shown tremendous positivity. The stock market was given the status of emerging markets in the year 2014 by Morgan Stanley

Capital International (MSCI). The stocks have seen significant growth and were rated as a booming stock market in the Gulf region, surpassing the United Arab Emirates (UAE) and Bahrain. The financial sector, as mentioned earlier, played a significant role in the stock's growth market as it contributed 35% of the total trade value in the capital market (Oxford Business Group, n.d.).

Saudi Arabia: The Saudi Arabian economy differs little from other GCC nations, as it depends on oil revenue. Hence, the largest source of income for the country is oil exports (Blasquez et al., 2021). Saudi Arabia established its stock market in the 1970s. However, it was developed only in the year 2004 as the Saudi Government established the Capital Market Authority, which is the sole regulator of the capital market. It was enhanced further by creating the Saudi Stock Exchange, also known as Tadawul in the year 2007. The reforms in the year 2015 saw the Saudi capital market emerge as a developing market. It includes the norms for qualified foreign investors (QFI), enabling foreign investors to purchase stocks of the companies listed in the Saudi capital market. However, the limit for foreign investment remains a maximum of 49% of shares purchasing power (Oxford Business Group, 2018).

The reforms led by the Saudi Government aimed at improving the country's capital market by encouraging and easing the process of foreign investment by granting ease of access and improving the transparency of the transactions to enhance the capital market. However, the exact effect of these regulations and reforms on market efficiency remains unclear and needs further investigation.

The United Arab Emirates (UAE): The UAE is among the most developed GCC nations, as it has a strong infrastructure, institutions, and macroeconomic stability. However, it has deficiencies in terms of education and innovation as compared to other GCC nations (Hvidt, 2011). UAE has three financial markets; Dubai Financial Market, the Abu Dhabi Securities Exchange and Nasdaq Dubai. The Abu Dhabi Government wholly owns the Abu Dhabi Securities Exchange, whereas the Dubai Financial Market is 79.6% owned by the Dubai government, and the rest is publicly traded. The Nasdaq Dubai was formed in the year 2005 and is partially owned by Dubai Financial Market (66.7%) and Borse Dubai (33.3%). Significant changes in the UAE were made to ensure market stability as they introduced governance of investment funds in the year 2012. They made further enhancements in the regulations to improve the interest of the traders by amending laws pertaining to corporate governance as it improves shareholder rights and protects minority interests (Oxford Business Group, 2017).

Despite the reforms overseen by the policymakers, the performance of the UAE market depends on factors such as oil prices and fluctuations in the interest rate in U.S. dollar terms. In order to assess the long-term effect of the regulations, further studies are needed to examine the effect of the new regulations on market efficiency. However, it should be noted that these regulations led to an increase in the GDP growth of UAE (Oxford Business Group, 2017).

Bahrain: Similar to other Arab nations, the principal source of income is through oil exports. The country is working towards diversifying its economy

by investing in transport and communication (Acikgoz et al., 2016). Further, the stock market started operating in the country from the year 1989, comprising 29 companies listed on the exchange. Thereafter, the country has seen several reforms to enhance the capital market. One such reform includes the monetary policy by pegging the Bahraini Dinar to the U.S. dollar. Hence, inflation relies on the monetary policies of the U.S. Federal Reserve. As a result, interest rates rose almost nine times from 2015 to 2018, which strengthened the liquidity and stability of the Islamic financial sector. During the year 2018, the Central Bank of Bahrain adopted a risk-based supervision approach to enhance the monitoring of the financial sector to improve the supervision and ensure the stability of the financial industry. The primary aim was to enhance the transparency and protection of the consumers (Oxford Business Group, 2020).

The tiny Gulf nation has seen poor economic growth from the macroeconomic perspective, as the capital outflows were high. This led to a significant increase in public debt as the government turned towards borrowing funds. Considering 10 years from 2008 to 2019, the borrowing increased from 13% to almost 110% (Oxford Business Group, 2020). The impact of regulations on the country's economy is yet to be seen. as there is an insufficient correlation between the reforms and market efficiency in Bahrain.

Oman: Oman's stock market was established during the 1980s with the founding of the Muscat Securities Market. In the 1990s, the need for a regulatory framework rose, which led to the establishment of the Capital

Market Authority to foster confidence among the traders and investors and enhance the overall trading process in the stock market (Alam & Hussein, 2019). Similar to other GCC nations, the economic growth despite the initiation of a stock market was very slow in Oman, which is also the smallest market in the entire GCC. Oman's stock market has seen no significant improvement in trade activity. Further, with the fall in oil prices, trading reduced. The government started issuing government bonds in the year 2016 to finance the budget. This led to the formation of the corporate bond market. There are new laws underway to improve the governance of the securities in the Omani capital market, likely to be implemented by 2020. This is to develop strong regulatory bodies, improve transparency and support foreign investment (Oxford Business Group, 2020).

Despite the efforts of the Omani government to enhance their capital market, the studies show slow growth in the capital market. In addition, with the fall in the oil prices, trade has been reduced. Although, Alam & Hussein (2019a) suggested that the growth in the financial sector of Oman has led to the growth in the economy. It requires further examination, taking into consideration recent reforms in the Omani capital market.

Jordan: In the past decade, Jordan's economy has faced significant strain due to a combination of various factors. It included the financial crises, blockage of trade routes, and the Arab Spring. These led to an increase in the cost of security, food and oil prices and a decline in remittances. Subsequently, this led to an increased debt burden on Jordan, which led the government to pass several reforms to improve the country's overall economic stability. The

Jordanian government agreed with the International Monetary Fund for the period 2012-2015 in order to lower the country's debt to GDP ratio. The principal aim of these reforms was to abolish subsidies by eliminating the primary deficit to ensure a downward slope of debt to GDP ratio and herald normal economic growth. However, with the rise in inflation, the debt rates increased significantly, making it extremely expensive for the country to raise new debt. As a result, this will hinder the growth plan of the country (FAO, 2017).

To address the nation's problems, the government of Jordan started changes in their regulatory frameworks. They plan to keep and invite foreign investment by easing the process of doing business in the country. Some reforms include outsourcing, digitisation, virtual workspace, re-engineering and so on. They also intend to pass several laws for the same purpose, such as the removal of tax on goodwill, preservation of shareholder agreement, amendments to companies' law, etc. Since the government of Jordan believes in its human capital market, it aims to capitalise on this advantage to attract outsourcing projects, especially in the information technology sector (FAO, 2017). Although some reforms are yet to be implemented, many of these are already initiated by the government. It would be interesting to examine the impact these reforms had on the market efficiency of the Jordanian capital market.

Tunisia: In recent years, Tunisia has faced major issues in terms of its economic and political environments. These are the main reasons behind the reforms to install an economic policy regime, a democratic political setting,

and a more accountable political system. Other recent reforms undertaken by the Tunisian government in the year 2007 include conserving the macroeconomic equilibrium, consolidating economic stability, reforming the educational sector and increasing investment in the highest yielding sectors (AFDB, 2013). In 2018, the Tunisian government passed the finance law, which aims to confront the structural imbalances to bring the budget deficit lower than 5% of the GDP. Another reform aims at liberalising the Tunisian Dinar to enhance the trade competitiveness to lower the fiscal imbalances in the long term.

One of the other issues faced by Tunisia was the rise in prices due to inflation. As a result, the government adapted the monetary policy in the year 2017 to introduce almost $100 million in the Tunisian financial market. However, further policy amendments are required to tackle inflation and control the Tunisian Dinar's depreciating value (Oxford Business Group, 2019). Considering the difficulties faced by the Tunisian government in handling the country's economic and political environment, it is essential to understand the impact government reforms have had on the country’s financial market.

Morocco: Morocco enjoys a very convenient geographical location in the midst of Africa and Europe, easing the trade process. However, similar to most emerging economies, the Moroccan State has been unable to manage development in terms of economy and technology because of a bad state structure. The main issues faced by this country are weak fiscal policies that limit the resources accessible to the public. Second, the political instability hinders growth and investment, leading to high unemployment rates (El Fakir,

2011). Considering these issues, some initiatives taken by the Moroccan Government include reducing the budget deficits by increasing the tax revenue to balance the deficits. The global 2008 crisis resulted in an increased debt of the country.

The principal aim of the government is to diversify the country's economy. This is because even though the agricultural sector plays a vital role as it employs almost 40% of the country's workforce, it offers a minimal contribution to the total GDP. The Green Morocco Plan started in the year 2010 aimed to modernise the agricultural sector. To attract foreign investment, the Moroccan State started a plan called the Industrial Acceleration Plan (2014-2020) to encourage economic diversification in automobiles and manufacturing (Oxford Business Group, 2019). It is interesting to study the impact these reforms have had on the country's financial market. It will help in understanding the efficacy of the policies introduced by the Moroccan State.

Egypt: The Egyptian financial market is one of the most diversified and oldest in the MENA region. In 2009, they formed the Financial Regulatory Authority to regulate the capital markets in terms of corporate governance, transparency and disclosure rules. The Egyptian Exchange, along with the regulators, introduced several reforms into the market. In the year 2016, the regulatory authorities of Egypt devalued the Egyptian pound in compliance with the International Monetary Fund for a loan of $12 billion (Thomson Reuters, 2019). They established the first investment trust in the real estate sector in 2018. In 2019, the Financial Regulatory Authority agreed to reduce

the fees pertaining to trade activity on the exchange to encourage investment and ensure a friendly platform for the investors. The primary aim of these reforms is to improve the country's economic growth (Oxford Business Group, 2021).

In 2010, the Egyptian exchange launched a separate board for SMEs (Small and Medium-Sized Enterprises) known as the Nile Stock Exchange. The trading and listing rules are like those of the large enterprises, except that the SMEs have low fees and fewer disclosure needs. The reforms have had a positive influence on the growth of the economy such that the value of the financial market's index grew by around 67% from 2016 to 2019 (Oxford Business Group, 2021). Subsequently, these results also lay a foundation for a future examination of the impact those reforms had on the market efficiency of the Egyptian market.

Lebanon: Beirut's stock exchange is one of the oldest stock markets in the MENA region. In 2006, they started a remote trading system that enables agents to trade with securities remotely. Soon after, in 2008, they implemented the e-trading platform with licensed brokers. Simultaneously, they introduced an advanced trading system and created a Capital Market Authority to regulate the financial market between 2009 and 2011. In the year 2014, the Beirut Stock Exchange went into an agreement with Euronext to implement a new trading application programme (BSE, 2018).

However, the Lebanese state is currently facing one of its worst economic crises. Throughout the past decades, the Lebanese financial regulatory bodies

functioned poorly in terms of proper governance, transparency and accountability. Reports suggest that there was not a single budget that was passed through the years 2005-2017, and the government neglected the control of public funds. They further ignored the recommendations laid by the International Monetary Fund to float the currency (Tawile, 2021). With passaging time, the negligence of the Lebanese authorities led to bursting the financial bubble, revealing the actual state of the country's economy and financial situation. Considering the downfall of the Lebanese economy, it is essential to study the current status of government reforms and its impact on the market efficiency of the Lebanese financial market.

Israel: The Tel Aviv Stock Exchange was formed in the year 1953. In the last two decades, the Israeli government introduced reforms to reduce government intervention in the capital markets, escalate capital movement, increase competition among the financial sectors and develop the stock exchange. The Israeli government also introduced reforms to increase foreign trade by increasing trade protection and lowering the regulatory burdens. In the year 2018, the government took initiatives to encourage imports through online buying by reducing import taxes on various products, including consumables. In the same year, the government began privatising various sectors, including electricity companies, to reduce the cost of living (OECD, 2019).

Despite the reforms undertaken by the government, a considerable amount of the population remains in poverty. A study suggests that the Israeli economy is not weak form efficient from an international trader's perspective (Karamera et al., 1999). However, no study has examined the market

efficiency after the reforms were implemented. This paves the way to examine the impact of these reforms on the efficiency of Israel's financial market.

1.5 Conclusion

Market efficiency is one of the most discussed financial theories since the publication of Fama's work in the year 1970. Although several markets have been studied throughout the years, including emerging markets, the MENA region has largely been overlooked because of its different cultural setting, regime, and regulations. Hence, the results differ for MENA countries when compared to other emerging markets. Similarly, as Abdmoulah (2010) concluded, the economic reforms in MENA intended to enhance transparency, growth, and trade had little or inverse effects on market efficiency. This is supported by other studies which found that the MENA stock markets were weak form efficient or inefficient (Harrison & Moore, 2012). This speculates that there is a need for further reforms in the MENA region. As mentioned earlier in this study, several reforms have been undertaken by the MENA policymakers, making it insightful to study the impact of these reforms on the economy of the MENA countries. This would help enrich the literature of market efficiencies in the MENA region, which is limited, and help compare and contrast with previous studies that found no effect of reforms on economic growth.

Chapter 2: Stock Market Efficiency: Evidence from MENA

This chapter measures the efficiency of stock exchanges in 14 countries in the MENA region that are investigated following Griffin et al. (2010) and Jegadeesh (1990) through momentum, short-term reversal representing the measure of trading strategy. For the traditional measures, the study employees delay, autocorrelation and variance ratio tests.

2.1 Introduction

Market efficiency has been a vital topic in financial economics for over four decades since the publication of Malkiel & Fama (1970). The efficient markets are defined as one in which new information is adequately reflected in its present security price. In this hypothesis , three forms of the efficient markets are categorised by Malkiel and Fama (1970) as the weak-form, semi-strong-form and strong-form. Weak form efficiency means that the information of all past prices is mirrored in today's prices. Semi-strong efficiency shows that all public information is considered at present prices. Strong form efficiency shows all information in the market.

Stock market efficiency in the Middle East and North Africa (MENA) region faces numerous challenges such as poor liquidity, political instability, and thin trading. These markets are trying to improve the stock market performance and efficiency to overcome such challenges. Referring to OECD

(2005. P. 13), “Countries in the MENA region have been attempting to strengthen their regulatory and institutional infrastructure for capital markets”. Studies such as Abdmoulah (2010) and Butler and Malaikah (1992) examined the MENA stock market efficiency through traditional relative efficiency measures.

Abdmoulah (2010) suggests that MENA markets are highly sensitive to past shocks and have weak form efficiency. It implies that historical information already reflects in the current stock prices; the returns are random and unpredictable. The reforms undertaken by the MENA markets were ineffective and required serious revaluations. Butler and Malaikah (1992) conclude that illiquidity, market fragmentation, trading and reporting delays, and the absence of official market makers are the main institutional factors leading to market inefficiency. Sensoy (2013) reveals that the stock markets of different MENA regions show varying degrees of dependence. They found Iran, Tunisia, and the UAE to be the most inefficient markets in the MENA, whereas Israel and Turkey’s stock markets displayed well-developed financial markets with the most efficiency in the MENA. Considering the inefficiency of most MENA stock markets, there is a need to narrow the gap between emerging capital markets and MENA capital markets. This paper contributes to the literature on MENA stock market efficiency. It adds to the existing literature on MENA stock market efficiency and provides evidence towards the current paradigm of stock markets.

Momentum investing strategies that exploit return reversal and post-earnings announcement drift are trading strategies that exploit market inefficiencies

such as momentum and return reversal. Griffin, Kelly, and Nardari (2010) show the empirical idea of these strategies of the market inefficiency are based on past returns and earnings announcements. Many scholars broadly discuss the mechanisms of computing this strategy. Jegadeesh and Titman (1993) define momentum strategies based on the returns of the past 3–12 months that buy past winners and sell past losers and buy recent losers and sell recent winners based on prior one-month returns is defined as short-term price reversal strategies.

The principal aim of this study is to investigate whether the MENA stock markets have improved in efficiency. Following Griffin et al. (2010) and Jegadeesh (1990), the study will measure the efficiency of stock exchanges through momentum, short-term reversal strategy, delay, autocorrelation, and variance ratio strategy.

2.2 Literature Review

As mentioned earlier, the efficient market hypothesis (EMH) is a vital topic in the theory of finance. Many studies have been conducted to determine the EMH across different markets. Brooks et al. (2000) studied the Greek market for absolute weak form EMH by examining long-range dependence using a spectral regression method. Chappell and Panagiotidis (2005) also studied the Greek market for weak form EMH by examining the non-linear dynamics of three stock indices. Cajueiro and Tabak (2006) some European markets for market efficiency using long-range dependence test over rolling sub-samples similar to Jagric et al. (2005). Hasanov and Omay (2007) and Omay and

Karadagli (2010) also tested some European markets using a non-linear unit root test. Heininen and Puttonen (2008) used calendar anomalies to test the weak form EMH in some European markets. Risso (2008) studied Russian market efficiency using symbolic time series analysis and Shannon entropy. They found that the Russian stock market was one of the most inefficient markets. Smith (2009) found a similar result for the Russian stock market while studying Russia and Turkey for weak form efficiency using joint variance ratio tests. Angelov (2009) studied Bulgaria's market by applying the VR test and filer rule strategy, while Anatolyev (2009) used non-parametric tests to predict financial returns. Guidi et al. (2010) studied the European market using autocorrelation and VR test along with calendar anomalies. Lomev et al. (2011) examined market efficiency through long-range dependence test and the investigation of principal predictability. They found that the Bulgarian stock market was inefficient, as shown by long-range dependence. Similarly, Ivanov et al. (2012) tested market efficiency by using a long-range dependence test and the investigation of forecasting possibilities.

The MENA stock markets' efficiency has often been overlooked while investigating emerging markets. Few studies show the traditional measures of relative efficiency in the emerging markets of the Middle East and North Africa (MENA) region, such as autocorrelation, variance ration, and delay. However, with the region's growing importance, researchers are gaining interest in studying the MENA markets. Gandhi, Saunders, and Woodward (1980) show the inefficiency of the Kuwaiti stock market. Butler and Malaikah (1992) concluded the weak form efficiency in the Kuwaiti stock

market and the inefficiency of the Saudi stock market. El-Erian & Kumar (1995) found serial dependence in returns in the Amman stock market.

Limam (2003) studied the long-range dependence of developed markets and Arab stock markets using parametric and semi-parametric estimation procedures. He found that the legal framework and peculiar characteristics of each country affected long-range dependence. Similarly, Aloui et al. (2005) studied Tunisian, Egyptian, Moroccan, Turkkish and Jordanian markets and detected long-range dependence in the Tunisian market. Lagoarde-Segot and Lucey (2008) concluded in their study that the MENA stock market efficiency is affected by market depth and corporate governance factors. Jeffers and Smith (2005) examined the MENA stock markets using GARCH specification with time-varying parameters. They found that Moroccan and Egyptian stock markets showed weak form efficient from the year 1999. Rejichi and Aloui (2012) conducted a study for the MENA stock markets using Hurst exponent behaviour to assess the stock market's efficiency. They found that most of the MENA stock markets were inefficient except for Israel, Turkey and Egypt. They also found evidence that average trading cost, market capitalisation and anti-self-dealing index affected the inefficiencies of the stock markets.

Abdmoulah (2010) outlined the weak form inefficient and inefficiency in the first quarter of 2009 of 11 Arab stock markets except for the Saudi stock market, which shows decreasing inefficiency. Many markets showed sub-period efficiency improvement while others like Tunisia, Oman and Morocco

experienced instability of market efficiency with no trend towards weak from efficiency.

Sensoy (2013) explored a negative effect on market efficiency in the 15 MENA stock markets over the 2007–2012 period. The time-varying efficiency analysis of daily data with a rolling window technique is employed. Sensoy found different levels of long-range dependence varying over time in all MENA stock markets adversely affected by the Arab Spring.

Andreas and Isabella (2008) showed the development of the Egyptian Stock Market over the last few years. They found that improvements in the economic environment plays a major role improving performance of the Egyptian Stock Market. A structural break point on September 11, 2001, illustrated the positive correlation of the Egyptian 30 index with other markets.

Neaime (2015) examined the mean reversion in 10 MENA countries. Results show a higher value in the average return in Saudi Arabia, Jordan, and Bahrain stock markets.

The momentum strategy is one of the important components of the trading strategy. This strategy is based on the rate of price movement over a period to help investors make investment decisions based on strong momentum stocks (Liu and Lee, 2001). However, the duration of such momentum is a topic of debate among scholars. Debondt and Thaler (1985, 1987) state that long-term (3 to 5 years) past losers perform better than long-term (3 to 5 years) past winners in the subsequent period (3 to 5 years). However,

Jagadeesh and Titman (1993) evidenced that instead of long-term performance (3 to 5 years), stocks over a medium-term (3 to 12 months period) winners performed better than past losers over the same period (3 to 12 months). Therefore, investor bias as a psychological factor in making investment decisions is significantly affected across various countries, including the U.S. stock markets, wherein they focus on such momentum of stock prices and buy past winners and sell past losers. Chan et al. (1996) conclude that stock price momentum might depend on the gradual price falls/rise since investors under-react to the change in stock prices over time, i.e., the perception change over stock is slow. Wermers (1997) also supports the stock market pattern exhibited by the momentum strategy. In contrast, Carhart (1997) argues that high earning stocks are not necessarily because of momentum strategies, but it is likely to happen by chance that last year's winning stocks hold a larger position in the current year. Researchers have studied different stock markets, considering the interest in the predictability of stock returns to determine whether the momentum strategy is optimal for different stock markets. Liu and Lee (2001) studied the Japanese stock market and found that the Japanese stock market was in reverse rather than continuing over a medium-term period (3 to 12 months). Teplova and Mikova (2015) supported it, who found the momentum returns to weakness in the Japanese stock market. Gupta et al. (2010) studied stocks from 51 countries and found significant returns using momentum strategies. Gupta et al. (2013) also clarify that several factors contribute to estimated momentum returns.

Similarly, Ramiah et al. (2011) found the applicability of momentum trading strategies in the Australian stock market. Shah and Shah (2015) found similar results for the Karachi stock market. They also suggested that different factors such as trading volume, trading cost, risk, size, liquidity and book to market value among various other factors should be considered when determining which factor explains momentum returns.

In this study, Following Griffin et al. (2010) and Jegadeesh (1990), the efficiency of stock exchanges is investigated in 14 countries in the MENA region through momentum, short-term reversal representing the measure of trading strategy. For the traditional measures, the study employees delay, autocorrelation and variance ratio tests.

2.3 Data Overview

Total market index returns are collected monthly from DataStream for the momentum analysis while short-term reversal technique, delay, autocorrelation and variance ratio are measured weekly. The sample periods start from January 2004 to July 2019 in ten countries in the MENA region, namely Bahrain (Bahrain Bourse All Share Index), Egypt (EGX-30), Israel (Tel Aviv-25), Lebanon (BLOM), Kuwait (Kuwait SE Weighted Index), Palestine (Al Quds), Qatar (DSM), Saudi Arabia (Tadawul All Share Index), Morocco (CFG-25), and the United Arab Emirates (Abu Dhabi Securities Market General Index), Dubai (DFMGI). To collect evidence in the MENA region and for data availability, the data in Jordan (Amman SE General Index) and Oman (MSM30) started from October 2005 to July 2019, in Syrian from

April 2011 to July 2019 (DSE), and from January 2007 to July 2019 in Tunisia (TUNINDEX).

In this study, MENA comprises Bahrain, Egypt, Jordan, Kuwait, Lebanon, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, and the UAE..

2.3.1 Market efficiency descriptive statistics

Table (2.1) shows the descriptive statistics of all 15 countries in MENA. We tested the significance of the mean return of each stock market, where the return is calculated from the total market index returns in the following equation:

$RI_{it} = \frac{TR_{it}}{TR_{it-1}} - 1$Where RI_{it} is the current stock market return of the 15 MENA countries and TR_{it} is the total market index return and TR_{it-1} is the previous total market return. Positive returns imply that these markets are not efficient because they gain profits based on the past returns as in Bahrain and Lebanon, while negative values of returns imply that these markets are efficient because they cannot predict profits in the futures.

2.4 Methodology

In this study, Griffin et al.'s (2010) framework was used in 15 countries in the MENA region. The evidence of market efficiency is used in a weak form and semi-strong efficient hypotheses in each test as an extension of Griffin et al.'s (2010). Trading strategy components are implemented using the momentum and short-term strategy. The study used traditional efficiency measures comprising delay, autocorrelation and variance ratio tests. All

measures are applied using two settings, namely stock/firm and portfolio analysis.

2.4.1 Momentum Strategy

Most academic research measures momentum investing strategy based on previous returns (Jegadeesh and Titman, 1993). The strategy involves buying past winner stocks and selling past losers, though the holding periods and formation are much longer. This study focuses on the average of eleven-month portfolio and level formation and holding a one-month period. Because the momentum strategies of 11 months changeable periods are instantaneously in effect at all times, the convention of skipping a month between the portfolio's ranking and holding period is employed to avoid having profits contaminated by microstructure effects.

Table (2.2) shows an analysis of the momentum investing strategy in a firm level of selected countries. Fifteen countries show the significance of its mean return under 5% significance level. Based on the past information (returns), the present /realised return is positive and this makes profit differences in Bahrain (0119086 per month and 14% per year) and Lebanon (.0001297 per month and 0.1% per year), This imply that Bahrain and Lebanon market are not efficient and weaken their stock market efficiency due to gains from the past information, However the mean returns of all other MENA stock markets have negative signs. This implies that the improvement of the market

efficiency and the weak form efficiency exists among the 12 markets and Israel tends to have a semi strong efficient market.[1]

The significant momentum portfolios are measured in Tables (2.3) and (2.4) based on the average of the last 11 months' returns and held for one month to avoid having profits polluted by microstructure effects.

The mean of future (realised) return is measured as a breakpoint for an equally sized weighted size portfolio. Table (2.3) Panel A represents a mean return of Egypt, Israel, Jordon, Oman, Saudi Arabia, and Kuwait in five portfolios based on the number of stocks in each market, while three portfolios are formed in Table (2.4) panel B for the remaining MENA countries.

Table 2.1 Descriptive Statistics of MENA Stock Markets

Country	Mean	t-statistics	Std. Dev.	Min	Max	Avg. Firms	Obs	Sample size
Bahrain	0.0119086	-2.2177	0.0655478	-0.1389	0.5435	33	149	Jan2004-July2019
Lebanon	0.0001297	-0.017	0.093365	-0.331	0.707	10	149	Jan2004-July2019
Morocco	-1.09669	(-20.5292)	0.6520907	-3.15107	0.2690842	64	149	Jan2004-July2019
Palestine	-0.835474	(-.835441)	0.7667467	-4.84552	0.3439174	33	149	Jan2004-July2019
Qatar	-0.004942	(-0.7748)	0.0778721	-0.393335	0.2896787	37	149	Jan2004-July2019
UAE	-0.865654	(-23.7412)	0.4450767	-2.99893	0.5443831	56	149	Jan2004-July2019
Dubai	-1.07413	(-15.5173)	0.8449601	-5.09376	0.8130149	38	149	Jan2004-July2019
Egypt	-1.72482	(-16.1425)	1.304273	-6.60592	0.3033893	138	149	Jan2004-July2019
Israel	-55.7475	(-2.9255)	115.5074	-1333.99	644.2223	151	149	Jan2004-July2019
Saudi Arabia	-1.08163	(-14.3172)	0.9221826	-5.86386	0.4761438	128	149	Jan2004-July2019
Kuwait	-3.41737	(-2.5989)	16.05072	-143.274	2.431056	168	149	Jan2004-July2019
Oman	-1.45968	(-18.2364)	0.9055779	-4.58044	0.1625955	101	128	Oct2005 - July2019
Jordan	-1.62645	(-10.2178)	1.8009	-7.1086	5.781078	132	128	Oct2005 - July2019
Tunisia	-0.718535	(-18.1460)	0.4427141	-2.05638	0.185366	59	125	Jan2007-July 2019
Syria	-0.28178	(-4.2096)	0.5270627	-2.74143	1.283297	22	62	April2011-July2019

[1] The Israel market shows a huge negative magnitude of the realised return, -55.74 monthly or -668.97 annually, that based on the average of 11 past returns compared with other countries

Table 2.2 Descriptive Statistics of MENA Stock Markets Average Return of Momentum Strategy

Country		Mean	t-statistics,	Std. Dev.	Min	Max	Avg. Firms	Obs	Sample size
Bahrain	WML	0.0119086	-2.2177	0.0655478	-0.1389	0.5435	33	149	Jan2004-July2019
	W	0.0142465	-2.7183	0.0052409	-0.0817	0.5625		149	
	L	0.0023378	-0.639	0.0036586	-0.1417	0.1909		149	
Lebanon	WML	0.0001297	-0.017	0.093365	-0.331	0.707	10	149	Jan2004-July2019
	W	0.0124686	-2.1446	0.0709674	-0.142838	0.4739749		149	
	L	0.0123373	-1.7777	0.0847153	-0.795173	0.303536		149	
Morocco	WML	-1.09669	(-20.5292)	0.6520907	-3.15107	0.2690842	64	149	Jan2004-July2019
	W	-0.251388	(-14.7556)	0.2079607	-0.904939	0.630063		149	
	L	0.8453069	-16.9935	0.6071906	-0.411499	2.994054		149	
Palestine	WML	-0.835474	(-.8354741)	0.7667467	-4.84552	0.3439174	33	149	Jan2004-July2019
	W	-0.179769	(-12.2460)	0.1791907	-0.543155	0.5627791		149	
	L	0.6557048	-11.0913	0.7216394	-0.525095	4.610728		149	
Qatar	WML	-0.004942	(-0.7748)	0.0778721	-0.393335	0.2896787	37	149	Jan2004-July2019
	W	0.0076365	-1.0313	0.0897807	-0.290121	0.4085497		149	
	L	0.0124768	-1.4603	0.1042905	-0.228942	0.8018856		149	
Abou	WML	-0.865654	(-23.7412)	0.4450767	-2.99893	0.5443831	56	149	Jan2004-July2019
Dhabi	W	-0.165681	(-7.3216)	0.276224	-0.584001	1.443889		149	
	L	0.69997	-20.4824	0.4171489	0.0093168	3.099856		149	
Dubai	WML	-1.07413	(-15.5173)	0.8449601	-5.09376	0.8130149	38	149	Jan2004-July2019
	W	-0.072261	(-1.9448)	0.4535413	-0.833166	1.750676		149	
	L	1.00184	-15.7708	0.7754307	-0.550453	4.841713		149	
Egypt	WML	-1.72482	(-16.1425)	1.304273	-6.60592	0.3033893	138	149	Jan2004-July2019
	W	-0.207132	(-9.7226)	0.2600495	-0.647402	0.8135686		149	
	L	1.517693	-14.0794	1.315806	-0.024694	6.348994		149	
Israel	WML	-55.7475	(-2.9255)	115.5074	-1333.99	644.2223	151	149	Jan2004-July2019
	W	36.90228	-3.8997	115.5074	-0.681749	721.9586		149	
	L	92.6498	-5.624	16.47395	0.0272236	1333.402		149	
Saudi	WML	-1.08163	(-14.3172)	0.9221826	-5.86386	0.4761438	128	149	Jan2004-July2019
Arabia	W	-0.142724	(-4.8734)	0.3574839	-0.755042	1.785913		149	
	L	0.9389133	-12.0882	0.9481032	-0.519283	6.047186		149	
Kuwait	WML	-3.41737	(-2.5989)	16.05072	-143.274	2.431056	168	149	Jan2004-July2019
	W	-0.071103	(-1.3981)	0.6207852	-0.657332	3.223951		149	
	L	3.346267	-2.5523	16.00353	0.1071095	142.8651		149	
Oman	WML	-1.45968	(-18.2364)	0.9055779	-4.58044	0.1625955	101	128	Oct2005 - July2019
	W	-0.174545	(-6.7438)	0.2928231	-0.537681	1.607212		128	
	L	1.285171	-16.7045	0.8704289	0.0733613	4.173214		128	
Jordan	WML	-1.62645	(-10.2178)	1.8009	-7.1086	5.781078	132	128	Oct2005 - July2019
	W	0.1890716	-1.9081	1.121054	-0.643864	10.05277		128	
	L	1.815523	-14.1183	1.454871	0.1538667	6.888543		128	
Tunisia	WML	-0.718535	(-18.1460)	0.4427141	-2.05638	0.185366	59	125	Jan2007-July 2019
	W	-0.183144	(-9.3705)	0.2185187	-0.57979	1.215906		125	
	L	0.5353909	-14.0605	0.42572	-0.270484	1.712325		125	
Syria	WML	-0.28178	(-4.2096)	0.5270627	-2.74143	1.283297	22	62	April2011-July2019
	W	-0.04814	(-1.6188)	0.2341886	-0.474249	1.169174		62	
	L	0.2336343	-3.8085	0.4830313	-0.617971	2.543867		62	

test statistics are reported in the parenthesis at the significance 5% level.

Table 2.3 Portfolio Based on Past Return Momentum, Panel A

Country	WML	L	2	3	4	W
Egypt	-1.724825	1.517693	0.3548178	0.1429413	-0.020818	-0.207132
t-statistic,	(-16.1425)	-14.0794	-12.9336	-5.3447	(-0.7837)	(-9.7226)
Israel	-55.74752	92.6498	18.16184	4.848338	6.070215	36.90228
t-statistic,	(-2.9255)	-5.624	-3.0546	-3.5983	-2.2162	-3.8997
Jordan	-1.626451	1.815523	0.4989749	0.2343159	0.0949296	0.1890716
t-statistic,	(-10.2178)	-14.1183	-14.2218	-8.1275	-2.5074	-1.9081
Oman	-1.459689	-0.1745452	0.3911308	0.0762044	-0.091462	1.285171
t-statistic,	(-18.2364)	(-6.7438)	-16.0959	-4.1325	-5.3006	-16.7045
Saudi Arabi	-1.081638	0.9389133	0.4996917	0.2094915	0.0129518	-0.142724
t-statistic,	(-14.3172)	-12.0882	-6.8909	-6.2897	-0.5462	(-4.8734)
Kuwait	-3.417371	3.346267	0.5522855	0.2195722	2.35896	-0.071103

Table 2.4 Portfolio Based on Past Return Momentum, Panel B

Country	WML	L	2	W
Bahrain	0.0119086	0.0023378	0.0036785	0.0142465
t-statistic,	-2.2177	-0.639	-2.0189	-2.7183
Lebanon	0.0001297	0.0123373	0.0098984	0.0124686
t-statistic,	-0.017	-1.7777	-1.5668	-2.1446
Morocco	-1.096696	0.8453069	0.105423	-0.251388
t-statistic,	(-20.5292)	-16.9935	-3.2067	(-14.755)
Palestine	-0.8354741	0.6557048	0.1356058	-0.179769
t-statistic,	(-.835474)	-11.0913	-6.7439	(-12.246)
Qatar	-0.0049428	0.0124768	0.0199103	0.0076365
t-statistic,	(-0.7748)	-1.4603	-2.8166	-1.0313
Syria	-0.2817809	0.2336343	0.0251228	-0.048146
t-statistic,	(-4.2096)	-3.8085	-1.4415	(-1.6188)
Tunisia	-0.7185359	0.5353909	0.0254891	-0.183144
t-statistic,	(-18.1460)	-14.0605	-2.0352	(-9.3705)
UAE	-0.865654	0.69997	0.1731331	-0.165681
t-statistic,	(-23.7412)	-20.4824	-8.6488	(-7.3216)
Dubai	-1.074135	1.001849	0.1889278	-0.072261
t-statistic,	(-15.5173)	-15.7708	-6.5629	(-1.9448)

Test statistics are reported in the parenthesis at the 5% significance level.

2.4.2 Short-term Reversal Strategies

Griffin et al. (2010) explained the reversal strategy as the stock return being long in the past-loser stocks and short in the past winners. A short-term reversal is developed on a weekly basis at the same sample period. T-Statistics is employed to test the significance of the firm and portfolio level. To avoid market microstructure distortion, skipping a week between periods is applied. In a portfolio approach, all stocks are grouped based on the past one-week return into quintiles (calculated over t - 1 to t). A week is skipped and returns are calculated from t+1 to t + 2. Long stocks in the low return quintile and short stocks in the high-return quintile, is adjusted weekly. This strategy is opposite to the momentum strategy. Long minus winner means that the past week low return will revert to be long in the next week and positive sign is expected while the past week high return will revert to short with a negative sign. Table (2.5) represents the results of firm level average returns in 15 MENA countries, while Table (2.6) shows the results in a portfolio level in two panels. Based on the LMW, Israel has a relatively large positive magnitude compared with the mean return of all other MENA markets that have small positive signs. This implies that the slightly improvement of SME and weak form efficiency exists among the 14 countries and the Israel market has strengthen its market efficiency and follows a semi-strong efficient market.

2.4.3 Delay

The measure of the relative efficiency related to the market return is considered through a delay strategy. To measure the sensitivity of the present returns (RI) to the previous market wide information (RM), the adjusted

coefficient of determination R Squared ($AdjR^2$) is computed. The study follows Mech's (1993) method by applying the delay that is calculated as the difference in the adjusted coefficient of determination R Squared ($AdjR^2$) between an unrestricted market model with four-week lags and a restricted model with no lags.

At the firm level, simple linear regression is run for each stock exchange in the MENA. Market return (RM) is considered an independent variable calculated by the market price index indicator.

$$RM_{it} = \frac{P_{it}}{P_{it-1}} - 1$$

The dependent variable is employed as a return of each firm in the stock exchange because return on all the companies is not elegant since the market price index is also for all companies, but in different ways.

$RI_{i,t} = \alpha_i + \beta_{0i} RM_{,t} + \beta_{1i} RM_{,t-1} + \beta_{2i} RM_{,t-2} + \beta_{3i} RM_{,t-3} + \beta_{4i} RM_{,t-4} + \varepsilon_{i,t}$ (unrestricted model)

$RI_{i,t} = \alpha_i + \beta_{0i} RM_{,t} + \varepsilon_{i,t}$ (Restricted model)

(Delay = $Adj\ R^2_{Unrestricted} - Adj\ R^2_{Restricted}$).

$$Adjusted\ R^2 = 1 - \frac{SSE/(n-k-1)}{\sum(y_i-\bar{y})^2/(n-1)},$$

Where SSE is the sum of square error which is the sum of the deference between the actual and predicted values of the dependent variable, n is the sample size, k is number of independent variables, y is dependent variable, and $\bar{y}$ is the mean of dependent variable.

Five portfolios for each country in the MENA are used at the portfolio level based on the market capitalisation derived from the market price index (P) multiplied by the number of shares (NOSH). To avoid a low degree of

confidence and missing time information, year-to-year regression will lead to capturing the time information. With crises, the delay should be high, and when the market is robust, the delay should be less. Therefore, in each portfolio, regressions every year (from June 2004 to July 2019) are estimated and adjusted R-squared for every year (restricted and unrestricted) are calculated.

The efficient market reacts to new information, and the reaction has to be instantaneous and unbiased. The price adjusts instantaneously to the information in the efficient market. Eight of the MENA countries show that the market is deteriorated and not efficient and other markets are insignificant in a firm-level analysis, while insignificant results are found in the portfolio approach.

Table 2.5 Descriptive Statistics of MENA Stock Markets Average Return of Short-Term Reversal Strategy

Panel A

Country		Mean	t-statistics,	Std. Dev.	Min	Max	Avg. Firms	Obs	Sample size
Bahrain	LMW	0.124413	-31.7523	0.003918	0.045249	0.382924	33	161	Jan2004-July2019
	L	0.071204	-20.4578	0.003481	0.009262	0.352147		161	
	W	-0.05321	(-23.1002)	0.002303	-0.22672	-4.66E-08		161	
Lebanon	LMW	0.103713	-19.6102	0.067107	0.023424	0.529841	10	161	Jan2004-July2019
	L	0.060889	-13.9894	0.055227	0.006048	0.458199		161	
	W	-0.04282	(-14.5414)	0.037368	-0.23264	-2.28E-08		161	
Morocco	LMW	1.939927	-44.5826	0.55212	0.890283	3.853139	64	161	Jan2004-July2019
	L	1.469825	-33.1148	0.563192	0.266293	3.390018		161	
	W	-0.4701	(-76.7846)	0.077684	-0.64818	-0.25542		161	
Palestine	LMW	1.34228	-22.4925	0.757214	0.601103	5.760833	33	161	Jan2004-July2017
	L	0.94356	-15.7705	0.759165	0.237493	5.42247		161	
	W	-0.39872	(-33.4817)	0.151103	-0.89843	-0.15626		161	
Qatar	LMW	0.184061	-30.3791	0.076878	0.094312	0.556519	37	161	Jan2004-July2019
	L	0.111904	-22.8238	0.062211	0.035569	0.458357		161	
	W	-0.07216	(-23.7675)	0.038522	-0.27787	-0.02706		161	
Abou Dhabi	LMW	1.678308	-62.7649	0.339287	0.857895	2.682022	56	161	Jan2004-July2019
	L	1.201903	-44.684	0.341295	0.452801	2.15387		161	
	W	-0.4764	(-1.3e+02)	0.046455	-0.62272	-0.31694		161	
Dubai	LMW	2.148243	-26.5105	1.028201	0.856657	5.908415	38	161	Jan2004-July2019
	L	1.652486	-19.8162	1.05811	0.320501	5.548677		161	
	W	-0.49576	(-70.4117)	0.089338	-0.71015	-0.23556		161	
Egypt	LMW	4.857226	(-1.4e+02)	0.027213	2.017164	13.34036	138	161	Jan2004-July2019
	L	4.194825	-26.5531	2.004522	1.226923	12.70262		161	
	W	-0.6624	(-1.6e+02)	0.05137	-0.79024	-0.54254		161	

Test statistics are reported in the parenthesis at the 5% significance level.

Table 2.5 Descriptive Statistics of MENA Stock Markets
Average Return of Short-Term Reversal Strategy
Panel B

Israel	LMW	131.9644	-8.1291	205.9812	2.887088	1319.062	151	161	Jan2004-July2019
	L	131.2197	-8.0819	206.0156	2.016905	1318.374		161	
	W	-0.74476	(-1.2e+02)	0.076058	-0.8934	-0.59766		161	
Saudi	LMW	2.247128	-54.6772	0.521476	1.190392	4.558174	128	161	Jan2004-July2019
Arabia	L	1.666061	-41.1458	0.513781	0.652695	3.989125		161	
	W	-0.58107	(-1.6e+02)	0.046363	-0.82393	-0.44588		161	
Kuwait	LMW	10.3485	-2.9399	44.66381	1.777125	381.655	168	161	Jan2004-July2019
	L	9.716049	-2.7602	44.66462	1.1245	381.0389		161	
	W	-0.63245	(-1.4e+02)	556064	-0.90767	-0.48628		161	
Oman	LMW	3.205373	-49.0363	0.065367	1.815679	6.104451	101	140	Oct2005 - July2019
	L	2.589996	-39.6604	0.772692	1.159469	5.446844		140	
	W	-0.61538	(-1.6e+02)	0.045669	-0.74732	-0.47968		140	
Jordan	LMW	3.789969	-21.3655	2.098872	1.69257	17.06597	132	140	Oct2005 - July2017
	L	3.169214	-17.7712	2.110074	1.08558	16.42929		140	
	W	-0.62076	(-1.6e+02)	0.045621	-0.72547	-0.51313		140	
Tunisia	LMW	1.673442	-48.7129	0.402093	1.023502	3.945606	59	137	Jan2007-July 2019
	L	1.223446	-35.6067	0.402174	0.56619	3.497667		137	
	W	-0.45	(-1.2e+02)	0.044873	-0.54999	-0.32276		137	
Syria	LMW	0.680251	-17.6158	0.334424	0.319709	2.226913	22	75	April2011-July2019
	L	0.419867	-10.825	0.335905	0.042329	1.988196		75	
	W	-0.26038	(-24.0222)	0.093871	-0.60699	-0.07336		75	

Test statistics are reported in the parenthesis at the 5% significance level.

Table 2.6 Portfolio Based on Past Return Short-Term Reversal Panel A

Country	LMW	W	2	3	4	L
Egypt	4.857226	-0.6624003	-0.2959513	0.0018411	0.4454309	4.194825
t-statistic,	-30.9071	(-1.6e+02)	(-1.4e+02)	-1.336	-96.2333	-26.5531
Israel	131.9644	-0.7447609	-0.320707	-0.004415	0.4743138	131.2197
t-statistic,	-8.1291	(-1.2e+02)	(-1.7e+02)	(-3.1916)	-123.0865	-8.0819
Jordan	3.789969	-0.6207555	-0.2371991	0.0042029	0.3351062	3.169214
t-statistic,	-21.3655	(-1.6e+02)	(-1.7e+02)	-4.4952	-118.3406	-17.7712
Oman	3.205373	-0.6153767	-0.2255033	-0.002335	0.2996265	2.589996
t-statistic,	-49.0363	(-1.6e+02)	(-1.0e+02)	(-2.8688)	-91.5919	-39.6604
Saudi Arabia	2.247128	-0.5810666	-0.2488076	0.0053387	0.3470842	1.666061
t-statistic,	-54.6772	(-1.6e+02)	(-1.3e+02)	-3.1713	-98.715	-41.1458
Kuwait	10.3485	-0.632452	-0.2623057	0.0005857	0.3747915	9.716049
t-statistic,	-2.9399	(-1.4e+02)	(-1.7e+02)	-0.6144	-121.1242	-2.7602

Test statistics in the parenthesis at the significance 5% level.

Table 2.6 Portfolio Based on Past Return Short-Term Reversal Panel B

Country	LMW	W	2	L
Bahrain	0.124413	-0.053209	-2.28E-09	0.0712038
t-statistic,	-31.7523	(-23.1002)	(-3.2416)	-20.4578
Lebanon	0.1037134	-0.042824	0.0015864	0.060889
t-statistic,	-19.6102	(-14.5414)	-17.3355	-13.9894
Morocco	1.939927	-0.4701024	0.0039354	1.469825
t-statistic,	-44.5826	(-76.7846)	-1.7941	-33.1148
Palestine	1.34228	-0.3987201	-0.0012659	0.94356
t-statistic,	-22.4925	(-33.4817)	(-0.5413)	-15.7705
Qatar	0.1840612	-0.0721575	0.002438	0.1119037
t-statistic,	-30.3791	(-23.7675)	-4.5955	-22.8238
Syria	0.6802507	-0.2603842	-0.0028259	0.4198665
t-statistic,	-17.6158	(-24.0222)	(-2.5336)	-10.825
Tunisia	1.673442	-0.449995	0.0080695	1.223446
t-statistic,	-48.7129	(-1.2e+02)	-3.495	-35.6067
About Dhabi	1.678308	-0.4764048	0.0128576	1.201903
t-statistic,	-62.7649	(-1.3E+02)	-4.4519	-44.684
Dubai	2.148243	-0.4957564	0.0046026	1.652486
t-statistic,	-26.5105	(-70.4117)	-1.1255	-19.8162

Test statistics are reported in the parenthesis at the 5% significance level.

Table 2.7 Descriptive Statistics of MENA Stock Market Delay Strategy Summary of Firm Level Measures of Local Market Return Jun 2004-July 2019–Weekly Basis

Country	Mean	t-statistics,	Std. Dev.	Min	Max	Firms	Obs	Sample size
Bahrain	0.0056	1.8602	0.0177264	-0.005743	0.095713	38	34	Jun2004-July2019
Lebanon	0.016	-2.6972	0.0197142	-0.00309	0.051182	11	11	Jun2004-July2019
Morocco	0.0031	-2.8978	0.0096532	-0.030981	0.031719	78	78	Jun2004-July2019
Qatar	0.0098	-4.8333	0.0135474	-0.006282	0.059948	44	44	Jun2004-July2019
Dubai	0.0041	-2.3819	0.0125922	-0.044728	0.049109	51	51	Jun2004-July2019
Egypt	0.0008	0.7334	0.0011023	-0.101868	0.082636	192	192	Jun2004-July2019
Israel	0.0038	-2.1857	0.0398564	-0.273349	0.794896	501	501	Jun2004-July2019
Saudi Arabia	0.0166	-3.6038	0.063226	-0.14452	0.606717	188	188	Jun2004-July2019
Oman	0.0082	-2.4223	0.0325696	-0.030534	0.219661	92	92	Jun2004-July2019
Jordan	0.0016	-3.4618	0.0069949	-0.015334	0.096187	226	226	Jun2004-July2019
Tunisia	-0.003	-0.1684	0.0169062	-0.126329	0.021785	82	82	Jun2004-July2019

Test statistics are reported in the parenthesis at the 5% significance level

Table 2.8 Summary of Portfolio Level from Jun 2004 to July 2019 on a Weekly Basis

Country	1	2	3	4	5
Bahrain	0.05942894	0.05382193	-0.0058836	0.04174376	-0.00985621
t-statistic	0.6626	1.2648	-0.2575	1.2771	-1.1448
Lebanon	0.14368197	0.03441384	0.00370591	0.02217138	0.07959144
t-statistic	-0.169747	-0.0572185	0.00001	0.555	1.2393
Morocco	0.1713515	0.04358098	0.00529901	0.00418729	0.00614428
t-statistic	0.7936	1.9243	0.2392	0.4609	1.4456
Qatar	0.02991686	0.00864236	0.02552704	0.03062653	0.00537789
t-statistic	1.57	0.7812	1.7083	2.0895	0.1256
Dubai	0.03423193	0.03285867	-0.0039275	0.00234923	-0.01909667
t-statistic	0.3287	0.7093	-0.2013	0.1181	-1.3953
Egypt	-0.00049052	-0.00193934	-0.0165932	0.00720986	-0.02268014
t-statistic	-0.03	-0.0938	-1.2441	0.5479	-1.2792
Israel	-0.00049052	-0.00193934	-0.01659324	0.00720986	-0.02168014
t-statistic	-0.0399	-0.1008	-1.3364	0.5885	-1.3741
Saudi Arabi	0.00446499	-0.00535916	0.0028565	0.00633472	-0.00617307
t-statistic	0.2186	-0.6407	0.4827	2.0359	-1.0266
Kuwait	0.01029778	0.00189299	0.00792044	0.01232041	0.00041289
t-statistic	1.8425	0.3169	0.3055	0.3815	0.0231
Oman	-0.00020125	0.04704878	0.02569725	-0.00599548	-0.03087677
t-statistic	-0.0092	-2.242	0.6411	-0.1802	-0.8512
Jordan	0.04940234	0.02756999	-0.02289076	-0.01902475	0.03367545
t-statistic	1.4311	0.8601	-1.309	-0.6823	1.9493
Tunisia	-0.01307782	-0.00693569	-0.00427355	-0.00827783	0.0011893
t-statistic	-0.6411	-0.4687	-0.2793	-0.6555	0.2837

Test statistics are reported in the parenthesis at the 5% significance level.

2.4.4 Autocorrelation

Many studies used one of the most common market traditional efficiency measures, the autocorrelation method, to analyse the return correlation. Autocorrelation in the individual and portfolio stock return is estimated using the Wooldridge (2002) test in Table (2.9) where the null hypothesis is no first-order autocorrelation. Drukker, D. M. (2003) finds the power of this test because it is simple and can be used under common conditions. The results of the autocorrelation tests at a firm-level found that most MENA countries do not have autocorrelation except Oman that show the rejection of the null hypothesis. This imply that Oman market is deteriorated and not efficient and all other MENA market are weak form efficient[2]. The analysis also shows that the autocorrelation sign is not always the same. In the portfolio approach, results show that all countries are not efficient except Israel, Bahrain, Dubai and Lebanon.

[2] Autocorrelation coefficient between lag return and today's return is checked. If the coefficient correlation has a strong structure, then the market is not perfectly efficient and it can be weak or semi strong form. A strong decay and long memory indicates that the market has a weak form efficiency.

Table 2.9 Descriptive Statistics of MENA Stock Market Autocorrelation Summary of Firm and Portfolio Level Jun 2004-July 2019–Weekly Basis

Country	Firm level	Portfolio 1	Portfolio 2	Portfolio 3	Portfolio 4	Portfolio 5	Firms	Sample size
Bahrain							38	Jun2004-July2019
test statistics	1.326	0.03363	2.647	0.00199	-5.1295	1.2445		
Lebanon							11	Jun2004-July2019
test -statistics	0.792	0.12763	0.0505	0.29626	-7.924	0.68646		
Morocco							78	Jun2004-July2019
test -statistics	0.116	-16.093	1.8835	-4.2239	-8.8299	-6.6955		
Qatar							44	Jun2004-July2019
test -statistics	0.084	-30.327	-7.9686	-6.686	1.1181	-24.092		
Dubai							51	Jun2004-July2019
test -statistics	1.007	0.37426	-9.6745	-14.034	-24.19	-20.551		
Egypt							192	Jun2004-July2019
test -statistics	1.027	-6.4244	-12.246	-6.4913	-9.8243	2.6307		
Israel							501	Jun2004-July2019
test -statistics	0.187	0.0162	-45.28	-8.9509	3.3052	1.9724		
Saudi Arabia							188	Jun2004-July2019
test -statistics	2.518	-13.924	2.5509	1.8222	0.03922	0.5634		
Kuwait							139	Jun2004-July2019
test -statistics	1.673	-49.207	-15.049	-17.101	0.2708	1.7149		
Oman							92	Jun2004-July2019
test -statistics	-75.04	-137.7	-45.71	-126.4	-225.92	-175.14		
Jordan							226	Jun2004-July2019
test -statistics	1.109	-12.463	0.0907	-4.9432	3.6929	3.6373		
Tunisia							82	Jun2004-July2019
test -statistics	0.799	-5.0402	-14.928	-10.321	-5.5389	0.0012		

Test statistics are reported in the parenthesis at the 5% significance level.

2.4.5 Variance Ratios

Variance ratios (VRs) are estimated weekly for individual and portfolio stocks levels. Following Lo and MacKinlay (1988) and Campbell, Lo, and MacKinlay (1997), the absolute value of the VR statistic minus one (|VR-1|) is computed as a measure of relative efficiency for each stock return and in the portfolio level. Table (3.10) shows variance ratio test statistics based on Lo and MacKinlay (1988).

The variance of a two period return $RI_{t,t+2}$;

$$Var\ (RI_{t,t+2}) = Var\ (RI_{t+1} + RI_{t+2}) = Var\ (RI_{t+1}) + Var\ (RI_{t+2}) \quad = 2\sigma^2$$

In general, for the k-th period (long-horizon) return $RI_{t,t+q}$:

$$Var\ (RI_{t,t+q}) = Var\ (RI_{t+1\ +\ \dots\ +\ rt+q}) = q\sigma^2$$

A test for the Random Walk model (or equivalently, for unforecastable returns):

$$VR(q) = \frac{VAR\ (\ RI_{t,t+q})}{qVAR\ (RI_{t+1})} = 1$$

A test for the Random Walk model (or equivalently, for unforecastable returns):

Results show that the test statistics for variance ratio in a firm and portfolio level are significant. The null hypothesis that the variance ratio is not statistically different from one is rejected. This implies that market in all MENA countries are departure from the random walk and markets are not efficient and are deteriorated.

Table 2.10 Descriptive Statistics of MENA Stock Market VRs Strategy Summary of Firm and Portfolio Level Jun 2004-July 2019–Weekly Basis

Country	Firm level	Portfolio					Firm	Sample size
		1	2	3	4	5		
Bahrain							38	Jun2004-July2019
test statistics	-18.87	-11.404	-7.402	1.697	-5.071	-8.235		
Lebanon							11	Jun2004-July2019
test -statistics	-6.6025	-4.436	1.356	2.374	-5.723	-4.075		
Morocco							78	Jun2004-July2019
test -statistics	-32.25	-8.844	-8.997	-8.089	-2.366	-5.975		
Qatar							44	Jun2004-July2019
test -statistics	-24.64	-6.993	-5.966	-4.344	-5.205	-5.489		
Dubai							51	Jun2004-July2019
test -statistics	-17.563	1.178	-5.16	-4.775	-5.61	-7.024		
Egypt							192	Jun2004-July2019
test -statistics	-23.639	2.124	-7.001	-4.312	-5.154	-3.253		
Israel							226	Jun2004-July2019
test -statistics	-45.307	1.119	-7.803	-4.917	-7.77	-6.863		
Saudi Arabia							188	Jun2004-July2019
test -statistics	-45.24	-5.273	-5.72	-6.549	-3.942	-5.631		
Kuwait							139	Jun2004-July2019
test -statistics	-30.39	-5.475	-7.864	-4.822	2.619	-5.933		
Oman							88	Jun2004-July2019
test -statistics	-9.38	-9.717	-8.184	-8.164	-8.899	-8.422		
Jordan							226	Jun2004-July2019
test -statistics	-45.307	-2.893	1.104	2.623	-6.85	-6.74		
Tunisia							82	Jun2004-July2019
test -statistics	-33.13	3.311	-6.317	-6.306	-6.273	-6.262		

The variance ratios for q-week returns, q=2, VR (q). Test statistics are reported in the parenthesis at the 5% significance level.

2.5 Conclusion

This chapter explores whether the MENA stock markets have developed to measure the improvements or deteriorations in stock market efficiency. Following Griffin et al. (2010) and Jegadeesh (1990), used measures of market inefficiency are used, namely momentum, short-term reversal strategy delay, autocorrelation and variance ratio strategy. The finding of momentum investing strategy shows that both Bahrain and Lebanon are weaken their stock market efficiency due to gains from the past information, and other MENA regions have the improvements of its markets efficiency. Results of short term strategy show the slightly improvement of SME and weak form efficiency exists among the 14 countries and the Israel market has strengthen its market efficiency. Restricted and unrestricted models are developed to measure the delay strategy. Eight of the MENA countries show that the market is weakened and not efficient and other markets are insignificant in a firm-level analysis, while insignificant results are found in the portfolio approach. While autocorrelation at a firm-level showed the improvement of SME or weak form efficiency except for Oman, variance ratio analysis found that all MENA markets efficiency are deteriorated markets.

Chapter 3: The Empirical Analysis of the Impact of Macroeconomic Variables (MEV) on the Stock Market Returns in MENA Countries

The study analyses the effect of macroeconomic variables (MEV) on stock returns in the MENA countries. MEV refers to the monetary and fiscal policy variables besides the economic policy uncertainty and transparency variables. We employed the SVAR model to capture the interrelations and the dependencies of MEV on stock returns. To identify the MEV shocks, the study uses a recursive approach (Cholesky decomposition). As a result of the SVAR model, variance decomposition and impulse response function techniques are developed to analyse the reaction and the percentage contribution of the dynamic system in response to shocks. Results show that the stock return responds differently to the MEV shocks depending on the economic conditions. These results conclude significant implications for policymakers to adopt proper policies based on the country's conditions.

3.1 Introduction

This chapter tries to emphasise the importance of stock return that is essentially relevant to the adoption of the momentum investing strategy. (Naughton, et al. 2008) finds a strong momentum behaviour that is a pervasive feature of stock returns for the market unlike what has been documented in the US, that there is no evidence of a relationship between stock returns and trading volume over medium-term holding periods. Another

empirical work in this thesis is related to the impact of macroeconomic policy, Economic policy uncertainty EP and transparency on stock market efficiency which expressed through the momentum investing strategy used in chapter 4 and calculated in chapter 2.

Stock markets play a vital role in a country's economy as it helps investors (both individual and corporates) earn a profit on their investments in listed companies. A stock market is a place where the shares of various companies are bought and sold. A considerable body of finance literature has studied the stock price behaviour of listed companies with many factors affecting the stock prices of the listed companies such as GDP, company performance, other countries' stock prices, exchange and interest rates and so on (Kurihara, 2006). These factors consider one of the most important links identified by researchers relates to macroeconomic variables and stock returns. Subsequently, this relationship has received acute attention among policymakers, economists, financial investors, and finance researchers. Researchers have identified short and long-run links between macroeconomic variables (MEV) and stock returns using the stock valuation model, arbitrage pricing theory (APT) model, aggregate demand and supply framework, among others (Ibrahim & Aziz, 2003). It is based on the assumption that as MEV changes, the stock prices should reflect those changes. For instance, if industrial production rises, then the stock prices should also reflect an increase. Similarly, if the interest rate increases, people shift their attention from the stock market to banks, and the stock price should decrease (Quadir, 2012).

Other significant relationships relate stock prices to economic policy (EP) uncertainty and transparency. EP uncertainty was significant during the global financial crisis as U.S. and European policies contributed to the huge economic declines during 2008-2009 (Baker et al., 2016). Research also suggests that EP uncertainty depresses the firms' investment decisions and affects market volatility (Kang et al., 2014; Wang et al., 2014; Liu and Zhang, 2015). Regarding transparency, it is assumed that, with sufficient transparency in the market environment, stock prices reflect more information about future events (Dasgupta et al., 2010). Most researchers focused on transparency through environmental, governance and social disclosures that are mandatory and voluntary and examined its effect on firm performance (Serafeim and Grewal, 2017; Yu et al., 2018). However, there is limited research that has examined the relationship between transparency and stock returns.

In this paper, we examine the effect of MEV, EP uncertainty, and transparency on stock returns of MENA stock markets. Since limited studies have explored the dynamic relationship between stock prices and MEV in the MENA region, this study contributes to the ongoing debate between the relationship between MEV and stock returns by attempting to examine the effect of MEV on stock prices in the MENA region.

3.2 Literature

3.2.1 Macroeconomics Variables

Ibrahim and Aziz (2003) studied the MEV and stock returns in the Malaysian equity market over 21 years. Their main MEV included real industrial

production, consumer price index, inflation, money supply m2 and exchange rate. They used a unit root test, cointegration and vector error correction model, among others, to study the relation. They found that a long-term relationship between MEV and stock prices. Exchange rate was negatively related to stock prices, whereas money supply showed positive liquidity effects but inverse long-term effects. Further, stock prices played a predictive role in determining MEV. Rahman et al. (2009) also examined similar variables in Malaysia for the years 1986-2008. Their cointegration results suggested a relationship between the Malaysian stock index and money supply, interest rate, exchange rate, reserves, and industrial production index. It shows that the Malaysian stock market index is sensitive to variations in MEV. Hussin et al. (2012) added another aspect to the Malaysian stock market as they tested the MEV effect on Islamic stock prices. Using a time series analysis, vector auto regression and Granger causality, their findings suggest that the Islamic stock index is cointegrated with the industrial price index and consumer price index but negatively related to money supply m3 and exchange rate.

Patra and Poshakwale (2007) studied MEV and stock returns in Greece's stock market for ten years from 1990 to 1999. They used the independent variables of consumer price index, money supply, exchange rate, and trade volume. They found most MEV related to stock prices in both short and long-term, such as money supply, consumer price index and trading volume, whereas exchange rate was unrelated. Gay Jr. (2008) studied the effects of MEV on the stock market returns of four emerging economies: Brazil, Russia, India, and China. They concluded that the markets of these emerging countries show a weak form of market efficiency as they found no relation

between past and present stock returns and no significant relationship between exchange rate and oil price on the stock price. Aydemir and Demirhan (2009) studied the relation between MEV (exchange rate) and stock prices in Turkey. Using Augmented Dickey-Fuller (ADF) test and causality, they found a bidirectional relationship between MEV and stock prices. They further noted that certain sectors like service, financial and industrial sectors showed negative causality to MEV, whereas the technological sector showed positive causality with MEV. Pilinkus and Boguslauskas (2009) studied the short-run relation between MEV and stock prices applying the impulse response function in Lithuania for the years 2000-2009. They used GDP, consumer price index, money supply, unemployment rate, short-term interest rate and exchange rate as proxies for MEV. They found MEV was significantly related to stock prices as GDP, and money supply are positively related, whereas unemployment rate, exchange rate and short-term interest rate are negatively related.

Agrawal et al. (2010) studied the stock market volatility (Nifty returns[3]) and exchange rates movement as a measure of MEV in India for two years (2007-2009). They tested the causality between the two variables using Granger causality and found a unidirectional relationship between nifty returns and exchange rates moving from the former to the latter. Maku and Atanda (2010) studied the determinants of stock market performance in Nigeria. Their main

[3] The NIFTY 50 is a benchmark Indian stock market index that represents the weighted average of 50 of the largest Indian companies listed on the National Stock Exchange.

MEV included consumer price index, money supply m^2, treasure bill rate (interest rate), real output growth (real GDP) and exchange rate. They used the Engle-Granger Cointegration test and regression and found that in the long-term, stock market performance is influenced by the MEV, specifically the exchange rate, inflation, money supply and real GDP. Singh et al. (2011) studied the relation between MEV and stock returns in Taiwan covering six years. They used market capitalisation, price-to-earnings ratio, price to book ratio and yield to construct a stock portfolio. For MEV, they used employment rate, exchange rate, inflation, GDP and money supply. They used regression to test their model and found that only exchange rate and GDP affect the stock portfolio returns, whereas inflation and money supply showed a negative relationship with returns of medium and big corporations. Kuwornu and Owusu-Nantwi (2011) studied the relation between MEV and stock returns in Ghana and used maximum likelihood estimation. They found stock returns significantly related to the consumer price index (positive affect), the exchange rate (negative affect) and Treasury bill (negative affect). Quadir studied the effect of MEV on stock returns on the Dhaka Stock Exchange. They used treasure bill rate and industrial production as a measure of MEV. Using the ARIMA model, they found MEV positively related to stock returns but insignificantly.

Tsai (2012) focused on Asian markets, namely Thailand, Singapore, Malaysia, Philippines, South Korea and Taiwan. They used only foreign exchange rate as a measure of MEV and end of month values of stock prices as the dependent variable. Using linear cointegration tests, Ordinary Least Square (OLS) and quantile regression methods, they found that when exchange rates are extremely low or high, there is a negative relationship

between foreign exchange markets and stock. Liang et al. (2013) conducted a similar study for Indonesia, Malaysia, Philippines, Singapore and Thailand, but they studied the relationship between stock and MEV using Granger causality. They found that exchange rates (MEV) have a negative impact on stock prices via capital mobility.

Many studies focused on the relationship between oil prices and stock returns in the GCC region. However, limited studies included other macroeconomic variables to examine the relationship between MEV and stock prices. Al-Kandari and Abul (2019) studied the MEV impact on stock prices of the Kuwaiti stock market. They used money supply m^2, interest rate, oil prices, exchange rate and inflation rate as a measure of MEV. Using the vector error correction model and Johansen cointegration test, they found a unidirectional relationship between stock returns and MEV. Kalyanaraman and Tuwajri (2014) conducted a similar study in Saudi Arabia and included consumer price index and industrial output, money supply, exchange rate, and oil prices. Applying time series analysis and the Johansen cointegration test, they found a long-term relationship between MEV and stock prices. In the long-term, they found a causality from MEV to stock prices, while, in the short-term, they found bidirectional causality between oil prices and stock prices. Al-Sharkas and Al-Zoubi (2011) studied inflation in relation to stock prices in Jordan, Saudi Arabia, Kuwait and Morocco. They used the consumer price index as a measure of inflation for the 2000 to 2009 period. Using the cointegration test, they found that there is a long-term relationship between inflation and stock prices.

Hatemi-J and Gunduz (2004) included several MENA markets in their study, such as Egypt, Jordan, Israel, Morocco and Turkey, using the exchange rate as a measure of MEV. Applying the Granger causality test, the authors found the relationship between exchange rates and stock prices differs across MENA countries. Their results suggest that there is unidirectional causality from exchange rates to stock prices in the Moroccan and Israel markets. Whereas, in Jordan, the causality runs from exchange rates to stock prices after the Asian financial crisis, and causality runs from stock prices to exchange rates in Turkey. There was no causal relationship found between exchange rates and stock prices during the tested period for the Egyptian market.

3.2.2. Economic Policy Uncertainty

Sum (2012) studied the economic policy uncertainty and stock market performance in European countries for the 1993-2012 period. To measure economic policy (EP) uncertainty, Sum used monthly data of the uncertainty index in Europe. Applying OLS regression, he found that changes in EP uncertainty had a significant negative effect on stock returns in Norway, Russia, Switzerland, Turkey and Ukraine, whereas, for other European countries, the relationship was insignificant. Brogaard and Detzel (2012) studied a similar relationship covering a wide range of countries across Asia, America, Africa and Europe for the 1990-2012 period. They used panel regression and univariate regression and found long-term and material financial implications of the economic policy on the stock returns. A rise in EP of 1% simultaneously affects the returns as they fall by 2.9%, and market volatility shows an increase by 18%. Kang and Ratti (2013) studied the EP

uncertainty on stock returns in the U.S. for the 1985-2011 period by employing forecast error variance decompositions and impulse response function. They found that a rise in EP uncertainty resulted in a significant but negative effect on stock returns.

Arouri et al. (2016) conducted a similar study in the U.S. for the 1900-2014 period. They used descriptive statistics and linear regression and found EP uncertainty negatively and significantly affect stock returns and that this effect is stronger during extreme periods of stock volatility. Liu and Zhang (2015) examined the relationship between EP uncertainty and stock returns on Standard and Poor's 500. They adopted Baker et al.'s (2012) index for EP uncertainty and applied the volatility model. Using descriptive statistics, estimation, and marginal effect and forecasting, they found that higher EP uncertainty positively affects market volatility. Li et al. (2016) studied the causal relationship between EP uncertainty and stock returns in China and India for the 1995-2013 period. They used the index constructed by Baker et al. (2012), whose major components for EP uncertainty were newspaper coverage of EP and disagreement among economic forecasters. Applying the Granger causality test, they found that there is no causal relationship between EP uncertainty and stock returns, but using the rolling window approach, they found a bidirectional causal relationship between EP uncertainty and stock returns; however, they concluded this relationship to be weak in both the economies. Christou et al. (2017) studied the EP uncertainty and stock returns in different economies, such as Australia, Canada, China, Japan, Korea and the U.S., for the 1998-2014 period. They used the EP uncertainty indices from www.policyuncertainty.com based on Baker et al. (2015). Applying the impulse response function, their results suggest that EP uncertainty affects

stock market returns negatively. EP uncertainty in the U.S. affects the stock returns of all the tested sample markets except for Australia. Phan et al. (2018) studied 16 countries by applying correlation, endogeneity tests, and mean variance. To measure the EP uncertainty, they followed Baker et al. (2016) as a proxy for real-world EP uncertainty. They tested the effect EP uncertainty has on the stock returns of different countries and sectors within each country. Their findings suggest that EP uncertainty can predict stock returns and concluded that EP uncertainty is important for certain countries or/and sectors. They also found irregularities in the predictability of EP uncertainty shocks on stock excess returns. Guo et al. (2018) studied the asymmetric dependence of stock returns on EP uncertainty in Canada, Germany, France, Italy, the UK, Japan, the USA, Russia, China, and India. They used correlation and panel quantile regression to test their variables. They found that EP uncertainty reduces stock returns, i.e., stock markets show asymmetric dependence with EP uncertainty in all the sample countries except for France and the UK.

The literature on EP uncertainty and stock returns is limited in the MENA region. However, few studies have highlighted the effect of U.S. economic policy uncertainty and stock returns of the GCC stock markets. Alqahtani and Martinez (2020) studied this relationship using correlation, unit rot test and cointegration for the 2004-2018 period. They found that the stock prices of Bahrain and Kuwait were affected the most (negatively) in the long run by both U.S. and global EP uncertainties, whereas other GCC stock markets were unaffected. Abdullah (2020) studied the EP uncertainty of the U.S. on GCC market returns using Granger causality. He found that the EP uncertainty of the U.S. does not cause stock returns of any GCC nation except Bahrain.

While using Vector Autoregression, he found that EP uncertainty in the U.S. responds negatively to the stock market returns of GCC countries. However, Istiak and Alam (2020) found contrasting results, which states that there is a symmetric relationship between GCC stock indices and U.S. EP uncertainty. This result is like those found by Arouri et al. (2014), who found that the EP uncertainty of major oil-importing countries, namely: U.S., Europe and China affected the GCC stock markets. Belcaid and Ghini (2019) studied the impact of U.S., European and Chinese EP uncertainty on Moroccan stock market volatility. They found that in a pure global financial crisis period, the only significant EP uncertainty was of U.S. and Germany, while others were insignificant. However, in the post-global financial crisis period, all the sampled countries showed a significant relationship with Moroccan market volatility, especially France, Spain and the U.S.

3.2.3. Transparency

Lin and Huang (2020) examined the effect of information transparency on stock prices in the financial institutions of Taiwan for the 2011-2014 period. They found that transparency has a significant and positive effect on the stock returns of financial institutions. It means that financial institutions with high transparency have a positive stock price reaction, whereas low transparency firms have a negative stock price response. Firth et al. (2015) tested the transparency and stock prices in China for 1999-2009. They measure corporate transparency using earnings management, auditor quality and audit opinions, along with related party transactions and state ownership. They concluded that firms with low transparency are affected by investor sentiment on stock prices compared to those firms with high transparency.

Dasgupta examined all firms covered by the Worldscope database for the 1980-2004 period. They found that there is a significant relationship between transparency and stock return synchronicity. Bushee and Noe (2000) found that firms with higher disclosure quality result in higher institutional investor ownership, thus increasing stock return volatility. Similarly, Zhu and Niu (2016) studied the relationship between accounting information and stock price and found a positive relationship between stocks with stable earnings. Osundina et al. (2016) studied the impact of accounting information on stock price volatility for manufacturing companies in Nigeria. Applying the cross-section fixed-effect model, they found that accounting information significantly positively impacts stock price volatility. The results are similar to those concluded by Ikhatua (2013), who used a GARCH analysis approach and found that accounting information as a measure of transparency influences stock price volatility.

Haddad et al. (2009) studied the relationship between transparency and stock market liquidity. They used a self-constructed voluntary disclosure index to measure the transparency of firms. They found that higher disclosure of voluntary information increased stock market liquidity. Azrak et al. (2020) studied the effect of information disclosure on the stock price volatility of banks in GCC. They found that high information disclosure did not have a significant effect on stock price volatility.

This study expands the scarce literature on the relationship between transparency and stock price/returns in the MENA region.

3.3 Data and Methodology

3.3.1 Data

Monthly data is used for all 12 assigned MENA countries, namely Bahrain, Egypt, Israel, Kuwait, Lebanon, Morocco, Qatar, Saudi Arabia, and the UAE for the period from January 2004 to December 2019, Jordon, Oman from October 2005 to December 2019, and Tunisia from January 2006 to December 2020. To manage monthly data for the macroeconomic variables, namely government expenditure, tax revenue, political stability (economic policy uncertainty), and government effectiveness (transparency), the study uses quadratic method converter from low to high frequencies using Eveiws software to unify the monthly frequencies data with stock return, money supply, interest rate, and the consumer price index.

RI (Stock return): The return of equity calculated from the rate of total return TRt/TRt-1. We obtained the data from Thomson Reuters DataStream. All series are monthly, and the average price index is computed from all firms registered at the stock exchange in each year.

M2 (Money Supply): A broader measure of the money supply than M1, which just includes cash, checking deposits, and easily convertible near money. We gathered the data from Thomson Reuters DataStream on a monthly basis. M2 is closely watched as an indicator of money supply and future inflation and as a target of central bank monetary policy (Emekaraonye et al., 2020).

IR (interest rate): Interbank offered rates at which banks borrow in the interbank market. We obtained the data from Thomson Reuters DataStream.

GE (Government Expenditure): A general government's final consumption expenditure as a percentage of GDP (formerly general government consumption). It includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most national defence and security expenditures, but excludes government military expenditures that are part of government capital formation. The data is collected from World Bank national accounts data, and OECD National Accounts data files.

TX (tax revenue): Compulsory transfers to the central government for public purposes as a percentage of GDP for all MENA. However, economists see the importance of taxation for the world economy. The average total rate for the Middle East region is 23% less than the global average of 44% (The Paying Taxes 2013). The GCC region, which is part of MENA countries, is heavily based on indirect taxes and revenue from oil exports (Almutairi, 2014). The data is obtained from the International Monetary Fund, Government Finance Statistics.

POLE (Political Stability Estimate). This variable is used to represent an economic policy uncertainty (EP) indicator calculated by World Bank Data Catalogue that measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism. The data is obtained from Thomson Reuters DataStream under Worldwide Governance Indicators.

GOEFE (Government Effectiveness, Estimate). This variable is used to capture transparency. Based on the World Bank Data Catalogue, this indicator captures perceptions of the quality of public services, the quality of the civil

service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.

3.3.2 Methodology

Time series analysis is used to study the effect of MEV variables on stock returns in MENA countries. Since most macroeconomic variable data shows a trend with time, we consider stationarity tests as the first step for any data analysis in finance and economics studies. Second, we apply structural vector autoregressive (SVAR), variance decomposition, and impulse response function are developed to study the reaction of the dynamic system in response to some external change (shocks).

3.3.2.1 Stationary test

To run the appropriate statistical tool for the model, the study uses the Augmented Dicky-Fuller test since the error term is unlikely to be a white noise. ADF equation contains a higher order of regressive process (Fuller, WA. 1979).

Augmented Dicky-Fuller test;

$$\Delta Y_t = \propto + \beta_t + \gamma Y_{t-1} + \sum_{i=1}^{p} \beta_i Y_{t-i} + \varepsilon_t \qquad (3.1)$$

$$\Delta Y_t = \propto + \beta_t + \gamma Y_{t-1} + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \beta_3 Y_{t-3} + \cdots \ldots\ldots\ldots\ldots. + \beta_p Y_{t-p} + \varepsilon_t$$

Where $Y_t = (Y_{1t}, Y_{2t}, Y_{3t}, Y_{4t}, Y_{5t}, Y_{6t}, Y_{7t})$, $Y_{1t} = RI_t$, $Y_{2t} = GOVEFE_t$, $Y_{3t} = POLE_t$, $Y_{4t} = M2_t$, $Y_{5t} = IR_t$, $Y_{6t} = GE_t$, $Y_{7t} = TX_t$. $\propto$, β_t are the constant and the time trend, respectively

$H_0: \gamma = 0\ has\ a\ unit\ root$ (Non-stationary)

$H_1: \gamma\ < 0$ Stationarity

The Phillips–Perron test (PP) test is utilised to increase the power of the stationarity test and the ability to identify the serial correlation (Phillips, 1988).

Appendix (A) shows the stationarity tests for the MENA countries. The values in the table express the test statistics of ADF and PP tests. Tests are implemented without and with a time trend and intercept. If the test statistics are less than the t critical value, we can reject the null hypothesis and state that the series is stationary; otherwise, the series has a unit root. In all countries, the stock return variable is stationary. Other MEV variables vary in the non-stationary and integrated levels. The study considers these results to build the structural vector autoregressive and variance decomposition methods.

3.3.2.2 Lag length criteria

The study uses the lag length method to determine the appropriate number of lags in the SVAR model after considering the stationarity tests in the assigned variables. The model can lose a degree of freedom if inserting many lag lengths into the model. In addition, too short a lag may lead to autocorrelation issues in the model. The analysis shows that the Akaike Information Criteria (AIC) method is recommended to use in the SVAR model. The study supports the notion that AIC is the most common approach to lag selection (Russell et al., 1999). The following equation shows the minimised value of the AIC.

$$MAIC = \ln(|\hat{\Sigma}|) + 2k/\ (T - p) \qquad (3.2)$$

Where k is the total number of estimated coefficients in all m equations in VAR and T is the observation on all variables, and the lagged variables will be available for observation; T-p is the number of observations used in the VAR (p) estimation.

The study uses diagnostic tests in table (3.1) to check the stability of the SVAR model.. The root of the system is tested to be less than 1 in the absolute value, the VAR residual serial correlation Lagrange multiplier (LM) tests, and multivariate normality test by Cholesky of covariance orthogonality method (Lütkepohl, 2009). Regardless of the presence of non-normalities, all other diagnostic tests confirm the validity of the SVAR estimation and provide efficient results.

Table 3.1 Diagnostic Tests for Structural Vector Autoregressive (SVAR)

Country	AIC Lag length	System root	LM Tests	multivariate normality test
Bahrain	1	< I 1 I	8.107391	2812.670**
Egypt	2	< I 1 I	80.78178	8042.376**
Israel	1	< I 1 I	78.65488	13803.00**
Jordon	6	< I 1 I	97.00201	13536.36**
Kuwait	2	< I 1 I	50.53627	271261.1**
Oman	1	< I 1 I	57.19864	17427.69**
Qatar	2	< I 1 I	70.11295	44684.97**
UAE	1	< I 1 I	72.40142	100403**
Saudi Arabia	1	< I 1 I	75.97539	78082.11**
Tunisia	1	< I 1 I	76.78322	26267.34**
Lebanon	1	< I 1 I	66.05169	21533.20**
Morocco	1	< I 1 I	51.54713	20683.19**

An asterisk (**) indicates significance at the 5 percent level, the value in the multivariate normality test is the joint value of Jarque-Bera test where residuals are multivariate normal express the null hypothesis.

3.3.2.3 Structure Vector Autoregressive (SVAR) Model

SVAR model considers a popular tool in the analysis of the monetary transmission mechanism (Christiano et al., 1999) and sources of business cycle fluctuations (Blanchard and Quah, 1989). The SVAR methodology is implemented in standard econometric software packages like EViews. SVAR models analyse the dynamics of a model by subjecting it to an unexpected shock (Gottschalk, 2001). Bernanke et al. (1995) found the data in a regular unrestricted VAR speak and act for itself. The innovation in a reduced form VAR does not have a direct economic interpretation, while the structural VAR model relies on the economic theory to sort out the contemporaneous link between the variables in our model. It identifies the assumptions required to impose an ad hoc structure that avoids incorrect calculation. If we consider the following VAR:

$$\Gamma\, Y_t = B(L).Y_t + e_t \qquad (3.3)$$

Where Y_t is a (n x 1) vector of the endogenous variables, Y_t contains the exogenous and lagged endogenous variables and e E (ee') = gives the variance-covariance matrix of the structural innovations. The coefficients in Γ and *B* are the parameters of interest.

Since we cannot estimate directly (3.14) to get the true Γ and B without adding identification restrictions (Gottschalk, 2001), the historically observed variation in the data is considered the identification (Sims, 1986).

SVAR models can be expressed as:

$$AY_t = \Gamma_0 + \Gamma_1 Y_{t-1} + \Gamma_2 Y_{t-2} + \cdots + \Gamma_p Y_{t-p} + \mathrm{B}u_t\ ,\ u_t \approx (0, \sigma_{ui}^2) \qquad (3.4)$$

Where Y_t represents the (k x1) vector of the observed variables, A and Γ_0 ,…, Γ_p are the (k x k) matrix of coefficients, B is a (k x k) matrix of the linear relationship between structural shocks and innovations in the reduced form.

Multiplying the model by the inverse A

$$A^{-1}AY_t = A^{-1}\Gamma_0 + A^{-1}\Gamma_1 Y_{t-1} + A^{-1}\Gamma_2 Y_{t-2} + \cdots + A^{-1}\Gamma_p Y_{t-p} + A^{-1}\mathrm{B}u_t \qquad (3.5)$$

Reduced form SVAR

$$Y_t = \mathrm{A}_0 + A_1 Y_{t-1} + \varepsilon_t \qquad (3.6)$$

Where Y_t is a$(Y_{1t}, \ldots \ldots \ldots, Y_{kt})'$) is a vector of k of endogenous variables, A_i, are matrices of coefficient attached to the lagged values of Y_t, ε_t is a vector of innovations with zero mean and is equal to A^{-1} B u_t. While u_t are not correlated, ε_t are correlated, but they are not correlated with their lag.

The random term determines the shocks of each variable in the SVAR model. The correlation between the error term and Y_t values makes the estimation of SVAR by the OLS meaningless unless imposing some restrictions (Gupta et al., 2020).

The restriction imposed on matrices A, or B, is healing the identification problem in SVAR. The number of restrictions imposed on matrices A and B is computed by $\frac{k^2+k\,(k-1)}{2}$ (Pfaff B. 2008). Recursively identified, SVAR is driven by implying the Cholesky decomposition. Besides the orthogonality conditions for ε_t, it is normal to normalise the SVAR model, setting the variance to one σ^2_{ri}, σ^2_{goef}, σ^2_{pol} , σ^2_{m2} , σ^2_{ir} , σ^2_{ge} , σ^2_{tx} To one. Using the impulse response function as an empirical analysis is important as the SVAR

model that is based on the moving average (MA) representation. This normalisation corresponds to unit innovation in $e_{ri}, e_{goe}, e_{pol}, e_{m2}, e_{ir}, e_{ge}, e_{tx}$. According to Cholesky decomposition, matrix A is identified as a lower triangular matrix and matrix B as an n-dimensional identity matrix.

Sims (1980) uses the likelihood ratio test to identify the over-identification of the restrictions investigating by the relationship between the observed shocks ε_t restrictions of and ν_t. Orthogonal shocks and the p-value of 20% showed that the restrictions were applied correctly and matched the data. As a result of the SVAR model, variance decomposition and impulse response function techniques are developed.

Results from estimating SVAR are reported in the table (3.2). The Parameter in the fiscal policy named tax revenue (TX) is statistically significant and has the sign predicted by the economic theory in Bahrain, Egypt, Jordan, Oman, Lebanon and Morocco. The other side of the fiscal policy - government expenditure (GE) - is statistically significant in Israel, Qatar, and Tunisia. The impact of monetary policy is shown through the interest rate (IR) in Bahrain, Egypt, Jordan, Kuwait, and Oman, however, the money supply (m2) is only significantly in Saudi Arabia. While an economic policy uncertainty (POLE) is shown significantly in Israel, Jordan, Kuwait, and Morocco, the transparency (GOEFE) indicator is seen in Qatar, United Arab Emirate, and Lebanon.

Table 3.2 Estimate for Structural Vector Autoregressive (SVAR) Model

Country	GOEFE	POLE	M2	IR	GE	TX
Bahrain	0.038315	-0.202444	67.82756	-0.140584	0.221612	-0.60981**
Egypt	0.017834	-0.009979	2177.234	-0.1941**	0.353997	-0.06072**
Israel	0.041941	-0.0490**	930.3864	-0.096339	0.3128**	-0.147169
Jordon	0.055341	-0.0660**	125.1766	-0.3081**	0.857299	-0.3240**
Kuwait	0.000248	-0.0002**	14.41778	-0.0033**	-0.040352	-0.000142
Oman	0.028408	-0.017546	68.534551	-0.2598**	2.033386	-0.0524**
Qatar	0.0071**	-0.010832	7648.912	-0.098758	0.7835**	-0.057059
UAE	0.0303**	-0.004388	11772.47	-0.95338	0.008911	-0.004123
Saudi Arabia	0.214096	-0.145454	0.0003**	-0.01342	0.00321	-0.004643
Tunisia	0.019065	-0.010932	544.8736	-0.422669	2.1193**	-0.027283
Lebanon	0.0102**	-0.128708	349.1448	-0.695914	1.143554	-0.0794**
Morroco	0.022027	-0.0316**	31391.89	-1.852596	0.267312	-0.3968**

An asterisk (**) indicates significance at the 5 percent level.

3.3.2.4 Variance Decomposition

To identify the importance of the interaction of the seven desired variables, variance decomposition is employed in each assigned country in the MENA region. The moving average representations of the (VAR) seven equations.

$$\begin{pmatrix} RI_t \\ GOEFE_t \\ POLE_t \\ M2_t \\ IR_t \\ GE_t \\ TX_t \end{pmatrix} = \begin{pmatrix} C_0 \\ d_0 \\ f_0 \\ g_0 \\ h_0 \\ k_0 \\ w_0 \end{pmatrix} + \sum_{j=1}^{\infty} \begin{pmatrix} C_{11} & C_{12} & C_{13} & C_{14} & C_{15} & C_{16} & C_{17} \\ d_{21} & d_{22} & d_{23} & d_{24} & d_{25} & d_{26} & d_{27} \\ f_{31} & f_{32} & f_{33} & f_{34} & f_{35} & f_{36} & f_{37} \\ g_{41} & g_{42} & g_{43} & g_{44} & g_{45} & g_{46} & g_{47} \\ h_{51} & h_{52} & h_{53} & h_{54} & h_{55} & h_{56} & h_{57} \\ k_{61} & k_{62} & k_{63} & k_{64} & k_{65} & k_{66} & k_{67} \\ w_{71} & w_{72} & w_{73} & w_{74} & w_{75} & w_{76} & w_{77} \end{pmatrix} \begin{pmatrix} e_{1t-j} \\ e_{2t-j} \\ e_{3t-j} \\ e_{4t-j} \\ e_{5t-j} \\ e_{6t-j} \\ e_{7t-j} \end{pmatrix} + \begin{pmatrix} e_{1t} \\ e_{2t} \\ e_{3t} \\ e_{4t} \\ e_{5t} \\ e_{6t} \\ e_{7t} \end{pmatrix} \quad (3.7)$$

Where C_0 , d_0 , f_0 , g_0 , h_0 , k_0, w_0 are vectors containing constant, seasonal dummies based on the lag length selection, and a trend; and C_{ij}, d_{ij}, f_{ij}, g_{ij}, h_{ij}, k_{ij}, w_{ij} $(i = 1, 2,3,4,5,6,7)$ are parameters. The orthogonalzed innovations from a Choleski decomposition is utilised.

Table (3.3) and Figure (3.1) summarise the forecasting error variance percentage effect or the variance contribution of MEV variables on stock returns. At period 1, the forecasting error variance of stock return can explain

100%, while other variables do not influence stock returns. The variance contribution from the desired variable on the stock return shows in the short and long run through period 2 and 100, respectively. While at period 2 on words, we can see the forecasting error variance percentage effect of the MEV on the stock returns (RI) in the short and long run. Table (3.3) represents the variance decomposition of stock returns, showing the contribution of other variables on stock returns. GOEFE is the greatest impact on stock return in the short and long run in Qatar, the UAE and Lebanon. POLE has the greatest impact in Egypt in the short run and Morocco and Jordon in the long run. M2 has a great impact in the short and long run in Saudi Arabia, but only in the short-run in Kuwait. IR has the greatest contribution in the long run in Egypt, Kuwait, and Oman and has the greatest impact in the short run in Oman and Morocco. GE has a substantial contribution in the short and long run in both Israel and Tunisia. TX has a significant impact in Bahrain's short and long run, while it has the greatest effect in the short run only in Egypt, Jordon, Lebanon, and Morocco.

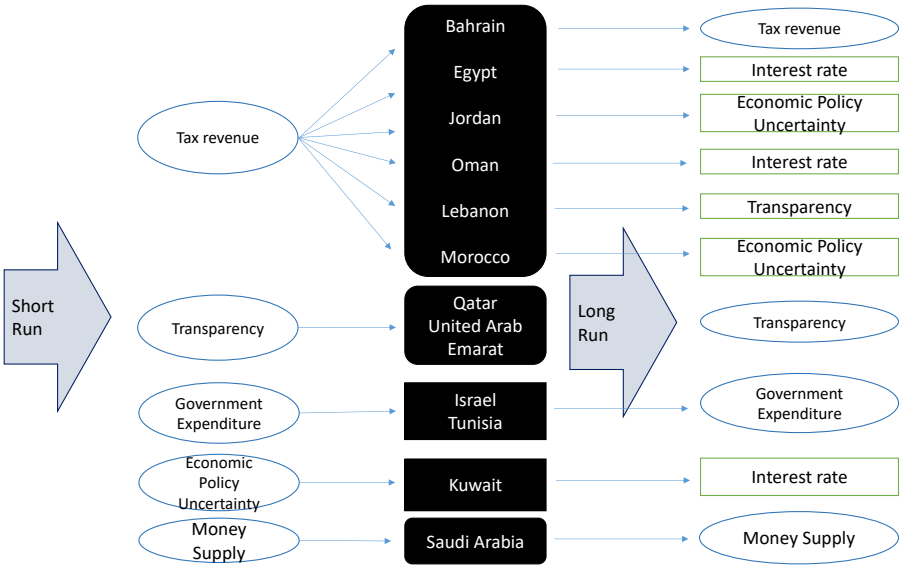

Figure 3.1 The Most Effective Variable on Stock Returns

Table 3.3 Variance Decomposition to Stock Returns

Country	AIC/ Lag	periods	RI	GOEFE	POLE	M2	IR	GE	TX
Bahrain	1	1	100	0	0	0	0	0	0
		2	96.44172	0.47706	0.031894	0.371537	1.019722	0.00102	1.657045
		100	93.86593	0.744646	0.033397	0.668364	2.022391	0.001937	2.663331
Egypt	2	1	100	0	0	0	0	0	0
		2	95.72175	0.687219	1.222198	0.00259	0.612777	0.190333	1.563137
		100	93.09332	0.822385	1.517009	0.341429	2.399828	0.228496	1.597536
Israel	1	1	100	0	0	0	0	0	0
		2	98.25381	0.001506	0.082955	0.069583	0.077887	0.863573	0.650684
		100	97.77334	0.002038	0.08794	0.069449	0.134935	1.072272	0.860029
Jordan	6	1	100	0	0	0	0	0	0
		2	98.045	0.004366	0.684659	0.15736	0.03515	0.242887	0.830574
		100	71.64235	0.808636	8.209754	4.431229	4.908549	2.362613	7.636868
Kuwait	2	1	100	0	0	0	0	0	0
		2	99.92584	0.004092	0.038447	0.015588	0.003169	0.011505	0.001359
		100	99.69104	0.017899	0.061074	0.028112	0.131103	0.034112	0.036661
Oman	1	1	100	0	0	0	0	0	0
		2	99.62908	0.046773	0.024122	0.020788	0.129098	0.046914	0.103227
		100	96.21482	0.32605	0.160228	0.053138	1.287103	1.26683	0.691835
Qatar	2	1	100	0	0	0	0	0	0
		2	95.15546	2.47411	0.554979	0.327537	0.074075	0.150148	1.263691
		100	92.56634	4.226386	0.522682	0.840854	0.20767	0.200869	1.435197
United Arab Emarat	1	1	100	0	0	0	0	0	0
		2	98.12202	0.823688	0.03062	0.739818	0.000233	0.246061	0.037558
		100	97.66213	1.051103	0.031506	0.742738	0.044329	0.429229	0.038962
Saudi Arabia	1	1	100	0	0	0	0	0	0
		2	98.89966	0.333029	0.353242	0.368418	0.027274	0.009631	0.008745
		100	98.78598	0.360775	0.362037	0.395052	0.043103	0.014509	0.038545
Tunisia	1	1	100	0	0	0	0	0	0
		2	96.82156	0.139289	0.316579	0.14081	0.778875	1.645699	0.157184
		100	95.43182	0.284483	0.97878	0.144242	0.77803	2.160033	0.222612
Lebanon	1	1	100	0	0	0	0	0	0
		2	98.74632	0.387848	0.098019	0.147476	0.002844	0.00118	0.616314
		100	97.8665	0.659063	0.32119	0.300878	0.047545	0.151135	0.65369
Morroco	1	1	100	0	0	0	0	0	0
		2	99.58135	0.073422	0.075241	0.052459	0.095262	0.004552	0.117716
		100	95.61231	1.064786	1.645685	0.213456	0.170903	0.040618	1.252245

3.3.2.5 Impulse Response Function (IRF

To check the result consistency with the variance decomposition. The IRF drives from the VAR (p) process as a vector moving average (VMA) process.

$$Y_t = \mu + u_t + \psi_1 u_{t-1} + \psi_2 u_{t-2} + \cdots + \psi_s u_{t-s} \ , \qquad (3.8)$$

Where $\psi_s$are matrices that are determined by a recursive substitution.

$$\psi_s = \sum_{j==1}^{p-1} \psi_{s-j} \pi_j \quad , \qquad (3.9)$$

The elements of coefficient matrices $\psi_s$is the mean effects of u_{t-s} shocks on Y_t. Then the impulse response function can be shown from the ψ_s matrix in the (i, j)-th elements ψ_{ij}^{s}

$$\frac{\partial Y_{i,t+s}}{\partial u_{j,t}} = \frac{\partial Y_{i,t}}{\partial u_{j,t-s}} = \psi_{ij}^{s} \;\; i, j = 1, \ldots., T. \tag{3.10}$$

However, as shown in Figure (3.2), the response of stock prices to one standard deviation shock of the assigned macroeconomic variables are varied in the selected MENA countries. It supports the results of the variance decomposition method.

- SD Shock (innovation) of Government Effectiveness (Transparency)

  During earlier stages, stock returns responded negatively to government effectiveness. The increase at the starting point gradually declined after the second period in Qatar, Egypt, the UAE, and Lebanon. In other countries, the variable is insignificant because the zero value is between the 95% confidence interval lines.

- SD Shock (innovation) of Political Stability

  During earlier stages, the positive impact of stock returns reacted as a response to standard deviation innovation of political stability in Tunisia, Qatar, Saudi Arabia, and Egypt.

- SD Shock (innovation) of Money Supply

  During earlier stages, the positive impact of stock returns reacted to standard deviation innovation of the money supply indicator in the UAE, Qatar, S.A., and Bahrain.

- SD Shock (innovation) of Interest Rate

During earlier stages, the negative impact of stock returns reacted to standard deviation innovation in the interest rate variable in Egypt, Bahrain, and Tunisia.

- SD Shock (innovation) of Government Expenditures

  During earlier stages, the negative impact of stock returns reacted to standard deviation innovation of government expenditure in Israel and Tunisia.

- SD Shock (innovation) of Tax Revenue

  During earlier stages, the negative impact of stock returns reacted as a response to standard deviation innovation of tax variable in Egypt, Oman, Qatar, and Lebanon, while a positive impact was found in Bahrain and Israel.

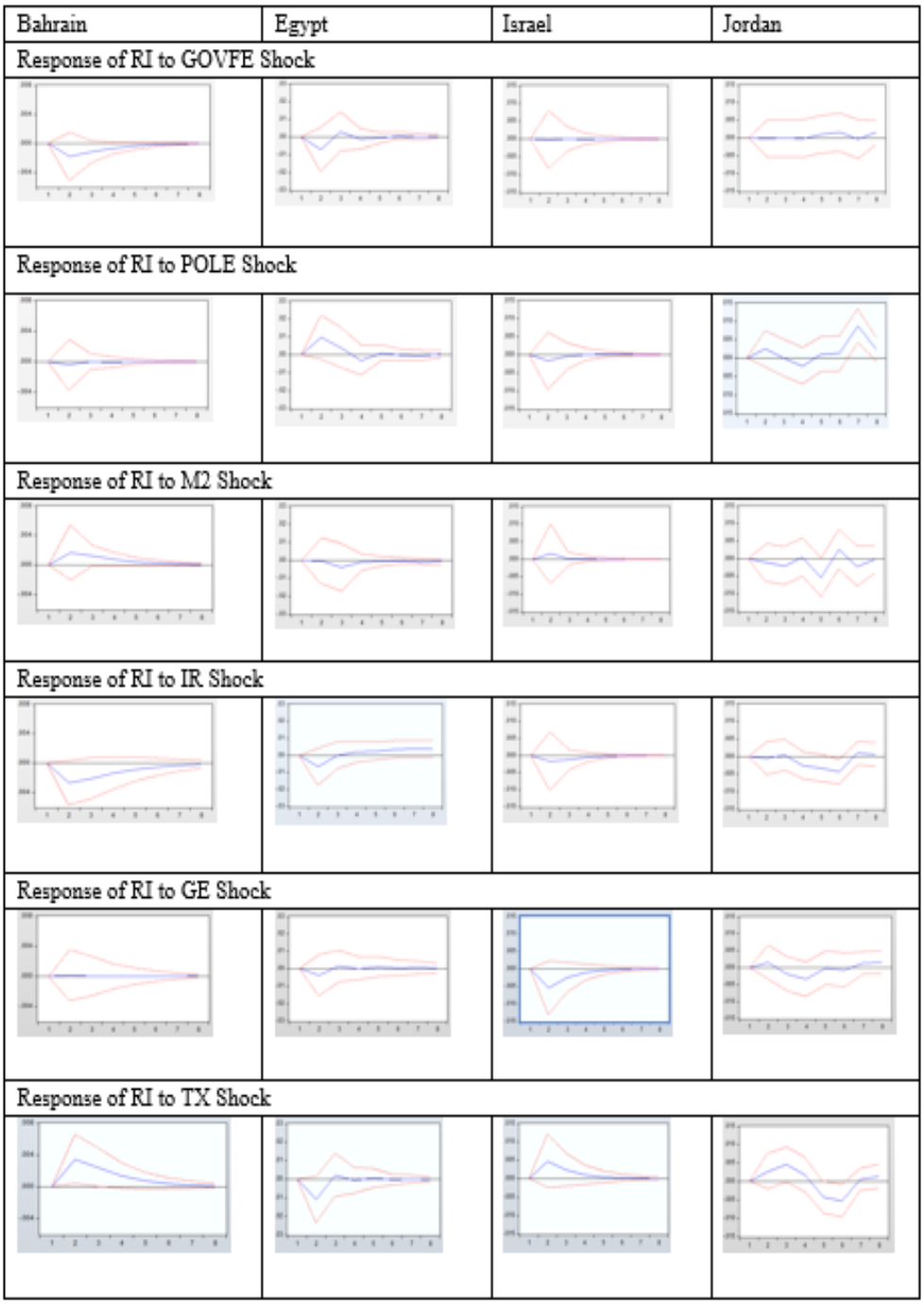

Figure 3.2 Impulse Response Function, Panel (A)

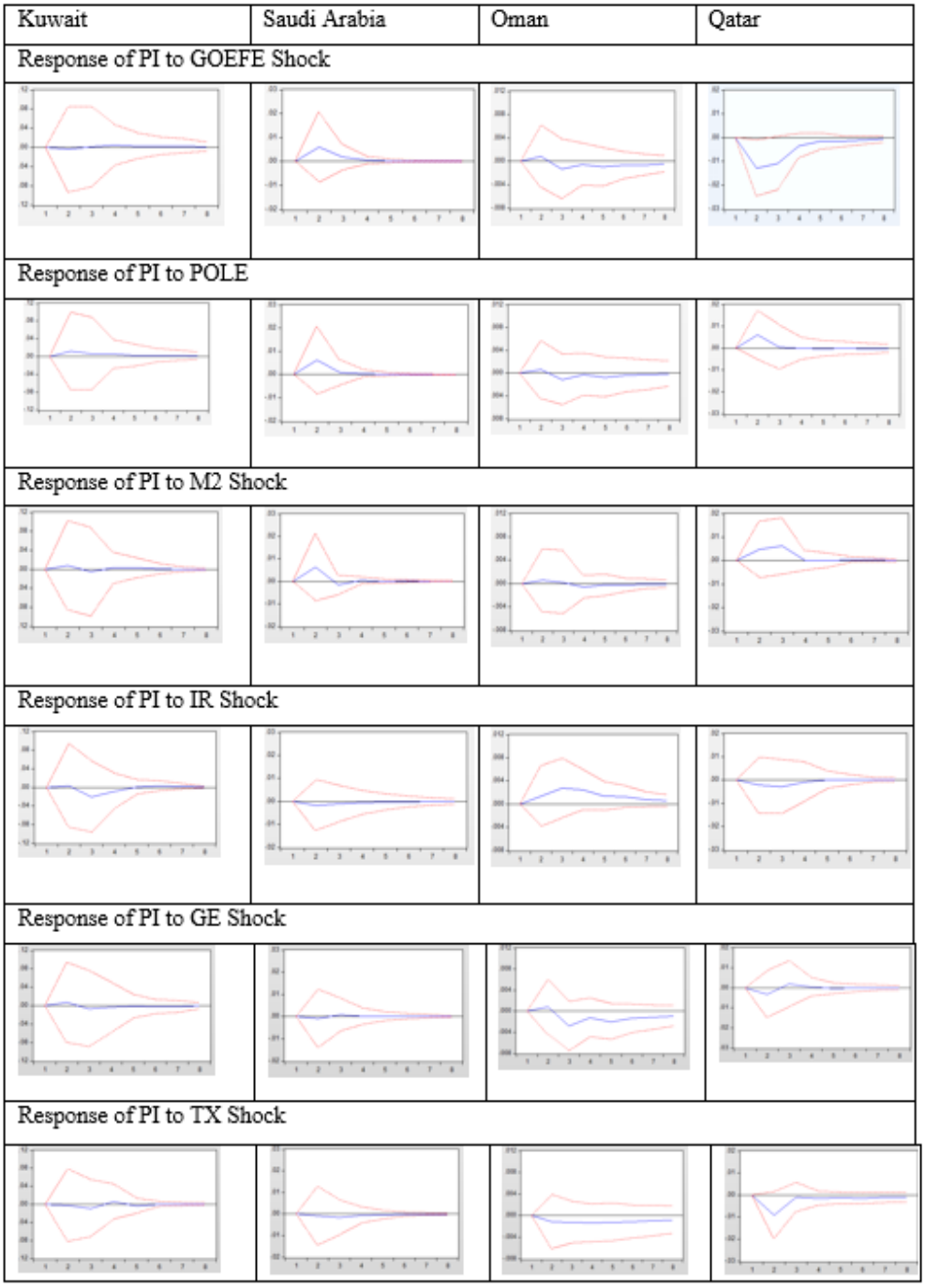

Figure 3.2 Impulse Response Function, Panel (B)

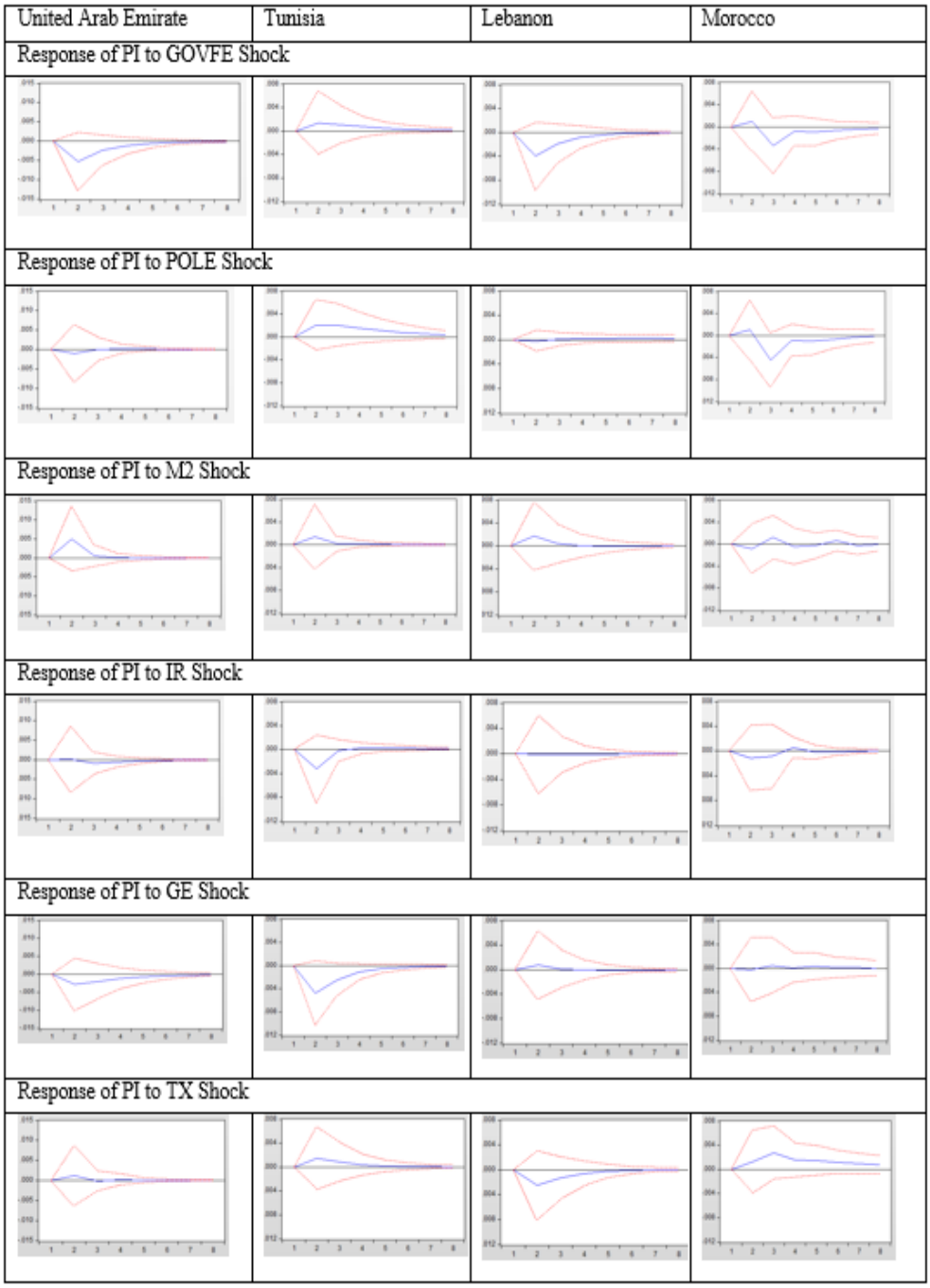

Figure 3.2 Impulse Response Function, Panel (C)

3.4 Conclusion

Stock market studies show the undisputable contribution to economic growth. This study investigated the interrelations and the dependencies of the macroeconomic variables on stock returns. Specifically, the study showed the impact of the monetary and fiscal policy, the economic policy uncertainty, and the transparency indicators on stock return in MENA countries. To describe the economic structure, the study employed the SVAR model. Because of SVAR, variance decomposition techniques and impulse response functions are developed. Stock returns responded differently from the MEV shocks depending on the economic conditions. The results show that the transparency indicator has the greatest impact on stock returns in the short and long run in Qatar, the UAE and Lebanon, while the economic policy uncertainty has the most significant impact in the short run in Egypt. Also, the economic policy uncertainty indicator plays a vital role in the long run in Morocco and Jordon. The money supply instrument of the monetary policy had a significant impact on stock returns in the short-run in Kuwait and in Saudi Arabia for both horizons. The other instrument for monetary policy, interest rate, contributed significantly in the long run in Egypt, Kuwait, and Oman and had the greatest impact on the short run in Oman and Morocco. The fiscal policy contributed through the government expenditure contributed significantly in the short and long-run in both Israel and Tunisia, while the tax revenue had a significant impact in the short and long-run in Bahrain and in the short-run in Egypt, Jordon, Lebanon, and Morocco. These results had significant implications for policymakers to adopt proper policies based on the country's conditions.

Chapter 4: The Empirical Analysis of Macroeconomic Variables and Stock Market Efficiency

Using MENA countries' data, this study follows two approaches. A structural approach to investigate whether stock market efficiency responds similarly to different macroeconomic policies, transparency and economic policy uncertainty. Several reforms undertaken by the MENA policymakers are displayed in the study. Following Griffin et al. (2010) and Jegadeesh (1990), the momentum investing strategy is used to supervise stock market efficiency. CUSUM and CUSUMSQ tests are employed to check the regression stability, then the Bai-Perron (1975) test is employed to control the multiple break months in the dependent variable, namely momentum investing strategy that captures market inefficiency. Results show that there is a different impact of macroeconomic variables on the momentum investing strategy that improve or deteriorate the SME before and after the breakpoint. While the government effectiveness variable (transparency) is the only significant variable that influences Egypt's structural change after the year 2008, Kuwait and Morocco show that the economic policy uncertainty has a significant effect. The nonlinear autoregressive distributed lag (*NARDL) approach is applied to check the possible asymmetry relations in both long- and short-run effects between fiscal policy, monetary policy, and transparency and economic political uncertainty and stock market efficiency through the momentum investing strategy. Results show that monetary policy instruments have more asymmetric impact than fiscal policy in the short-run effects in Egypt, Israel*

and Lebanon while the fiscal policy shows asymmetric impact in Oman through the government expenditure. The monetary policy has also a more long-run asymmetric impact in Kuwait, Qatar, Egypt, Jordan and the UAE than in the short-run impact.

4.1 Introduction

Applied economics address inquiries of economic importance through trials of restrictions on the parameters of exact models within time series analysis. Many methods assume that the relationship between variables is constant, disregarding the impact of structural breaks on rejecting or accepting the null hypothesis. The discussion at hand shifts the focus from the questioning of efficiency to the chance of instability, which brings about ambiguous/misleading findings (Stevens et al., 2014)

Structural breaks in the variables of interest usually disrupt time series analysis. Inspired by Andrews (1993), this theory includes the model's stability in the null hypothesis of interest. This allows for the investigation of the data until the break, and beyond it, thereby providing proof of inefficiency that would otherwise not be traced.

Market efficiency is a vital topic in financial economics for over four decades since the publication of Fama (1970). It is defined by the efficient markets hypothesis (EMH) as one in which it correctly reflects new information in its current security price. Fama (1970) divides the EMH into three forms; the weak form, semi-strong-form and strong-form. Under weak form efficiency, they reflect the information of all past prices in today's prices. Semi-strong

efficiency implies that we calculate all public information at current prices. Strong form efficiency shows that all information is in a market.

Although several markets have been studied throughout the years, including the emerging markets, the MENA region differs because of its different cultural settings, regime, and regulations. We measure the market efficiency in the environment of some of the stock markets in MENA countries using the momentum strategy in chapter (3). The momentum strategy is one of the most researched strategies that relies on past returns and is also known as the momentum effect. This is very popular among investors and traders, since this strategy takes a long position in past winners and a short position in past losers (Griffin et al., 2010). Studies have proved that momentum strategy has been profitable across many classes of securities and around several countries. However, the momentum strategies are likely to display crashes (losses) in certain situations where some scholars state the reason being the leverage dynamics of stocks (Daniel et al., 2012).

The Stock Market Efficiency in the MENA region has recently faced many challenges, such as poor liquidity, political instability, and thin trading. These markets have been subject to reform in recent years to improve performance and efficiency. As the OECD (2005, p. 13) has observed, ‘Countries in the MENA region have been attempting to strengthen their regulatory and institutional infrastructure for capital markets’. Several studies examined the MENA stock market efficiency (for example, Badmouth, 2010; Antoniou, Ergul and Holmes, 1997; Butler and Malaikah, 1992). However, Bekaert and Harvey (1998) found that informational efficiency provides a crucial link between stock markets and economic growth in emerging economies, which

makes it of considerable importance to the policymakers in such countries where very limited studies have considered stock market liquidity. The direct relationship with macroeconomic variables (namely money supply, interest rate, government expenditure and taxes) and with other significant relationships highlighted from past research such as economic policy (EP) uncertainty and transparency. The EP uncertainty has become a crucial point during the global financial crisis and suggested that U.S. and European policies have contributed to the huge economic declines from 2008 to 2009 (Baker et al., 2016). Research also found that EP uncertainty depresses the firm's investment decisions and affects market volatility (Kang et al., 2014; Wang et al., 2014; Liu and Zhang, 2015). MENA policymakers have undertaken several reforms. It would be insightful to study the impact of these reforms on the economy of the MENA countries. This would help in enriching the literature of market efficiencies in the MENA region, which is limited. It will help compare and contrast with previous studies, which found no effect of reforms on the economic growth. This issue needs to be incorporated in the analysis of the impact of macroeconomic policy combination (fiscal and monetary policy) on the MENA stock market efficiency since no study examined the market efficiency in recent times after the reforms have been implemented. This paves the way to examine the impact of these reforms on the market efficiency of the MENA region.

The literature in chapter (3) showed the interrelationship between the stock return and MEV, EPU and transparency. These factors contribute to predicting stock returns and can lead to structural break as well. Each country seeks to improve its economic growth by implementing reforms to their economies. These reforms aim initially to improve its stock markets. This

chapter focuses on how these factors peruse breaks in the stock market efficiency of 12 MENA countries, namely Egypt, Kuwait, Qatar, Saudi Arabia, the UAE, Bahrain, Oman, Jordon, Tunisia, Israel, Lebanon, and Morocco. This study applies the structural break approach developed by Bai-Perron (1975). Multiple breakpoints are examined for the efficiency of stock exchanges as measured in chapter (2) following Griffin et al. (2010) and Jegadeesh (1990) through the momentum investing strategy in a monthly basis from 2004 to 2019 to investigate the impact of MEV used in chapter 4 on stock market efficiency (SME) before and after the breaks/reforms. In addition, the study uses a nonlinear autoregressive distributed lag (NARDL) framework to examine the asymmetric long and short run relation between the momentum investing strategy shock that affects the efficiency of the stock market and macroeconomic variables (fiscal and monetary policies).

4.1 Breakpoints Effects (Factors)

The Egyptian financial market is one of the most diversified and oldest in the MENA region. In the year 2009, they formed the Financial Regulatory Authority to regulate the capital markets in terms of corporate governance, transparency and disclosure rules. The Egyptian Exchange, along with the regulators, introduced several reforms into the market. In the year 2016, the regulatory authorities of Egypt devalued the Egyptian pound in compliance with the International Monetary Fund for a loan of $12 billion (Thomson Reuters, 2019). In the year 2018, they established the first investment trust for the real estate sector. In 2019, the Financial Regulatory Authority agreed to reduce the fees pertaining to trade activity in the market to encourage investment and ensure a friendly platform for the investors. The principal aim

of these transforms is to improve the economic growth of the country (Oxford Business Group, 2021). In the year 2010, the Egyptian exchange launched a separate board for SMEs (Small and Medium-Sized Enterprises) known as the Nile Stock Exchange. The trading and listing rules are like those of the large enterprises, except that the SMEs have low fees and fewer disclosure needs. The reforms have had a positive influence on the growth of the economy, such that the value of the financial market's index grew by around 67% from 2016 to 2019 (Oxford Business Group, 2021). Subsequently, these results also lay a foundation for a future examination of the impact those repairs had on the market efficiency of the Egyptian market.

The Israeli Stock Exchange was formed in the year 1953 and was given the name Tel Aviv Stock Exchange. Further, in the last two decades of the 20th century, the Israeli government laid certain reforms to achieve certain goals. It included reducing government intervention in the capital markets, escalating capital movement, increasing competition among the financial sectors, and developing the stock exchange. Recently, there have been some reforms that the Israeli government started. To increase foreign trade by increasing trade protection and lowering the regulatory burdens. In the year 2018, the government took initiatives to encourage imports through online buying by reducing import taxes on various products, including consumables. In the same year, the government started privatisation of various sectors, including the electricity company, to reduce the cost of living (OECD, 2019).

Despite the reforms undertaken by the government, a considerable amount of the population remains in poverty. A study suggests that the Israeli economy is not weak form efficient from an international trader's perspective

(Karamera et al., 1999). However, no study examines the market efficiency in recent times after the reforms have been implemented. This paves the way to examine the impact of these reforms on the financial market efficiency of Israel.

Bahrain is like other Arab nations. The principal source of income is through exports of oil. However, the country is working towards diversification of its economy by investing in transport and communication (Acikgoz et al., 2016). Further, the stock market started operating in the country from the year 1989, which had 29 companies listed on the exchange. Thereafter, the country has seen several reforms to enhance the capital market. One such reform includes the monetary policy by pegging the Bahraini Dinar to the U.S. dollar. Hence, inflation is heavily relying on the monetary policies of the U.S. Federal Reserve. As a result, the interest rates rose almost nine times from 2015 to 2018, which strengthened the liquidity and stability of the Islamic financial sector. During the year 2018, the Central Bank of Bahrain adopted a risk-based supervision approach to enhance the monitoring of the financial sector to improve the supervision and ensure the stability of the financial industry. The primary aim was to enhance the transparency and protection of the consumers (Oxford Business Group, 2020).

In the past decade, the economy of Jordan has faced significant strain because of the combination of various factors. It included the financial crises, blockage of trade routes and Arab Spring. These led to an increase in the cost of security, food and oil prices and a decline in remittances. Subsequently, this led to an increased debt burden on Jordan, which led to several reforms being passed by the government to improve the overall economic stability of

the country. The Jordanian government agreed with the International Monetary Fund for the period 2012-2015 in order to lower the country's debt to GDP ratio. The chief aim of these reforms was to abolish subsidies by eliminating the primary deficit, ensure a downward slope of debt to GDP ratio, and ensure it started a normal economic growth pattern. However, with the rise in inflation, the debt rates have significantly increased, making it extremely expensive for the country to raise new debt. As a result, this will hinder the growth plan of the country (FAO, 2017).

In realisation of the problems faced by the country, the Government of Jordan has started changes in their regulatory frameworks. They plan to keep and invite foreign investment by easing doing business in the country. Some reforms include outsourcing, digitisation, virtual workspace, re-engineering and so on. They also intend to pass several laws for the same purpose, such as removal of tax on goodwill, preservation of shareholder agreement, amendments to company's law, etc. Since the government of Jordan believe in its human capital market, it aims to capitalise on this advantage to attract outsourcing projects, especially in the information technology sector (FAO, 2017). Although some reforms are yet to be implemented, the government has already started many of these, and it would be interested in examining the impact these reforms had on the market efficiency of the Jordanian capital market.

The stock market in Kuwait was established in the year 1961, soon after the independence from the British. However, it was not long enough that the stock exchange faced several collapses because of improver regulations and speculative trading activities. The Kuwaiti stock exchange saw a very slow

development and growth as they limited the market to the GCC citizens, the majority of the activity remained under the control of the government, the ability to lend and borrow securities did not exist, and there were limited market makers. In order to provide effective oversight over the capital market, the government passed a Capital Market Authority Law in the year 2010. The primary purpose of this law was to govern all modes of market manipulation techniques so that they ensure an efficient market. Because of several issues faced by the Capital Market Authority Law in 2010, it was revised and issued again in the year 2014 and later in 2015. Some of the important reforms that were introduced in the Kuwaiti capital market were "independent regulatory body, comprehensive change in the standards of licensing for all market participants, a new set of provisions that criminalise and punish many market abuse, new restrictions on dealers, new corporate governance rules, and the privatisation of Kuwait Stock Exchange" (Brush & Abdulsalam, 2019, p.48).

The stock market in Oman was initiated during the 1980s when the Muscat Securities Market was found. Later in the 1990s, the need for a regulatory framework rose, which led to the establishment of the Capital Market Authority to instil confidence among the traders and investors and to enhance the overall trading process in the stock market (Alam & Hussein, 2019). Similar to other GCC nations, the economic growth despite the initiation of the stock market was very slow in the Oman region, and it is also the smallest market in the entire GCC. The stock market of Oman has seen no significant improvement in trade activity. Further, with the fall in the oil prices, the trading has lowered as well. The government has started the issuance of government bonds in the year 2016 to finance the budget, and it led to the formation of the corporate bond market. There are new laws underway to

improve the governance of the securities in the Oman capital market, likely to be implemented by 2020. This is to develop strong regulatory bodies, improve transparency and instil foreign investment (Oxford Business Group, 2020).

Qatar established the stock market in the year 1995 with only 17 companies listed. Similar to other GCC nations, only local citizens could invest in the listed enterprises. However, from the year 2005 onwards, foreigners have been allowed to invest in the listed businesses, which led to rapid growth in the economy. There have been tremendous changes thereafter in the Qatar Stock Exchange, such as linking the Qatari brokers with the New York Stock Exchange universal trade platform in the year 2010, which became the first trading platform in the Gulf region. This enhanced foreign participation in the trading platform. Their system was further enhanced in the year 2012, as the companies listed on the stock exchange were further categorised into a wide range of activities. Considering the various sectors in the Qatari Market, the financial sector that includes banks and insurance companies holds the maximum occupancy, it is followed by industrial companies, telecom service companies, and utilities and energy sector (oxford business group n.d.2012). The Qatar Stock exchange is continually improving foreign investments, improving market makers and rising awareness among the investors.

Considering the changes made by the policymakers for the Qatar Stock exchange, the results have shown tremendous positivity. Morgan Stanley Capital International (MSCI) gave the stock market the status of emerging markets in the year 2014. The stocks have seen significant growth and were rated as the booming stock market in the Gulf region, surpassing United Arab

Emirates (UAE) and Bahrain. The financial sector, as mentioned earlier, played a significant role in the stock's growth market as it contributed 35% of the total trade value in the capital market (Oxford Business Group, n.d 2012.).

United Arab Emirates (UAE) is among the most developed GCC nations as it has a strong infrastructure, institutions, macroeconomic stability. However, it has deficiencies in terms of education and innovation as compared to other GCC nations (Hvidt, 2011). UAE has three financial markets; Dubai Financial Market and Abu Dhabi securities exchange and Nasdaq Dubai. The Abu Dhabi Government wholly owns the Abu Dhabi securities exchange, whereas the Dubai Financial Market is 79.6% owned by the Dubai government and the remaining is publicly traded. The Nasdaq Dubai was formed in the year 2005 and is partially owned by Dubai Financial Market (66.7%) and Borse Dubai (33.3%). There were some enormous changes in the UAE to ensure market stability as they introduced governance of investment funds in the year 2012. They made further enhancements in the regulations to improve the interests of the traders by amending laws pertaining to corporate governance, as it improves shareholder rights and protects minority interests (oxford business group, 2017).

Although there were many reforms laid by the policymakers, performing the UAE market largely depends on factors such as oil prices and fluctuations in the interest rate in terms of the dollar. In order to assess the long-term effect of the regulations, they need further studies to examine the effect of the new regulations on market efficiency. However, it should be noted that these

regulations led to an increase in the GDP growth of UAE (oxford business group, 2017).

The Saudi Arabian economy is not very different from other GCC nations, as it highly depends on the revenue from the oil. Hence, the largest source of income for the country is from oil exports (Blasquez et al., 2021). Considering the stock market of Saudi Arabia, they established it during the 1970s. However, it was developed only in the year 2004 as the Saudi Government started the creation of Capital Market Authority, which is the only regular of the capital market. It was further enhanced by creating the Saudi Stock Exchange, also known as trowel, in 2007. The reforms in the year 2015 saw the Saudi capital market emerge as a developing market. It also includes the norms for qualified foreign investors (QFI), enabling them to purchase stocks of the listed companies in the Saudi capital market. However, the limit for foreign investment remains at maximum of 49% of shares purchasing power (oxford business group, 2018).

The reforms led by the Saudi Government aim to improve the country's capital market by encouraging and easing the process of foreign investment by granting ease of access to them, improving the transparency of the transactions. They seek these to enhance the capital market of the country. However, the exact effect of these regulations and reforms on market efficiency is still unclear and needs further investigation.

In recent times, Tunisia has faced major issues in terms of its economy and political environment. These are the main reasons behind the reforms to instil an economic policy regime, a democratic political setting, and a more accountable political system. The Tunisian government undertakes other

recent reforms in the year 2007 include; conservation of macroeconomic equilibrium, consolidation of economic stability, reforms in the educational sector and increased investment in the highest yielding sectors (AFDB, 2013). In 2018, the Tunisian government passed the finance law, which aims to confront the structural imbalances to bring the budget deficient lower than 5% of the GDP. Another reform aims to liberalise Tunisian Dinar to enhance trade competitiveness to lower the fiscal imbalances in the long term.

Some of the other issues faced by Tunisia were the rise in prices because of inflation. As a result, the government adapted the monetary policy in the year 2017 to introduce almost $100 million in the Tunisian financial market. However, further policy amendments are required to tackle inflation and control the Tunisian Dinar's depreciating value (Oxford Business Group, 2019). Considering the difficulties faced by the Tunisian government to handle the economic and political environment in the country, it is essential to understand the impact government reforms have on the country's financial market.

The stock exchange of Beirut is one of the oldest stock markets in the MENA region. In the year 2006, they started a remote trading system that enables the agents to trade with securities remotely. Soon after, in 2008, they implemented the e-trading platform with allowed brokers. Simultaneously, they introduced an advanced trading system and created a Capital Market Authority to regulate the financial market in 2009 and 2011, respectively. In the year 2014, the Beirut stock exchange went into an agreement with Euronext to implement a new trading application programme (BSE, 2018).

Morocco enjoys a very convenient geographical location that is during Africa and Europe, easing the trade process. However, similar to most of the emerging economies, the Moroccan State could not manage the development in terms of economy and technology because of a bad state structure. The main issues faced by this country are weak fiscal policies that limit the resources accessible to the public and, second, the political instability that hinders the growth and investment, further leading to high unemployment rates (El Fakir, 2011). Considering these issues, some initiatives taken by the Moroccan Government include reducing the budget deficits and increasing the tax revenue to balance the deficits. The global crisis of 2008 triggered the increased debt of the country.

The primary aim of the government is to diversify the country's economy. This is because even though the agricultural sector plays a vital role as it employs almost 40% of the workforce in the country, it still has a low contribution to the total GDP. The Green Morocco Plan started in the year 2010, aims to modernise the agricultural sector. To attract foreign investment, the Moroccan State has also started a plan called the Industrial Acceleration Plan (2014-2020) to encourage economic diversification in automobiles and manufacturing (Oxford Business Group, 2019). It is interesting to study the impact these reforms have had on the financial market of the country. It will help in understanding the efficacy of the policies laid by the Moroccan State.

Macroeconomic variable MEV can have different effects over the business cycle than economic policy (EP) uncertainty and transparency indicators. Past research suggests that EP uncertainty depresses the firms' investment decisions and affects the market (Kang et al., 2014; Wang et al., 2014; Liu

and Zhang, 2015). Regarding MEV, Blanchard and Perotti (2002) find that fiscal policy might be more effective in mitigating economic slumps than in muting booms; alternatively, it might be less effective at lengthening expansions than at shortening recession. Regarding transparency, they assumed that with sufficient transparency in the market environment. On the monetary side, Cover (1992) illustrates a clear asymmetric effect of monetary policy on aggregate output for the USA, with monetary contractions having a greater effect on output than equally sized monetary expansions. However, very little literature has been devoted to testing for such an asymmetry in response to monetary policy on stock market efficiency (SME). Therefore, this study will use MENA data to investigate whether stock market efficiency responds similarly to different macroeconomic policies, economic policy (EP) uncertainty, and transparency indicators.

4.2 Literature

Limited studies have explored the emerging markets of the Middle East and North Africa (MENA) region, and results have been mixed. Gandhi et al. (1980) found that the Kuwaiti stock market was inefficient. However, Butler and Malaikah (1992) challenged this result, who concluded that the Kuwaiti stock market was weak form efficient but that the Saudi stock market was inefficient. El-Erian and Kumar (1995) found that the Amman stock market exhibited a serial dependence in returns. However, as well as the development of better methodologies to test for market efficiency in emerging markets, a major shortcoming of these early investigations is that they failed to test for growing market efficiency in the markets investigated.

The primary purpose of introducing new reforms pertaining to the stock market is to ensure safe trade, fairness and increased trust among the investors. Apart from these, it is to improve market efficiency and performance. In order to measure the effectiveness of the reforms introduced in Kuwait, Borelli and Abdulsalam (2019) tested the liquidity measures of the firms in the Kuwait Stock Exchange and compared the pre-Capital Market Authority Law implementation period and post-Capital Market Authority Law implementation period. They found that despite the aim of introducing reforms to improve the capital market efficiency, the regulations in the emerging markets had an adverse effect on market efficiency, especially with small firms. Hence, the policymakers should review the law and regulatory actions as some studies suggest unclear laws create inefficiencies in trade for investors and hurt their confidence in the capital markets (Cumming et al., 2011).

Despite the efforts of the Omani government to enhance their capital market, the studies show slow growth in the capital market. In addition, with the fall in the oil prices, trade has also reduced. Although a study suggests that the growth in the financial sector of Oman has led to the growth in the economy (Alam & Hussein, 2019), it requires further examination, taking into consideration recent reforms in the Omani capital market.

The tiny Gulf nation has seen poor economic growth from the macroeconomic perspective, as the capital outflows were high. This further led to a significant increase in the public debt as the government turned towards borrowing of funds. Considering 10 years from 2008 to 2019, the borrowing increased from 13% approximately to almost 110% (Oxford

Business Group, 2020). The impact of regulations on the country's economy is yet to be seen as there is insufficient correlation between the reforms and market efficiency in Bahrain.

However, the Lebanese state is currently facing one of the worst economic crises. Throughout the past decades, the Lebanese financial regulatory bodies functioned poorly in terms of proper governance, transparency and accountability. Reports suggest that there was not a single budget that was passed through the 2005-2017 period, and the government neglected the control of public funds. They further ignored the recommendations laid by the International Monetary Fund to float the currency (Tawile, 2021). With the passage of time, the negligence of the Lebanese authorities led to bursting the financial bubble, revealing the actual state of the country's economy and financial situation. Considering the downfall of the Lebanese economy, it is essential to study the status of government reforms and its impact on the market efficiency of the Lebanese financial market.

The usual measure to assess market efficiency is to examine whether a market is efficient regarding a particular and fixed period following Emerson et al. (1997), Zalewska-Mitura, (1999), Urga (2000), Röckingen (2001), Harrison & Paton (2004). Pošta (2008), Arouri (2010), and Charfeddine & Khediri (2016) examined the evolution of the efficiency of stock exchanges over time rather than assessing it at a point of time. The weak form efficiency of many European transition stock exchanges is employed using the GARCHM (1,1) model of the daily index returns volatility and a Kalman filter state-space in estimating the time-varying dependency of the daily returns on their lagged

values. This time-varying dependency is expected to become more stable and infinitely small if the market moves towards more efficiency.

Abdmoulah (2010) studied 11 Arab stock markets. He found weak form inefficiency does not sufficiently improve towards the first quarter of 2009, except for the Saudi stock market showing decreased inefficiency during the current crisis. Although many markets have experienced sub-periods of efficiency improvement, Tunisia, Oman and Morocco's markets' efficiency is highly unstable, with no tendency towards weak form efficiency.

Sensoy (2013) studied the time-varying efficiency of 15 MENA stock markets over the 2007–2012 period, using a generalised Hurst exponent analysis of daily data with a rolling window technique. He found that all MENA stock markets exhibited different degrees of long-range dependence varying over time and that the Arab Spring has had a negative effect on market efficiency in the region.

Andreas and Isabella (2008) found that the Egyptian Stock Market (ESM) has developed rapidly over the last few years. Results show that there is limited evidence of overvaluation in the ESM in the last three years, but that an improved economic environment could bode well for the continued performance of the Egyptian Stock Market. Using September 11, 2001, as a structural break point, correlations of the Egyptian 30 index with most other markets (of both levels and changes) have risen dramatically between the two periods, whereas the correlation of returns has only increased with some Arab markets. However, long-run developments as evidence for bilateral cointegration being weak, portfolio diversification is desirable in the long run.

Most empirical studies emphasise the interaction between stock markets and monetary policy for assessing economic growth. Brunner (1961), Friedman (1961). Friedman and Schwartz (1963), Cagan (1972), and Michael (1974) found that monetary policy does not have a lagged effect of an efficient stock market; lagged monetary variables cannot affect current stock returns and affect contemporaneously on stock prices. In Baker and Harvey (1998), informational efficiency provides a crucial link between stock markets and economic growth in emerging economies, which is important to policymakers in such countries.

Tobin (1969) found that both money growth and budget deficits might significantly affect stock returns. He used the growth rate of stock prices, money stock growth rate, and the change in the real high-employment budget deficits expressed relative to real potential GNP as a measure of fiscal policy. Darrat (1988) found a significant lagged relationship between the fiscal measure and stock return, and past monetary policy actions have an insignificant effect on current stock returns.

Tests (2012) monetary policies in emerging markets used to be ineffective because of fiscal dominance, while fiscal policies used to be pro-cyclical. However, as part of the recent developments, emerging markets could pursue countercyclical monetary and fiscal policies that helped contain output volatility.

Durham (2000) and Pateli (1997) examined the empirical link between changes in monetary policy and short and long-run stock market performance. Bailey (2001) empirically analysed the impact of monetary and fiscal policy developments on the Jamaican stock market. They based it on the work of

Blanchard (1981), which examined the interaction between stock prices and changes in expected and unanticipated monetary and fiscal policies. Bailey (2001) used a turnover ratio of the stock market to measures the liquidity or activity of the stock market relative to its size and is used as an efficiency indicator. Defining liquidity as the ability to easily buy and sell securities, a small but active market will have a high turnover ratio, whereas a large but less liquid stock market will have a low turnover ratio.

The literature on the transitions in the economy, profitability, efficiencies and capital investments is limited in the MENA region. Some studies have focused on the MENA region but do not contain in-depth analysis. One reason could be the slow progression of MENA countries in terms of development. Most of the developing countries have adopted the concept of privatisation to improve their economies. However, the poor private sector, regulatory weaknesses and initial stages of financial markets hinder strong privatisation in this region. Similar to other regions, the first emphasis on privatisation in the MENA region was on SMEs (Small and Medium Enterprises). The MENA countries that had the highest rate of privatisation of industrial sectors included Turkey and Egypt. Some ways Egypt used to privatise was through the sale of shares through the stock market, to sell stakes to investors and so on (Rejichi & Aloui, 2012). Studies on the MENA countries such as Gandhi et al. (1980), Malaikah (1992), Abdmoulah (2010), Andreas and Isabella (2008) find weak form inefficient in some of these countries. According to this view, a market is weak-efficient when today's returns are not dependent on lagged past returns.

Literatures have recognised that many of the macroeconomics variables are nonlinear. (Keynes 1936, p. 314) found that "the substitution of a downward

for an upward tendency often takes place suddenly and violently, whereas there is, as a rule, no such sharp turning point when an upward is substituted for a downward tendency". More recently, (Kahneman and Tversky 1979; Shiller 1993, 2005) have shown the association behaviour between finance and economics by modelling of asymmetry and emphasising the nonlinearity in the social science.

According to Jammazi et al. (2014), "by successive episodes of economic and financial crisis, black swan events, geopolitical tensions, structural changes in business cycle, and heterogeneous economic agents." The authors also added, "the asymmetries can arise from the differences in the fundamental factors that determine the dynamics of markets under consideration".

Accordingly, the estimate of the NARDL model is used in the analysis of a range of economic issues. Van Treeck (2008 used the NARDL model to analyse the asymmetric impact of wealth on U$ consumption. Recently (Delatte and López-Villavicencio 2012), employed the NARD4 technique to examine the long run asymmetric of exchange rate on the consumer prices in advanced economies. This study fills the gap by exploring the relation between MEV and the momentum investing strategy that capture the market inefficiency, considering nonlinearity and asymmetry.

4.3 Methodology and Data

In this study, the same data is used from both chapter 2 and 3. Following Griffin et al. (2010) and Jegadeesh (1990), the momentum investing strategy - winner minus loser (WML) - generated in chapter 2 on a monthly basis from 2004 to 2019 is used as an indicator of the inefficiency method (MOM) and to see its impact on the market efficiency. Continuing the time series data analysis used in chapter 3, structural break tests are applied at the starting point through CUSUM and CUSUM square tests, then Bai-Perron (1975) to determine the multiple break months in the dependent variable, namely momentum investing strategy (WML) for market efficiency. Least square

with break method is used to capture the break months and show the significance of the desired variables. Finally, the Nonlinear Autoregressive Distributed Lag (NARDL) is used to explore the asymmetric linkage between the MOM (as an exogenous variable) and each of M2, IR, GE, TX, POLE, and GOVEFE (as an endogenous variables). These endogenous variables are explained in chapter (3) and express the fiscal and monetary policies along with the transparency and economic policy uncertainty variables.

4.3.1 Structural Break Tests

The cumulative sum (CUSUM) of recursive residuals and the CUSUM of square (CUSUMSQ) tests are employed to check the parameter stability (Pesaran & Pesaran, 1997) and to confirm the structural break that needs to consider the estimation. The stability tests depend on the recursive regression that yields a cumulative sum of the recursive residual (Brown, Durbin, and Evans, 1975). They define the recursive residual as:

$$w_t = \frac{(y_t - x_{t-1}{}'b)}{(1 + x_t'(x_{t-1}{}'x_{t-1})^{-1}x_t)^{1/2}}$$

The CUSUM test statistic is defined as:

$$W_t = \sum_{r=k+1}^{t} w_r/s$$

Where w_t is the recursive residual, and is the standard deviation of the recursive residuals for t = K +1 … T.,$E(W_t) = 0$ when the β remains constant from period to period, but if β varies, it will diverge from the zero mean value line. The significance of any departure from the zero line is assessed by reference to a pair of 5% significance lines. The movement of W_t outside the critical value implies that the coefficient is unstable as Figure 4.1.

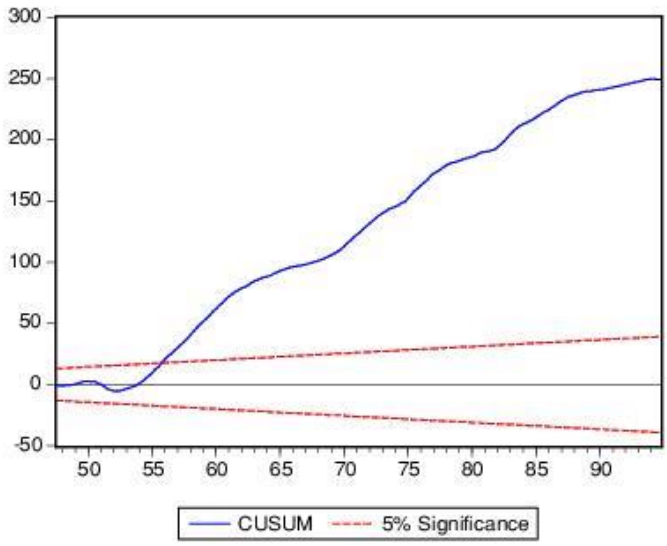

Figure 4.1 Instability CUSUM Test

While the CUSUM of square (CUSUMSQ) test statistics is defined as:

$$S_t = \left(\sum_{r=k+1}^{t} w_r^2 \right) / \left(\sum_{r=k+1}^{T} w_r^2 \right)$$

The expected value of S_t under the hypothesis of parameter reliability is going to zero if t = k and is unity if t =T:

$$E(S_t) = (t - k)/(T - k)$$

The movement outside the critical lines shows that the parameter or variance is unstable and structural change exists. The results show the coefficients' absence of stability because the plots of the CUSUM and CUSUMSQ statistics fall outside the critical bands of the 5 percent confidence intervals of parameter stability. Therefore, there is instability in the coefficients over the sample period.

4.3.2 Bai-Perron Multiple Breakpoints Test

Bai (1997) and Bai and Perron (1998, 2003a) developed further extensions of the Quandt-Andrews framework considering multiple unknown breakpoints. The structural break test is mainly applied in the market efficiency variable captured from the momentum investing strategy to determine the year of break point in 12 MENA countries.

$$Y_t = X_t'\beta + Z_t'\delta_j + U_t \tag{4.1}$$

For j = 1… m+1, where m is the number of breaks, X_t , and Z_t are covariate variables that explain the change in the dependent variable. U_t is the error term. Global information criteria are used as a test specification to capture the number of breaks that minimise the Schwarz information criteria (Liu, Wu and Zidek 1997)

Figure 4.2 represents the Bai-Perron multiple breakpoints test for the SME in the MENA region. Bahrain SME had a structural break in the year 2007 in September. This result supports the fact that after 2008, Bahrain has widely increased the borrowing of funds from 13% approximately to almost 110% (Oxford Business Group, 2020). Egypt SME recorded a break point in the year 2008 because the new financial regulations for the capital market was introduced for the Egyptian stock exchange besides developing a new stock exchange, namely the Nile Exchange in 2010 for small and medium-sized enterprises.

The Israeli authorities implemented reforms to reduce government intervention in the capital markets and promote competition in the financial sectors. In 2018, import taxes were reduced to encourage online imports

besides supporting privatisation in the electricity firms to reduce the cost of living (OECD, 2019).

The breakpoint in 2008 in Jordon due to the decline in the economic activity was affected by pressure in the financial markets because of the decline of the U.S. gross domestic product by 4.3 percent (Labonte, M. 2010). Jordan's economy in 2005 was negatively affected by the increase in global oil prices. This factor also affected the sharp decline in the Jordanian economy in 2008, besides the international financial crises (Jaradat, 2010).

Important reforms were established in Kuwait in the year 2014 and at the end of 2015 because many challenges faced the Capital Market Authority Law since 2010. These issues continued until a breakpoint in 2016 and applied new reforms in the late 2015 such as an independent regulatory body, comprehensive change in the standards of licensing for all market participants, new provisions that criminalise and punish market abuse, new restrictions on dealers, new corporate governance rules, and the privatisation of the Kuwaiti Stock Exchange (Brush & Abdulsalam, 2019).

Oman's crude oil declined from US$126.8 per barrel in Q3 2008 to the U.S. $92.6 in Q4 2008, then U.S.$45 in Q1 2009 because of the global recession in 2008 related to the collapse of the housing market. This implies the breakpoint in 2008. Oman started in 2008 to develop reforms in the banking system, investment and merchant banks, and leasing and finance companies, establishing a private credit bureau, the National Bureau Commercial Information, and operate a new insurance theme (Khamis et al., 2010)

The Qatar Exchange (QE) had a 28% decline in the main market index in 2008. Because of the effect of the global financial crises, a breakpoint

happened in the year 2008. Doha's Securities Market (DSM) reformed the stock exchange and linked the Qatari Broker with the New York Stock Exchange to become the first trading platform in the Gulf region in 2010 (Oxford Business Group. 2012)

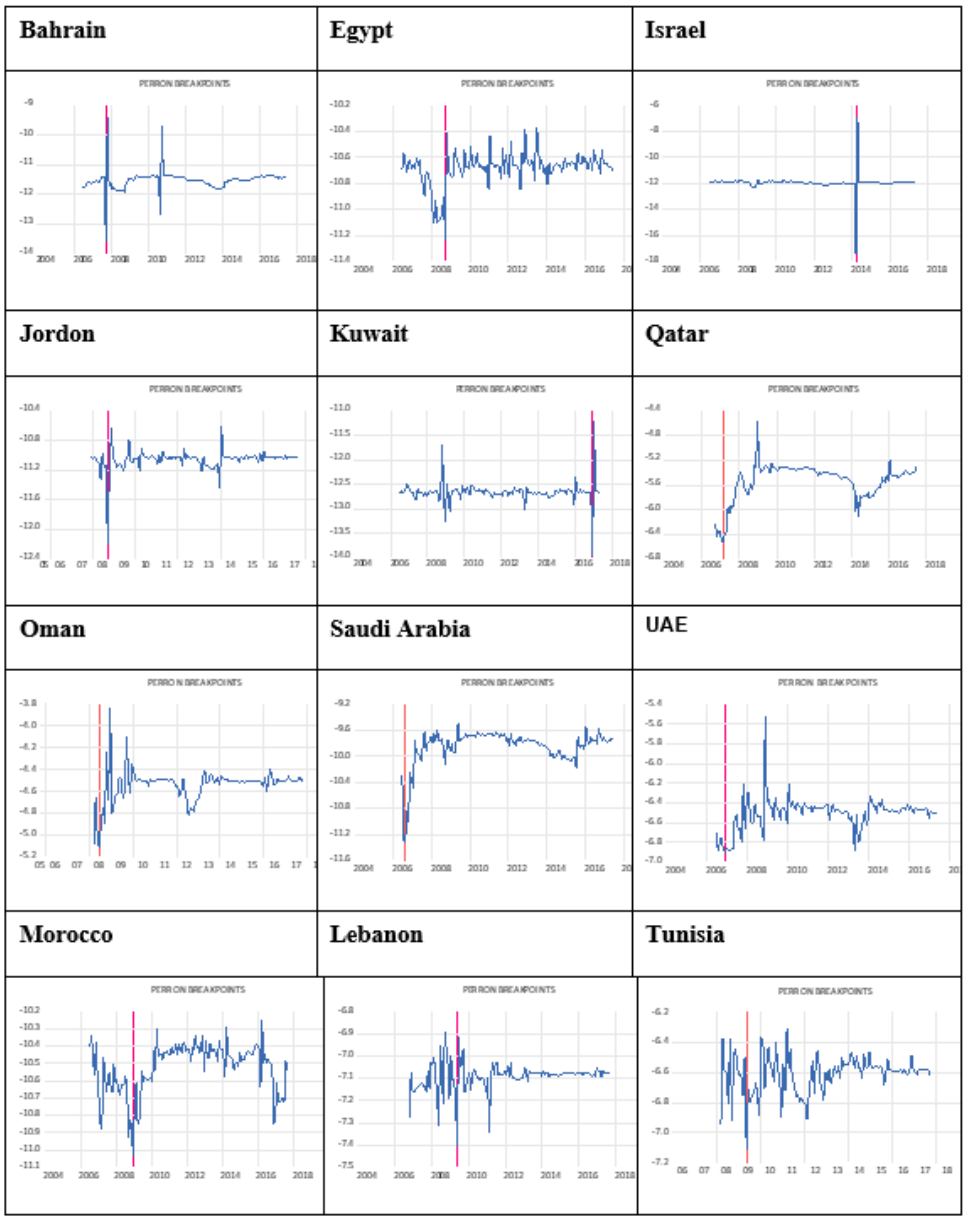

Figure 4.2 Bai-Perron Multiple Breakpoints Test for SME in the MENA Region

The Emirates Credit Information Company (EMcredit) was established in 2006 as the UAE's pioneer information services company, resulting in a structural change in the same year. EMcredit improved the efficiency of the stock exchange by reducing the cost and turnaround time for credit evaluations and decisions (Mina, 2012).

Saudi Arabia has oil exports as its largest source of income (Blasquez et al., 2021). The initial development of the stock market of Saudi Arabia was in 2004 with the establishment of the Capital Market Authority. Large reforms existed in the Saudi Stock Exchange, known as a trowel in the year 2007 resulting in a structural break in the year 2006.

Many reforms were introduced before 2009 in education, democratic political setting, and the general elections were the starting point to lead a revolution that affects the Tunisian economy, which were a major issue present in Tunisia's political and economic environment.

Lebanon has a structural break in the year 2008 once applied the e-trading platform which allowed brokers and implemented an advanced trading system in the Capital Market Authority to regulate the financial market in the years 2009 and 2011 (Reinhart & Rogoff, 2009).

The structural change in Morocco in 2008 was related to the global crises in 2008 that increased the country's debt, but also to the high unemployment rate and the political instability that hindered the investment and growth in Morocco (El Fakir, 2011).

4.3.3. Least Square with Breakpoint

Bai and Perron (1998) describe in the previous section global optimisation procedures for identifying the multiple breaks using equation (4.1). Once the number of the breakpoints is allocated, a standard regression equation is employed as the following.

$$Y_t = X_t'\beta + \bar{Z}_t'\bar{\delta} + \epsilon_t \qquad (4.2)$$

β and $\bar{\delta}$ $= (\delta_0', \delta_1', \ldots., \delta_m')$ are fixed parameter vectors and $\bar{Z}_t'$ is an expanded set of repressors interacted with the set of dummy variables corresponding to each of the regime segments.

This methodology explores the relationship between the significance of macroeconomic variables on the momentum investing strategy. The analysis is based on the sign of the significant variable(s) which either weakens or strengthens the momentum. If the sign of the variable is positive, it indicates a strengthened momentum, which implies that the market is less efficient. If the sign of the variable is negative, it reflects a weakened momentum, which can be interpreted as a more efficient market.

Table (4.1) shows the result of the least square with the break method for the MENA countries. The results conclude with the significant variables that affect the market efficiency through the momentum investing strategy. The significant impact of tax revenue in Bahrain before the breakpoint (2008) indicates a weakened momentum which reflects a more efficient market, and the same impact exists in Egypt and Qatar, but after the break year. The positive estimate of government expenditure indicator in Qatar, the UAE, and Morocco is significant after their breakpoint year, which strengthens the

momentum and lowers the market efficiency. Though Jordon and Morocco‘s results confirm that the interest rate has a significant impact after their break year, it is evident that Morocco has a negative estimate, proving that the momentum is weakened with more market efficiency. On the other hand, Jordan’s results imply a positive momentum after the break, lowering market efficiency, while in Egypt, the interest rate is positively significant before and after the breakpoint. In Kuwait, the political stability estimate variable shows its positive significant impact after its breakpoint, strengthening the momentum and lowering market efficiency. However, in Morocco, POLE is a negatively significant variable, weakening the momentum and strengthening the efficiency of the market before its break year. Government effectiveness (transparency) is a negatively significant variable that has weakened the momentum and increased market efficiency after Egypt’s structural change in 2008. Regarding the money supply (M2) indicator, results show that it has not been a significant variable in this model.

Table 4.1 Least Square Breakpoint of the MENA Region

Country	Breaks	GOVEFE	POLE	M2	IR	GE	TX
Bahrain	4M04 - 2008M	0.293849	0.418423	1.042814	0.44432	-0.427127	-1.9423**
	8M06 - 2019M	0.246229	-0.70485	-0.835842	-1.06525	0.549765	-0.193818
Egypt	04M01 - 2008M	-1.2214	0.284737	0.658385	1.97178**	-1.645597	1.094083
	08M10 - 2019M	-2.391**	0.013287	-0.025874	2.4504**	1.243338	-2.252**
Israel	04M02 - 2014M	-0.313159	-0.56483	0.898912	-0.796844	-0.151636	0.502849
	14M04 - 2019M	-1.302731	0.422647	-0.674191	1.066977	-1.460328	1.464796
Jordan	06M01 - 2008M	0.461048	-0.07166	-0.21651	2.021597	-0.420987	0.570456
	08M10 - 2019M	-1.203407	0.123012	-0.107221	2.1236**	-0.845569	-0.709624
Kuwait	04M02 -2016M	0.009786	1.616363	0.155366	-0.593345	0.17681	-0.23985
	04M02 - 2019M	0.079978	2.0075**	0.067864	-0.681009	0.174234	-0.297969
Oman	05M10 - 2008M	-1.241084	1.071132	-0.568346	0.334442	0.876959	-1.010337
	08M07 - 2019M	1.324516	-2.08946	0.419025	1.095994	-1.176806	1.80117
Qatar	04M01 - 2007M	3.376266	0.554285	0.370176	-1.423271	2.33604**	-0.717288
	07M03-2019M	-1.232133	-0.55894	0.141357	-0.552699	1.709402	-1.9499**
United Arab Emirates	04M01-2006M	1.49615	-0.26603	0.098659	0.42566	2.0400**	-0.317777
	06M12-2019M	-1.441595	0.974282	-0.024049	-0.725023	-0.121521	0.386448
Saudi Arabia	04M01-2006M	-0.873156	-0.54326	1.525086	-0.111245	0.914828	-0.686224
	06M09 -2019M	1.20169	-0.0244	1.282318	-1.95567	-0.215826	-0.382001
Tunisia	06M01 - 2009M	1.709625	-1.8401	-0.080868	-0.554993	-1.379867	1.490574
	09M06 - 2019M	-0.522103	1.295001	0.300415	-0.130069	1.878271	-1.194759
Lebanon	04M01 - 2008M	0.351839	-0.50602	0.667508	0.530045	0.05863	-0.188231
	08M10 - 2020M	0.454366	-0.65701	1.25378	1.144307	0.219868	-0.192266
Morocco	04M01-2008M	1.62134	-2.203**	-0.082829	-0.428577	2.128**	-1.930**
	09M01-2019M	-0.403917	0.731412	-0.934698	-2.404**	1.876371	-1.260121

Test statistics are reported in the parenthesis at the 5% significance level.

4.3.4 Asymmetric Responses of Market Efficiency

The study investigates the possible asymmetry in the reaction of stock market efficiency, investigating stock markets' responses to fiscal policy, monetary policy, and transparency and economic political uncertainty. Because of the techniques of VAR, SVAR presume of a symmetric relation between the MEV (the macroeconomics variables) and MOM (the indicator of SME) and the linearity of the relation, new studies have shown greater significance of the nonlinear and asymmetric relation between variables. In particular, Shin et al. (2014) expanded an extension to the well-known Autoregressive Distributed Lag (ARDL) approach initiated by Pesaran and Shin (1999) and Pesaran et al. (2001). While results from ARDL model show no evidence of long run asymmetric, the NARDL model is accurately employed to capture

the asymmetric long run relationship. Symmetric relationship means the degree of impact of X on Y is the same when X increases (X+) as when X decreases (X-). If we find the magnitude of impact is not the same on both sides of the change, then we conclude that the impact is asymmetric (Forrester, D. I. 2019). The NARDL approach adopted in this study to check the possible asymmetry relation in both long- and short-run effects between fiscal policy, monetary policy, and transparency and economic political uncertainty (as an endogenous variables) and stock market efficiency through the MOM (as an exogenous variable). The asymmetry linkage expresses the negative and positive variation of 1% in the independent variables on the MOM as dependent variable in both sign and magnitude. The asymmetry long run is shown in equation (4.5)

$$MOM_t = \alpha_0 + \propto_1 M2_t^+ + \propto_2 M2_t^- \propto_3 IR_t^+ + \propto_4 IR_t^- \propto_5 GE_t^+ + \propto_6 GE_t^- \propto_7 TX_t^+ + \propto_8 TX_t^- \propto_9 GOEFE_t^+ + \propto_{10} GOEFE_t^- + \propto_{11} POLE_t^+ + \propto_{12} POLE_t^- + \varepsilon_t \quad (4.5)$$

Where the long run parameters are shown through the vector $\propto = (\propto_0 + \propto_1 + \propto_2 + \ldots \propto_{12})$ for each independent variable increase (iv_t^+) and decrease () as follows:

$$iv_t^+ = \begin{cases} \Delta iv_{it} & if \Delta iv_{it} > 0 \\ 0 & \text{otherwise} \end{cases} \quad (4.6)$$

An

$$iv_t^- = \begin{cases} \Delta iv_{it} \text{ if } \Delta iv_{it} < 0 \\ 0 \text{ otherwise} \end{cases} \quad (4.7)$$

The long run linkage between MOM and the increase in M2, IR, GE, TX, GOEFE, and POLE are shown respectively through $\propto_1, \propto_3, \propto_5, \propto_7, \propto_9$ and $\propto_{11}$,while $\propto_2, \propto_4, \propto_6, \propto_8, \propto_{10}$, and $\propto_{12}$ are represent the decrease effects. While results from ARDL model show no evidence of long run asymmetric, the NARDL model is accurately employed to capture the asymmetric long run relationship. From equation (4.5), the NARDL setting can be shown as follows:

$$\Delta MOM_t = \alpha + \beta_0 MOM_{t-1} + \beta_1 M2^+_{t-1} + \beta_2 M2^-_{t-1} + \beta_3 IR^+_{t-1} + \beta_4 IR^-_{t-1} + \beta_5 GE^+_{t-1} \beta_6 GE^-_{t-1} + \beta_7 TX^+_{t-1} + \beta_8 TX^-_{t-1} + \beta_9 GOEFE^+_{t-1} + \beta_{10} GOEFE^-_{t-1} + \beta_{11} POLE^+_{t-1} + \beta_{12} POLE^-_{t-1} + \sum_{i=1}^{m} \lambda_i \Delta MOM_{t-i} + \sum_{i=1}^{n} (\gamma_i^+ M2^+_{t-1} + \gamma_i^- M2^-_{t-1}) + \sum_{i=1}^{p} (\theta_i^+ IR^+_{t-1} + \theta_i^- IR^-_{t-1}) + + \sum_{i=1}^{q} (\delta_i^+ GE^+_{t-1} + \delta_i^- GE^-_{t-1}) + \sum_{i=1}^{S} (\varphi_i^+ TX^+_{t-1} + \phi_i^- TX^-_{t-1}) + \sum_{i=1}^{w} (\xi_i^+ GOEFE^+_{t-1} + \xi_i^- GOEFE^-_{t-1}) + \sum_{i=1}^{Z} (\psi_i^+ POLE^+_{t-1} + \psi_i^- POLE^-_{t-1}) + u_t \quad (4.8)$$

The variables indicated in equation (4.5) represent the lag order: m,n,p,q,s,w, and z. while $\propto_1 = \beta_1/\beta_0, \alpha_3 = \beta_3/\beta_0, \alpha_5 = \beta_5/\beta_0, \alpha_7 = \beta_7/\beta_0, \alpha_9 = \beta_9/\beta_0, \propto_{11} = \frac{\beta_{11}}{\beta_b}$ represents respectively the long-run asymmetric coefficients of increase in M2, IR, GE, TX, GOEFE, and POLE on MOM. Correspondingly, $\propto_2 = \beta_2/\beta_0, \alpha_4 = \beta_4/\beta_0, \alpha_6 = \beta_6/\beta_0, \alpha_8 = \beta_8/\beta_0, \alpha_{10} = \beta_{10}/\beta_0, \propto_{12} = \beta_{12}/\beta_0$ depict the long-run asymmetric coefficients of the decrease in M2, IR, GE, TX, GOEFE, and POLE on MOM that supervise SME. While $\sum_{i=1}^{n} \gamma_i^+, \sum_{i=1}^{p} \theta_i^+, \sum_{i=1}^{q} \delta_i^+, \sum_{i=1}^{s} \varphi_i^+, \sum_{i=1}^{u} \xi_i^+, \sum_{i=1}^{z} \psi_i^+$ capture the short-run asymmetric impact on the MOM, the $\sum_{i=1}^{n} \gamma_i^-$, $\sum_{i=1}^{p} \theta_i^-, \sum_{i=1}^{q} \delta_i^-, \sum_{i=1}^{s} \varphi_i^-, \sum_{i=1}^{u} \xi_i^-, \sum_{i=1}^{z} \psi_i^-$ represent the short-run asymmetric impact of the decrease in the variables respectively. Besides the equation (4.5) that represent the asymmetric of the long-run relation, Equation (4.8) depicts the asymmetric impact of both long and short run on MOM. The unit root test is employed to know the order of integration of the variables because the nonlinear ARDL can apply regardless of I(0) or I(1) but the presence of I(2) variables can affect the estimate significantly (Ibrahim 2015). The general to specific method are applied in the basic model to exclude the insignificant lag until significant results are obtained. Consequently, the

bound-testing approach is employed to examine the long-run relation. If the long run relationship exists (cointegration relation), the WALD F-test for long run asymmetric is applied to test if the difference in the asymmetric coefficient is statistically significant or not. The null hypothesis of Wald test is known as $-\propto_1 = -\propto_2 = -\propto_3 = -\propto_4 = -\propto_5 = -\propto_6 = -\propto_7 = -\propto_8 = -\propto_9 = -\propto_{10} = -\propto_{11} = -\propto_{12}$. The rejection of the null hypothesis means that the long run asymmetric exists (the magnitude of the change in the dependent variable is when the independent variable increase is not the same as when the independent variable decrease. Lastly, the study applies the long- and short- run asymmetries in the relations between the MOM (supervise the SME) and the variables of interests. The asymmetric cumulative multiplier impact of 1 % can be shown as follows (Ibrahim 2015):

$$m_{in}^{+} = \sum_{i=1}^{n} \frac{\partial y_{t+i}}{\partial iv_{it-1}^{+}} (n = 0,1,2, \dots.) \; ; n \to \infty, m_{in}^{+} \to \propto_{n}^{+} \tag{4.9}$$

$$m_{in}^{-} = \sum_{i=1}^{n} \frac{\partial y_{t+i}}{\partial iv_{it-1}^{-}} (n = 0,1,2, \dots.) \; ; n \to \infty, m_{in}^{-} \to \propto_{n}^{-} \tag{4.10}$$

The estimation of the NARDL equation (4.8) is shown in table (4.2.). These results explores the short and long-run impact of positive and negative changes of the sample independent variables on the dependent variable (MOM) , we note that the estimated coefficients related to the short-term positive change in GOEFE are highly significant at the 1% and 5% significant levels for Kuwait, Oman, Qatar and Tunisia while negative changes in GOEFE are significantly seen in Jordon, Qatar and United Arab Emirate. For POLE, the significance of the short-term positive changes coefficients are noticed in Kuwait, Oman and Tunisia while negative changes of POLE are found only in Kuwait and Saudi Arabia. Significance of short-term positive

change on M2 is only found in Egypt while positive and negative changes are seen in Lebanon. Significant positive changes of the short-term IR are seen in Bahrain, Egypt, Kuwait, Qatar and Saudi Arabia. For the government expenditure (GE), Significance positive changes are reported in Bahrain, Qatar, Tunisia while negative change is only seen in Morocco. For the tax revenue (TX), significant positive changes are seen in Bahrain and Oman while Morocco witnesses negative change impact for tax revenue.

For the long-run impact, GOEFE are significantly seen in positive and negative changes in Kuwait while negative changes are seen in both Qatar and Tunisia. POLE positive and negative changes are seen in Qatar. Positive change only is significantly found in Saudi Arabia, while negative change appears significantly in Morocco. For the monetary supply variable (M2), positive changes are evidently significant in Morocco and Kuwait. Interest rate has proven to have significantly positive changes in Egypt, Israel, Jordan, and Qatar, while Kuwait and Israel have significantly negative changes. The government expenditure variable appears to be significant for the negative change in Kuwait. In regards to tax revenue, it is significant for the positive changes in Jordan, Qatar and Morocco, and for the negative changes in Qatar and Kuwait.

Results of bound test in table (4.3) show a nonlinear long run relationship between the dependent (MOM) and assigned independent variables for each country. Based on the significance of F-test results, the six variables, that is, GOEFE, POLE, M2, IR, GE, and TX move together in the long run. With these results, we can determine the effect of the momentum investing strategy

that supervise the market efficiency dynamics and their relation to positive and negative changes in the explanatory variables.

Results of table (4.4) provides Wald test for the analysis of long and short-run asymmetric of MEV besides economic political uncertainty (POLE) and transparency (GOEFE). The null hypothesis of symmetry in both the long and short run against the alternative of asymmetric provides mixed results.

Regarding asymmetry in the short run, the null hypothesis of asymmetry is rejected for the short-term interest rate variable (IR) in Egypt and Israel. For the transparency variable (GOEFE), the asymmetric impact is significantly seen in Tunisia while Lebanon asymmetrically affected by money supply (M2) indicator. Oman is the only country that has significant asymmetric impact for the government expenditure variable.

The null hypothesis for the long-run asymmetry is rejected in Egypt, Jordan, Kuwait, Qatar and the UAE for the interest rate variable. Significant results are shown through the tax revenue variable in Jordan, Kuwait, Qatar, and Morocco. For M2, Qatar and Kuwait possess significant long-run asymmetric results. Significant impacts appear in Qatar for the POLE variable, in Kuwait for GOEFE, and in Tunisia for GE.

The asymmetric cumulative multiplier impact confirm that momentum investing strategy are related in a nonlinear manner to macroeconomic fundamentals such as MEV and economic policy uncertainty and transparency. The response is highly sensitive to whether the changes in macroeconomic variables are positive or negative. In reference to Figure 4.3, we can infer that momentum portrays a high sensitivity to positive and negative shocks in short-term impacts of the monetary policy in Egypt and

Israel (through interest rate) and in Lebanon (through money supply). It is evident that the momentum investing strategy reacts instantly to negative and positive shocks in short-term GOEFE in Tunisia, and in short-run GE in Oman. It may be evident that countries have reactions to the variables, however not all were proven to be statistically significant.

Table 4.2 Nonlinear ARDL estimation

Country	Bahrain	Egypt	Israel	Jordon	Kuwait	Oman	Qatar	UAE	KSA	Tunisia	Lebanon	Morocco
Short-run coefficients												
ΔMOM(-1)				0.297598			0.184517**	-0.111947**	0.25953**			
ΔGOEFE +					-0.170177	0.843529**	1.295031**			-0.781747*		
ΔGOEFE+(-1)					1.076538**	0.764593**						
ΔGOEFE -				0.053988	1.044776		-0.070026	0.046833		0.331327		
ΔGOEFE- (-1)				-0.950827**			0.846608**	0.832374*				
ΔPOLE+					1.058065**	-0.896347**	-0.910415		0.170615	1.070307**		
ΔPOLE +(-1)												
ΔPOLE -					-0.026959				0.372815			-0.419761
ΔPOLE- (-1)					0.842879**				-0.831302**			
ΔM2+		-0.0000025									0.000015	
ΔM2+(-1)		-0.0000028									0.0000339**	
ΔM2+(-2)		-0.000397**										
ΔM2-	-0.000107										6.39E-08	
ΔM2- (-1)											-0.0000115**	
ΔIR+	0.107346**	0.097265	0.041445	-0.042802	0.023107		-0.108408		-0.163494**			
ΔIR+ (-1)		0.140068***			-0.057833**		0.242695*					
ΔIR+ (-2)												
ΔIR+ (-3)												
ΔIR-		-0.069992	-0.10227			0.017569						-0.006891
ΔIR- (-1)						0.026487						-0.011949
ΔGE+	0.047649**					-0.020942	-0.040405*			0.033295*		
ΔGE+(-1)										0.032511*		
ΔGE-						0.010234						
ΔGE-(-1)						0.008724						0.023496**
ΔTX+	-0.02467**					0.340167**						
ΔTX+ (-1)												
ΔTXt-										-0.142376		-0.049267**
ΔTXt-(-1)										-0.123461		
Long-run coefficients												
MOMt-1	-0.924718**	-0.879106	-0.960641**	-1.21836**	-1.070674**	-0.856952**	-1.11197**	-0.80578**	-0.933786**	-1.090062**	-0.814636**	-0.916193**
GOEFE+(-1)	0.072271		0.002382	0.102901	0.601832**	0.11799	-0.054229	-0.002367	0.164076	-0.050832	0.15582	0.195545
GOEFE-(-1)	-0.14856		0.125109	-0.080016	-0.807909**	-0.078672	-0.409348**	-0.223285	-0.033508	-0.195548*	-0.154281	-0.401125
POLE+(-1)	-0.019478		0.0269	0.040378	-0.236488	0.089818	0.967828**	0.007576	-0.214303*	0.01433	-0.09629	-0.08877
POLE-(-1)	-0.030494		-0.031489	-0.140701	0.113249	0.156414	-0.196669*	-0.027906	-0.005525	-0.00925	-0.009044	0.435285**
M2+(-1)	0.0000038	1.65E-07	7.11E-08	-2.27E-06	-0.000013**	-0.0000195	0.000000664	-1.47E-07	-2.28E-07	-1.38E-06	9.47E-07	-0.00459*
M2-(-1)	0.0000127	0.00000242	-1.79E-06	-3.85E-06	0.000016	-0.0000322	-0.0000135	4.98E-08	5.51E-07	-0.0000005	0.00000317	-0.0009
IR+(-1)	0.012478	0.053908***	-0.037732**	0.079011**	0.006402	0.004843	0.073897**	**0.016367	0.026344	0.010374	0.000767	0.001628
IR-(-1)	-0.00697	0.023037	-0.030737**	0.018196	0.026177**	-0.002969	-0.005896	-0.003952	0.014167	-0.022579	0.002544	0.002247
GE+(-1)	0.011906	0.002924	-0.074952	-0.006233	0.005815**	0.004242	0.007296	0.024246	0.010744	-0.0065	0.00549	-0.002018
GE-(-1)	-0.002642	0.003675	0.029961	-0.001702	-0.004654	-0.003028	-0.005048	0.060794	-0.024287	0.019696	0.002666	0.001136
TX+(-1)	-0.007403	0.016725	0.039164	-0.044769**	-0.073452	-0.024961	-0.043859**		0.003704	0.003929	-0.010453	0.01971**
TX-(-1)	0.004993	0.01276	-0.009332	0.00883	0.360223**	0.010207	0.051201**		-0.015546	0.071486	0.007988	-0.012169

***, **, and *, denote significance level at 1%, 5% and 10%.

Table 4.3 Nonlinear ARDL bounds test results

Country	Bahrain	Egypt	Israel	Jordon	Kuwait	Oman	Qatar	UAE	KSA	Tunisia	Lebanon	Morocco
F-Statistics	11.45769***	15.0878***	11.80448***	8.541611***	15.06724**	8.223864***	8.908078***	5.308196***	8.310258***	11.81078***	9.823794***	10.67542***
cointegration	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 4.4 Wald test of long and short-run asymmetry

Country/variables		Bahrain	Egypt	Israel	Jordon	Kuwait	Oman	Qatar	UAE	KSA	Tunisia	Lebanon	Morocco
Long-run asymmetry	GOEFE	0.821785		0.322558	0.346449	10.81420**	0.580123	1.060014	0.724892	0.823977	0.502874	1.018808	2.026837
	POLE	0.011593		0.064675	1.829520	1.776528	0.069765	4.920191**	0.052963	1.006783	0.016544	0.978769	2.073140
	M2	0.407847	2.589989	1.170857	0.064443	5.115659**	0.327323	4.402250**	0.762750	1.403003	0.007467	0.262388	1.605629
	IR	1.202683	2.740775*	0.176282	5.764999**	7.989079**	0.562659	4.235521**	5.876718**	0.596491	1.411901	0.774811	0.013276
	GE	0.006413	0.006842	1.590579	0.149201	2.345990	0.695133	0.405353	0.221923	1.221304	3.367949**	0.134008	0.178744
	TX	2.031569	0.014227	0.337348	5.502753**	10.25634**	0.124604	9.970424**		0.866203	1.847092	1.515149	5.928409**
Short-run asymmetry	GOEFE					0.017200		0.423916			4.077693**		
	POLE					0.114984				1.364454			
	M2											11.65640***	
	IR		8.446358***	3.477936**									
	GE						5.540177**						
	TX												

F-statistic is reported for the long and short-run symmetry which tests the null hypothesis of for each explanatory. *, ** and *** indicate rejection of the null hypothesis of symmetry at the 10%, 5% and 1% levels, respectively.

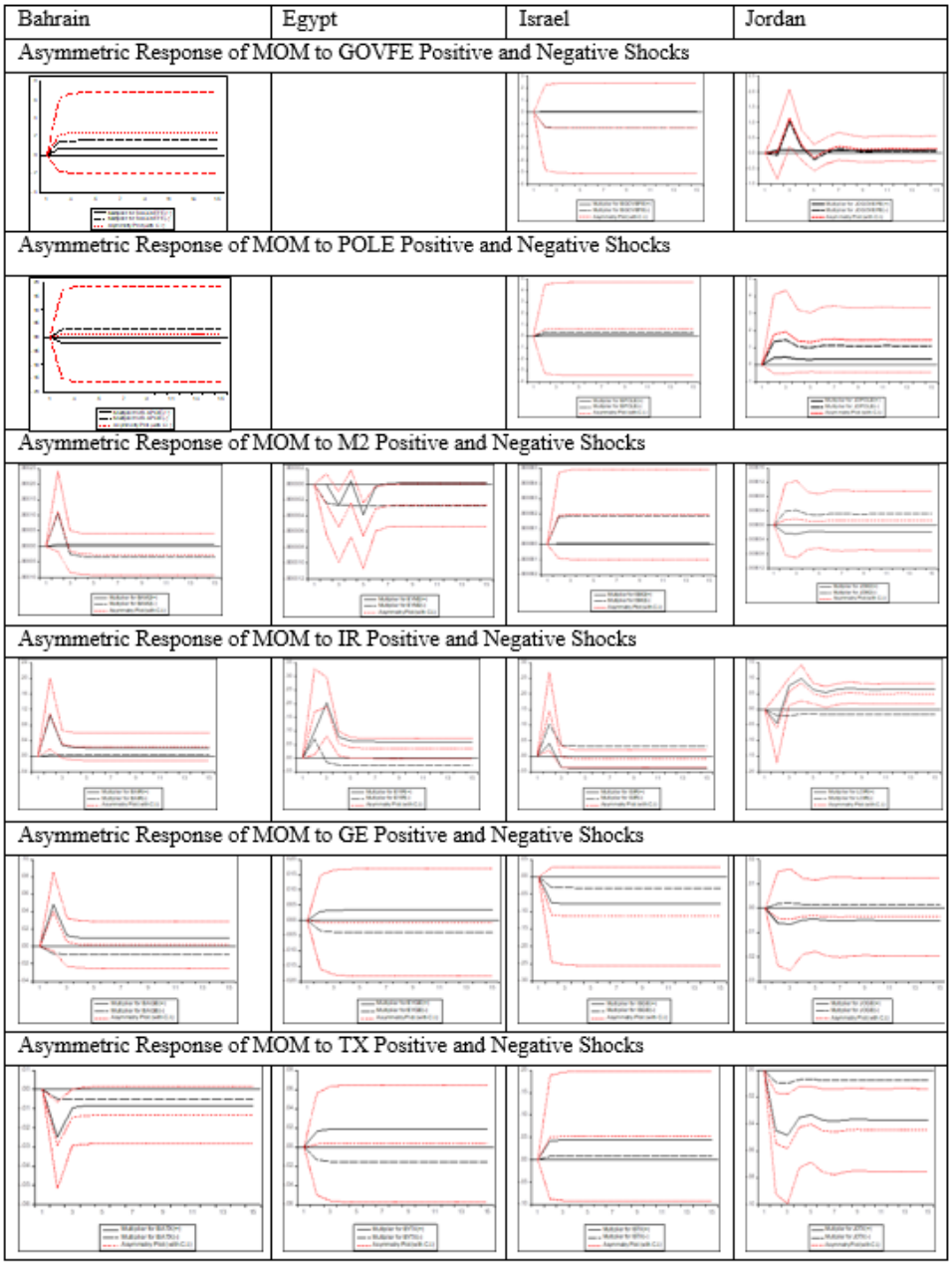

Figure 4.3 Asymmetric Dynamic Multiplier impacts, Panel (A)

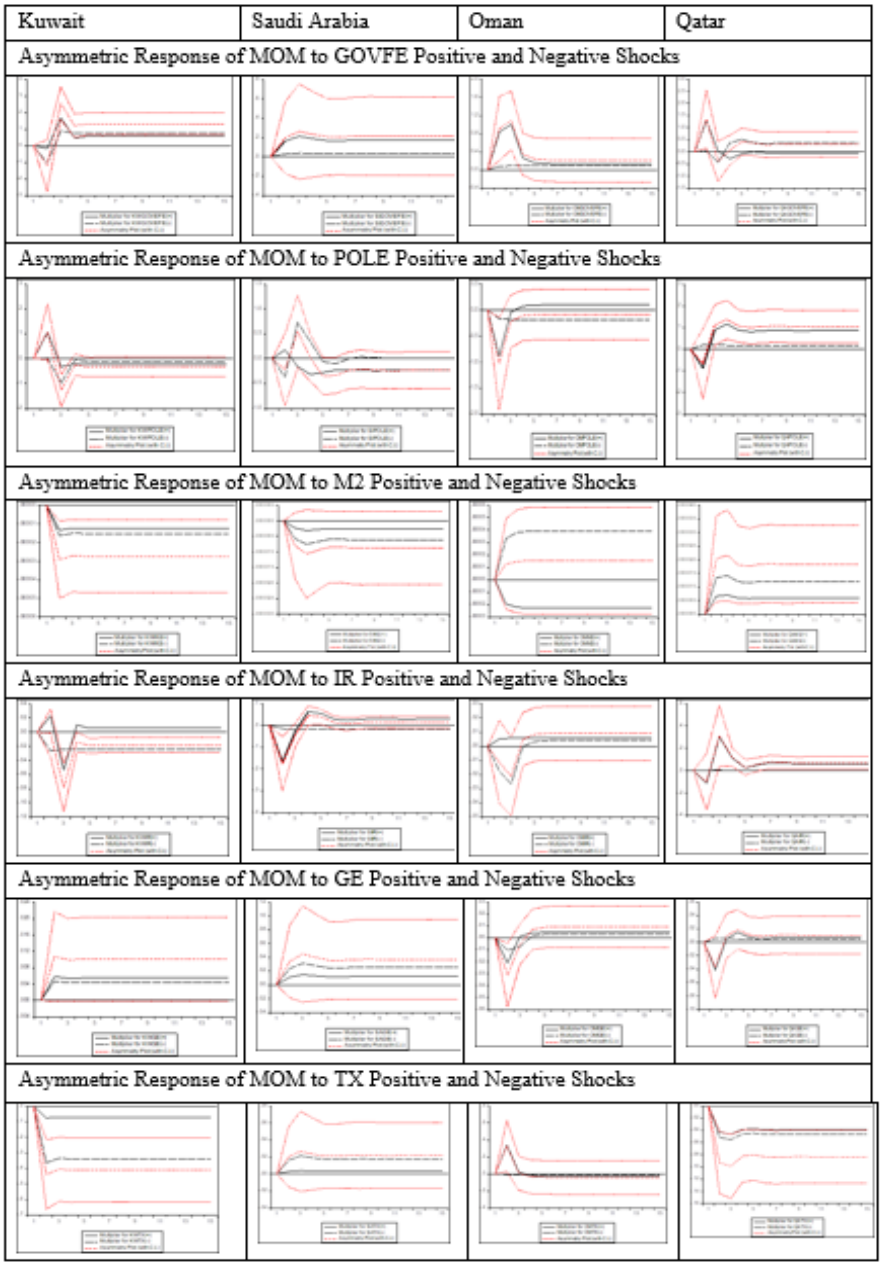

Figure 4.3 Asymmetric Dynamic Multiplier impacts, Panel (B),

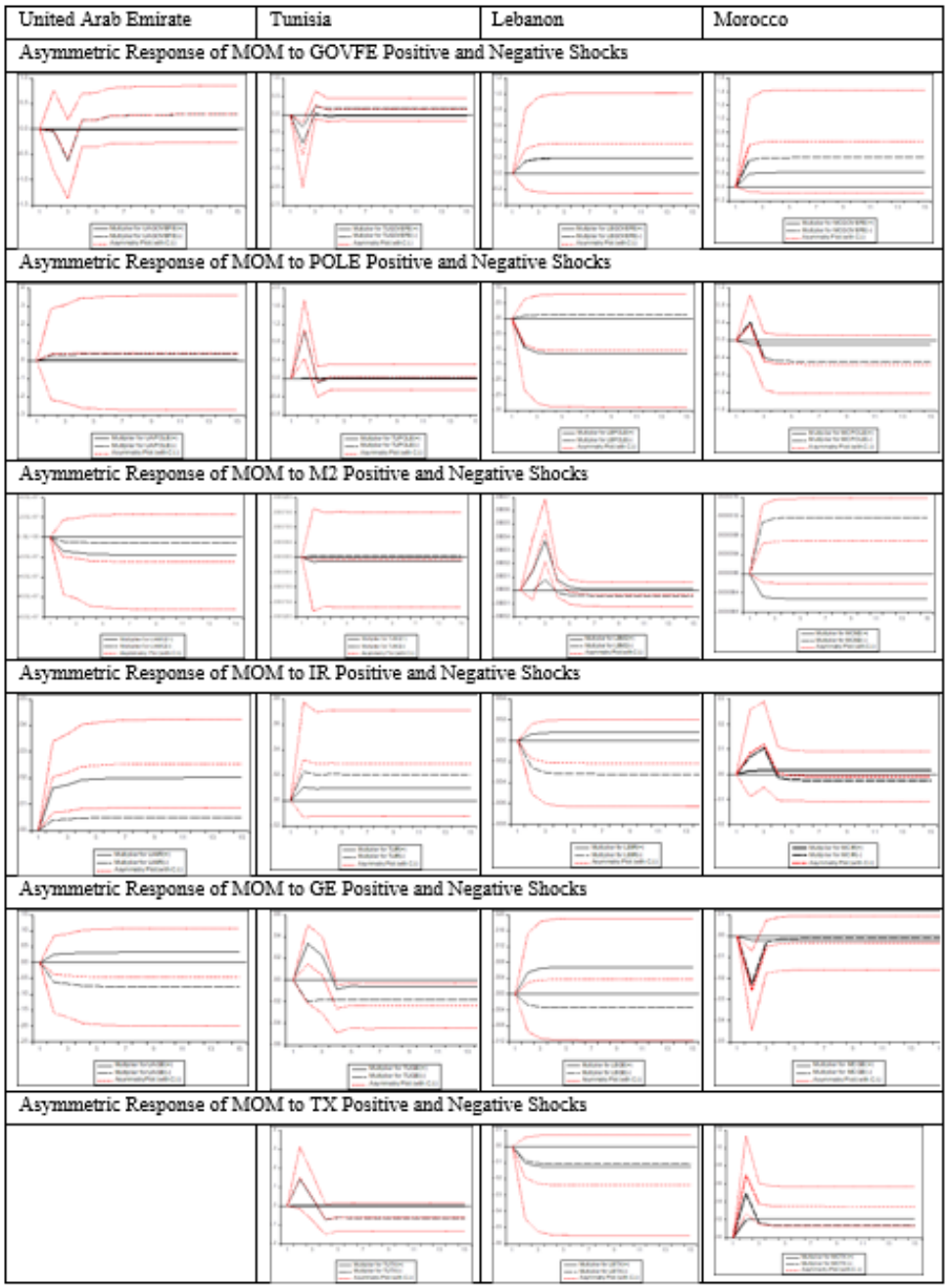

Figure 4.3 Asymmetric Dynamic Multiplier impacts, Panel (C)

4.4 Conclusion

The study uses the structural approach to investigate the impact of the macroeconomic variables, the transparency and the economic policy uncertainty variable on the momentum investing strategy which reflects the efficiency of the market in MENA countries. During the period before the breaking point, Bahrain, and Morocco reflect improvement in the efficient market with significant tax revenue (TX), and the political stability estimate (POLE), while Egypt, Qatar and Morocco are less efficient with the government expenditure (GE) and interest rate (IR) as significant variables. Markets of Egypt, Qatar and Morocco are shown to improve efficiency in terms of the significant interest rate (IR), tax revenue (TX), and government effectiveness (GOEF) after the break year. On the other hand, Egypt, Jordan and Kuwait reflect a lowered market efficiency with the significant variables being interest rate (IR) and the political stability estimate (POLE).

The transparency variable shows a significant impact only in Egypt and the political stability estimate appears significant in Kuwait and Morocco. This result is similar to Abdmoulah (2010). Economic reforms in the MENA sought to enhance transparency had little effect on the market efficiency which is reflected in all the MENA countries studied except Egypt. Further reforms in the MENA region are recommended.

Results of Wald test short-run asymmetric show that monetary policy instruments have a more asymmetric impact than fiscal policy in the short-run effects in Egypt, Israel and Lebanon while the fiscal policy shows asymmetric impact in Oman through the government expenditure. The Wald test shows that the monetary policy has a more long-run asymmetric impact

in Kuwait, Qatar, Egypt Jordan and the UAE than in the short-run impact. The same is to be said in regards to the fiscal policy, which shows more long-run asymmetric impacts in Jordan, Kuwait, Qatar, Tunisia, and Morocco. Asymmetric cumulative multiplier is employed to investigate the immediate impact of positive and negative changes in the MEV, transparency, and economic policy uncertainty on momentum investing strategy. Egypt and Israel show high sensitivity of the change in the short-term interest rate while Lebanon respond to the money supply instrument and government expenditure (GE) for Oman. Transparency variable is instantly reacted to in Tunisia during the short-term period.

Conclusions

This section illustrates the findings of the dissertation, its primary contributions, the policy implications/recommendations, and highlights the limitations of the study.

Stock market efficiency is one of the most important topics in any economy. Investors study market efficiency using different strategies to increase their gain and beat the market as much as possible. If market participants can develop profitable trading rules, then the market will be inefficient, and the stock market will not play an effective role directing the financial resources to the most productive sectors of the economy. Investors cannot earn abnormal profit by predicting future stock market behaviour if the market is efficient and all the relevant information is known concerning the changes in macroeconomic variables that are fully reflected in current stock prices. In an efficient market, past (current) is not valuable in forecasting current (future) stock prices.

Stock market efficiency in the MENA region faces many challenges such as poor liquidity, political instability, and thin trading. These markets have been subject to reform in recent years to improve performance and efficiency. Researchers investigated the interrelations and the dependencies of the macroeconomic variables (MEV) on stock returns. In addition, other significant relationships highlighted by the literature related stock prices to economic policy (EP) uncertainty and transparency.

This dissertation empirically tested for the existence of the efficiency of the stock market in the Middle East and North African (MENA) countries, Saudi

Arabia, the UAE (Dubai, Abou Dhabi), Bahrain, Qatar, Oman, Kuwait, Egypt, Palestine, Israel, Tunisia, Morocco, Syria and Lebanon. Using structural vector autoregression (SVAR), variance decomposition, and impulse response function are developed to study the reaction of the dynamic system in response to some external change (shocks), we test the impact of MEV on stock market returns in the selected MENA countries. We employ the structural approach to examine the impact of the macroeconomic variables on stock market efficiency as measured through momentum strategies.

The first part of the study in chapter 1 measured the stock market efficiency in different strategies following Griffin et al.'s (2010) framework to test the efficiency of stock markets. The measure of trading strategy is tested through momentum and short-term reversal strategies while delay, autocorrelation and variance ratio tests are used to test the traditional measures.

The study results conclude that both momentum and short-term reversal strategy in stock and portfolio levels yield weak form efficiencies in the MENA countries. Nine of the MENA countries showed the effectiveness of the delay strategy in firm-level analysis. While autocorrelation at a firm-level shows a weak form efficiency, except Oman, where variance ratio analysis found inefficiency in all MENA countries. The weak form efficiency was shown in both autocorrelation and variance ratio analysis. The results align with past literature, where using STATA software by programming new commands in the first part of this study was novel.

The second part of the study showed the most important variables that significantly affect stock returns. The study showed the impact of monetary and fiscal policy, economic policy uncertainty and transparency variables on

the stock returns in MENA countries. Results show that the transparency indicator has the greatest impact on stock returns in the short and long run in Qatar, the UAE and Lebanon, while economic policy uncertainty has the greatest impact on the short-run in Egypt. Also, the economic policy uncertainty indicator plays an important role in the long run in Morocco and Jordon. Monetary policy has a significant impact of money supply instrument on stock returns in the short run in Kuwait and in Saudi Arabia for both horizons. The other instrument for the monetary policy, interest rate, shows a most significant contribution in the long run in Egypt, Kuwait, and Oman, while it has the greatest impact on the short-run in Oman and Morocco. The fiscal policy contributes through the government expenditure that has a great contribution in the short and long-run in both Israel and Tunisia while the tax revenue has a great impact in the short and long-run in Bahrain and in the short-run in Egypt, Jordon, Lebanon, and Morocco. These results conclude significant implications for policymakers to adopt proper policies based on the country's conditions.

The second study results offer an important indication that is worthwhile to academics, researchers, investors, and market regulators to consider the most important variables that affect stock returns in the selected MENA countries. Policymakers who aim to increase the performance of financial markets, especially stock market efficiency, should put more weight on the variables that have the most significant impact on stock returns. The weakness of this part is related to data preparation that is a time-intensive and sensitive process. Macroeconomic variables in the MENA countries require some manipulation. The methodology used in this part is on a monthly basis, and it was difficult to find monthly data for the MEV (independent variables). We used a

converter high-frequency mechanism to transfer high frequencies (annual) to low frequencies (monthly) using EVeiws software to unify the monthly frequencies data. Future studies may consider this issue by taking quarterly data from MEV and should as well use the stock return variable every quarter.

The third part of the study applied the structural break approach developed by Bai-Perron (1975). Multiple breakpoints are examined for the efficiency of stock exchanges as measured in chapter (2) through the momentum investing strategy monthly from 2004 to 2019 to investigate the impact of MEV used in chapter 3 on the SME before and after the breaks/reforms. We investigated the drives that led to this break in the efficiency indicator determined by the momentum strategy.

The analysis uses the structural approach to identify the impact of the macroeconomic variables, including the monetary and fiscal policy, transparency, and the economic policy uncertainty variable on the momentum investing strategy which reflects the market efficiency in the MENA region. The study finds that tax revenue and the political stability estimate reflect a more efficient market in Bahrain and Morocco before the breaking point. Markets are less efficient due to the significant variables of government expenditure and interest rate in Morocco, Qatar, and Egypt before the break year. Significant interest rate, tax revenue, and transparency imply a more efficient market in Morocco, Egypt and Qatar after the breaking point. On the contrary, interest rate and the political stability estimate reflect a lower market efficiency after the break year in Egypt, Kuwait, and Jordan.

Results of Wald test short-run asymmetric show that monetary policy instruments has more asymmetric impact than fiscal policy in the short-run

effects in Egypt, Israel and Lebanon while the fiscal policy shows asymmetric impact in Oman through the government expenditure. The Wald test also shows that the monetary policy has a more long-run asymmetric impact in Kuwait, Qatar, Egypt Jordan and the UAE than in the short-run impact. The same is to be said in regards to the fiscal policy, which shows more long-run asymmetric impacts in Jordan, Kuwait, Qatar, Tunisia, and Morocco.

Future Research

The methodology used in Chapter 3 is on a monthly basis, and it was difficult to find monthly data for the MEV (independent variables). Future studies may consider this issue by taking quarterly data from MEV and should as well use the stock return variable every quarter.

Using Bai-Perron (1975) approach to find multiple break months in the market efficiency do not reflect all reforms found in the MENA region. Future studies may investigate specifically the reason behind the break appeared in the efficiency measure and policymaker should carefully take into account this effect on SME.

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Appendices

Appendix A: ADF and PP stationarity tests

Variable	Stationary test	Bahrain				Egypt			
		ADF		PP		ADF		PP	
		Without trend	Trend and intercept	Without trend	Trend and intercept	Without trend	Trend and intercept	Without trend	Trend and intercept
RI	level	-7.09**	-7.09**	-9.27**	-9.27**	-11.09**	-11.25**	-11.16**	-11.34**
	1st Diff.	---	---	---	---	---	---	---	---
GOVEFE	level	-2.49	-2.65	-1.57	-1.53	-1.70	-0.78	-1.33	-0.07
	1st Diff.	-5.5**I(2)	-5.4**I(2)	-8.66**	-8.68	-12.1**I(2)	-12.1**I(2)	-6.85**	-7.63**
POLE	level	-1.91	-1.01	-2.27	-1.09	-1.64	-1.13	-1.15	-0.87
	1st Diff.	-7.27**I(2)	-7.25**I2)	-10.29**	-10.53**	-6.7**I(2)	-6.7**I(2)	-10.15**	-10.18**
M2	level	-0.91	-1.35	-0.90	-1.43	2.16	-2.49	2.12	-2.49**
	1st Diff.	-15.53**	-15.52**	-15.42**	-15.42**	-13.52**	-13.90**	-13.56**	-13.90**
IR	level	-2.11	-1.40	-2.23	-1.11	-3.23**	-3.84**	-2.79	-3.40
	1st Diff.	-3.22**	-3.65**	-6.70**	-6.85**	---	---	---	-1.47**
GE	level	-1.47	0.21	-1.35	-0.14	0.09	-1.04	0.26	0.92
	1st Diff.	-3.64**	-4.18**	-9.79**	-10.06**	-3.27**	-3.35	-8.99**	-9.24**
TX	level	-1.24	-2.30	-1.53	-2.54	-1.31	-1.75	-1.78	-1.90
	1st Diff.	-4.79**	-4.78**	-10.32**	-10.31**	-3.99**	-3.97**	-10.78**	-10.76

Note: ** denote significance at 5 percent

Variable	Stationary test	Israel				Jordan			
		ADF		PP		ADF		PP	
		Without trend	Trend and intercept	Without trend	Trend and intercept	Without trend	Trend and intercept	Without trend	Trend and intercept
RI	level	-10.87**	-10.85**	-11.18**	-11.16**	-11.09**	-11.25**	-11.16**	-11.34**
	1st Diff.	---	---	---	---	---	---	---	---
GOVEFE	level	-2.44	-2.74	-2.29	-2.76	-1.44	-1.50	-1.78	-2.29
	1st Diff.	-3.82**	-3.81**	-10.57**	-10.60**	-3.19**	-5.3**I(2)	-9.39**	-9.44**
POLE	level	-0.19	-2.05	-0.75	-2.05	-0.84	-0.75	-3.29	-3.25
	1st Diff.	-3.73**	-3.87**	-10.45**	-10.46**	-4.62**	-4.61**	-10.11**	-10.23**
M2	level	2.16	-2.49	2.12	-2.49	-1.88	-0.51	-1.91	-0.51
	1st Diff.	-13.52**	-13.90**	-13.56**	-13.90**	-12.82**	-13.05**	-12.84**	-13.05**
IR	level	-1.29	-2.41	-1.12	-2.21	-3.15**	-4.10**	-3.45**	-3.55**
	1st Diff.	-10.92**	-10.90**	-10.87**	-10.85**	---	---	---	---
GE	level	-1.63	-2.31	-1.34	-1.54	-3.09**	-1.62	-2.42	-3.64
	1st Diff.	-3.98**	-4.02**	-9.19**	-9.22**	---	---	---	---
TX	level	-1.85	-2.17	-1.42	-1.76	-3.63**	-2.40	-2.29	-1.60
	1st Diff.	-5.49**	-5.48**	-9.75**	-9.73**	---	---	---	---

Note: ** denote significance at 5 percent

Variable	Stationary test	Kuwait				Oman			
		ADF		PP		ADF		PP	
		Without trend	Trend and intercept	Without trend	Trend and intercept	Without trend	Trend and intercept	Without trend	Trend and intercept
RI	level	-15.42**	-15.40**	-15.42**	-15.40**	-6.15**	-10.68**	-10.53**	-11.13**
	1st Diff.	---	---	---	---	---	---	---	---
GOVEFE	level	-1.94	-2.38	-1.64	-1.86	-1.47	-1.08	-2.38	-2.02
	1st Diff.	-5.78**	-5.79**	-10.12**	-10.13**	-3.72**	-3.87**	-10.69**	-10.84**
POLE	level	-1.16	-2.06	-1.40	-1.70	-2.24	-2.18	-1.87	-1.69
	1st Diff.	-4.56**	-4.54**	-10.51**	-10.50**	-3.83**	-3.90**	-9.00**	-9.08**
M2	level	-1.67	-1.04	-1.89	-0.81	-0.01	-2.44	0.02	-2.35
	1st Diff.	-14.53**	-14.66**	-14.57**	-14.82**	-15.59**	-15.55**	-15.62**	-15.58**
IR	level	-1.45	-1.98	-1.77	-2.120	-1.80	-1.86	-1.74	-1.78
	1st Diff.	-7.32**	-7.28**	-8.33**	-8.30**	-10.51**	-10.49**	-10.54**	-10.52**
GE	level	1.64	0.31	1.56	-1.04	-0.52	-2.71	-1.64	-3.52**
	1st Diff.	-2.79**	-3.82**	-9.90**	-10.58**	-4.95**	-4.98**	-11.00**	---
TX	level	0.67	0.52	3.18	0.23	-1.17	-1.90	-1.77	-2.64
	1st Diff.	-4.89**I(2)	-4.88**I(2)	-4.69**	-9.03**	-4.48**	-4.47**	-11.04**	-11.02**

Note: ** denote significance at 5 percent

Variable	Stationary Test	Qatar				United Arab Emirate			
		ADF		PP		ADF		PP	
		Without Trend	Trend And Intercept	Without Trend	Trend And Intercept	Without Trend	Trend And Intercept	Without Trend	Trend And Intercept
RI	level	-12.65**	-12.65**	-12.65**	-12.65**	-6.76**	-6.79**	-11.98**	-12.01**
	1st Diff.	---	---	---	---	---	---	---	---
GOVEFE	level	-2.05	-1.53	-1.73	-1.753	-2.05	-0.87	-1.53	-1.44
	1st Diff.	-4.76**	-4.98**	-10.44**	-10.43**	-4.57**	-4.93**	-10.42**	-10.51**
POLE	level	-1.12	-1.67	-0.73	-1.27	-1.01	-2.29	-2.02	-2.80
	1st Diff.	-4.13**	-4.14**	-9.56**	-9.57**	-4.31**	-4.33**	-11.10**	-11.08**
M2	level	-0.39	-2.29	-0.20	-2.014	-0.96	-1.28	-0.89	-1.67
	1st Diff.	-5.80**	-5.79**	-15.09**	-15.06**	-12.21**	-12.21**	-12.40**	-12.39**
IR	level	-1.59	-3.36	-1.67	-3.36	-1.35	-2.06	-1.43	-2.10
	1st Diff.	-8.39**	-8.98**	-8.34**	-8.93**	-11.15**	-11.18**	-12.72**	-12.73**
GE	level	-0.79	-1.90	-1.47	-2.58	-1.48	-2.67	-1.21	-2.09
	1st Diff.	-4.44**	-5.84**	-10.93**	-10.92**	-3.87**	-3.87**	-9.16**	-9.16**
TX	level	0.88	-3.39	1.94	-4.79	1.37	1.40	10.28	9.17
	1st Diff.	-3.01**	-3.89**	-6.82**	-8.95**	-14.8**I(2)	-15.1**I(2)	-25.7**I(2)	-26.8**I(2)

Note: ** denote significance at 5 percent

Variable	Stationary test	Saudi Arabia				Tunisia			
		ADF		PP		ADF		PP	
		Without trend	Trend and intercept	Without trend	Trend and intercept	Without trend	Trend and intercept	Without trend	Trend and intercept
RI	level	-12.81**	-12.78**	-12.94**	-12.90**	-10.02**	-10.31**	-10.52**	-10.64**
	1st Diff.	---	---	---	---	---	---	---	---
GOVEFE	level	-2.44	-2.43	-3.35**	-3.33	-2.43	-1.19	-1.95	-0.87
	1st Diff.	-7.07**	-7.06**	-11.16	-11.13	-5.88**	-6.29**	-9.62**	-9.741**
POLE	level	-1.48	-2.09	-1.28	-2.76	-1.66	-1.25	-1.19	-0.33
	1st Diff.	-4.36**	-4.43**	-11.01**	-10.99**	-3.00**	-14.4**I(2)	-6.54**	-6.76**
M2	level	-0.52	-1.23	-0.52	-1.33	3.43	1.59	3.19	0.85
	1st Diff.	-8.61**	-15.56**	-15.61**	-15.55**	-7.3**I(2)	-12.57**	-15.38**	-15.94**
IR	level	-2.17	-2.48	-1.55	-1.73	0.81	0.026	0.65	0.012
	1st Diff.	-6.24**	-6.23**	-6.13**	-6.11**	-12.58**	-12.99**	-12.65**	-12.99**
GE	level	-1.32	-1.77	-1.65	-2.20	-0.98	-1.34	-0.78	-1.94
	1st Diff.	-4.31**	-4.28**	-10.17**	-10.17**	-4.51**	-4.54**	-9.77**	-9.75**
TX	level	-2.64	-3.08	-1.71	-2.33	-2.85	-2.08	-2.54	-1.72
	1st Diff.	-3.36**	-12.1**I(2)	-8.83**	-8.81**	-5.46**	-5.83**	-9.34**	-9.65**

Note: ** denote significance at 5 percent

Variable	Stationary test	Lebanon				Morocco			
		ADF		PP		ADF		PP	
		Without trend	Trend and intercept	Without trend	Trend and intercept	Without trend	Trend and intercept	Without trend	Trend and intercept
RI	level	-12.29**	-12.27**	-12.29**	-12.26**	-12.38**	-12.56**	-12.41**	-12.56**
	1st Diff.	---	---	---	---	---	---	---	---
GOVEFE	level	1.38	-0.83	1.57	-0.21	-2.31	-2.30	-1.99	-2.28
	1st Diff.	-3.73**	-4.11**	-9.06**	-9.57**	-3.71**	-3.73**	-10.28**	-10.33**
POLE	level	-3.53**	-3.41	-3.17**	-2.723468	-1.91	-2.17	-2.49	-3.06
	1st Diff.	---	-3.49**	---	-8.32**	-6.17**	-6.01**	-10.63**	-10.65**
M2	level	-1.3	1.28	-1.25	0.84	1.06	-0.97	1.90	-0.49
	1st Diff.	-7.84**	-8.08**	-8.20**	-8.24**	-9.45**I(2)	-9.43**I(2)	-19.09**	-19.94**
IR	level	-6.07**	-6.08**	-9.26**	-9.24**	-2.12	-3.05	-2.25	-3.32
	1st Diff.	---	---	---	---	-13.64**	-13.61**	-13.64**	-13.61**
GE	level	-1.42	-1.61	-2.13	-2.00	-2.27	-2.26	-2.65	-2.66
	1st Diff.	-4.55**	-4.52**	-9.65**	-9.82**	-5.39**	-5.35**	-8.92**	-8.97**
TX	level	-1.78	-1.89	-2.14	-1.70	-2.53	-2.76	-2.84	-2.93
	1st Diff.	-3.41**	-3.43**	-8.51**	-8.80**	-5.46**	-5.69**	-9.48**	-9.89**

Note: ** denote significance at 5 percent