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Macroeconomic Variables and the Stock Market Index: Empirical Evidence from MENA Countries

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Abstract: Investment, public and private, is vital for sustainable development, profit making, and economic growth. It allows for providing services, securing employment opportunities, enhancing national income, and more production. To provide these financial resources, countries established financial institutions (such as commercial banks) to act as an intermediary between savers and investors. In addition to the lending financial institutions, stock markets have been created as the mechanism through which buying and selling shares take place. These markets provide important data about companies and the stock market price indices. The stock market price index reflects the economic situation and offers related future predictions. Therefore, this paper tries to discover the long-run relation between main macroeconomic variables and the stock market price index, using annual panel data for 10 MENA countries through (2000-2019). Since our data used a small sample and was based on unit root tests which show a mixed of integration order, ARDL model was applied. The results confirm a positive relationship between economic growth, foreign direct investment, and the stock market price index, while negatively affected by inflation, exchange rate, and interest rate. On the other hand, money supply does not have a significant effect. We conclude that the increase of economic growth (GDP) increases individuals' income and their spending, which reduces unemployment and increases firms' profits, thus improving financial markets. Policymakers and regulators can depend on these results for improving the stock market via enhancing positive factors and manipulating the bad effect of some variables on the stock market performance.

Keywords: Stock Market Index, Economic Indicators, Cointegration, ARDL, MENA

JEL Classification: C33, E44, B41, C02, C13

1. Introduction

Financial markets, especially stock markets, have a vital role in improving and enhancing the economic growth and economic development for each nation all over the world through providing investors with the money they need to purchase stocks where this money comes from savers who have extra money. Therefore, stock market serves as a channel for investments and transferring funds from savers to borrowers, and considered as a means for efficient capital allocation among different sectors. Moreover, the capital accumulation of an economy can be based on the stock market. Many studies have been carried out in developed countries and emerging markets in an attempt to examine the association among a group of macroeconomic indicators (e.g. the economic growth, consumer price index, interest rate, monetary policy, exchange rate, and foreign direct investment) and the stock market performance. This relationship has attracted the interest and the attention of an enormous number of researchers and policymakers in these countries (e.g. Maysami et al., 2004; Rahman et al., 2009; Bekhet and Matar, 2013; Kumar et al., 2020).

The analysis results of this paper could provide valuable and beneficial information to the regulatory bodies and policymakers in determining the macroeconomic variables that enchase the stock market performance and adopting regulations and policies which enhance the immunity of the stock markets to severe fluctuations in economy. Immunity has an influence on the confidence of investors in the solidity of economics and good investment decision-making. Determining the economic variables affecting the stock market index is the main problem this paper tackles due to the mixed results obtained from different studies coming from both developed and developing countries. Most studies use a set of factors (e.g., Consumer Price Index, GDP, Oil Price, Exchange Rate, Interest Rate, and Monetary Policy), while few studies use some different variables such as Bank Credit, Total Export, Industrial Production Index, Interest rate, Consumer Price Index, and Monetary Policy. However, not all studies obtain the same results, possibly due to applying different estimation methods, being concerned with different countries or regions, or using different measurements of variables. Therefore, this study tries to answer the following question: What is the relationship between the macroeconomic variables (GDP, Consumer Price Index, Foreign Direct Investment, Exchange Rate, Interest Rate, and Monetary Policy) and the stock market performance for MENA countries?.The effect of the macroeconomic variables on the stock market price index for MENA countries has not been examined in depth and this relationship might not have been efficiently studied in MENA countries. So, the paper comes to fill this gap by studying this relationship and to explore the effect of a set of macroeconomic variables on the stock market performance for the time period (2000-2019) by applying the ARDL approach.

The remainder of this study is structured as follows: Part 2 introduces the literature review, while part 3 provides the sources of data, variables measurement, develops the methodology, and the model of the study; the results of the study are discussed in Part 4, and the last section concludes the results of the study and provides the recommendations for future research.

1. Literature Review

The economic structure of developed economies is positively affected by financial stock exchanges; however, the stock exchange is still going through a stage of emergence and development in most developing

countries. Many studies in both developed and emerging countries are conducted to investigate the relationship between the macroeconomic indicators and the stock market price index. Many studies have used time series data for examining this relationship, while others have used panel data.

Sohail and Hussain (2009) examine the impact of some macroeconomics factors on the stock market index in Pakistan by using monthly data and applying the vector error correction model (VECM). The results report that inflation and the stock market price index are negatively correlated. Eita (2012) examines the effect of macroeconomic indicators on the stock market price index in Namibia based on the percentage of market capitalization to GDP and the overall stock market price index as proxies for the stock prices. The results show a positive relationship between the economic growth, money supply, and the stock market price index, while a negative relationship with inflation and interest rate. Bekhet and Matar (2013) examine the short-and the long-run relationship between the stock market price index and a set of macroeconomic indicators (industrial production, monetary policy, interest rate, and exchange rate). The results based on the ARDEL model confirm such a relation. In a recent study, Panta (2020) uses annual time series data to examine the effect of some macroeconomic indicators on the stock market prices for Nepal. Applying the Auto-regressive distributed lag (ARDL) model, results indicate that the stock market price's long-run volatility is affected by money supply, interest rate, exchange rate, and inflation, while it is positively affected by the GDP, money supply, and exchange rate in the short run, moreover, money supply holds a positive relationship in the long run. In another recent study, Kumar et al. (2020) conclude that the stock market price index is affected by all macroeconomic indicators included in their study in the long and the short run

Regarding the relationship among monetary policy, oil price, and the stock market index, a study by Rahman and Mustafa (2008) examine the above mentioned indicators on the U.S. stock market (S&P500) using monthly data. To do so, the authors apply two statistical techniques: the cointegrating test and the vector error-correction model. They conclude that the long-run relationship does not exist in the model, but the short-run one does. It also shows that the past stock price volatility has a positive effect on the current volatility, while monetary policy and oil prices have a negative impact on the U.S. stock market. Giri and Joshi (2017) confirm that the economic growth, inflation, and exchange rate have a positive relationship with the stock market prices index, while the stock market price index and oil prices are negatively correlated. A recent study by Demir (2019) examines the effect of a set of macroeconomic indicators on the stock market index volatility in Turkey. The results report that the economic growth, exchange rate, portfolio investment, and foreign direct investment have a positive relationship with the shock market index, while a negative relationship with interest rate and oil prices. Khalid and Khan (2017) conclude that inflation and exchange rate have a positive effect on the stock market index, while a negative relationship with interest. Khan and Khan (2018) examine the effect of a set of macroeconomic indicators on the stock market price index in Pakistan through (2016-2020). They report that exchange rate and interest rate have a negative effect on the stock market index, while a positive effect with money supply.

Maghayereh (2003) explores the relationship between a set of macroeconomic factors and the stock market index in Jordan for the period 1987-2000. The study reports that exports, foreign reserves, and industrial production have a positive effect on the stock index, while a negative effect with interest rate. On the other hand, money supply does not affect the stock market price index. Acikalin et al. (2008) examine the effect of a set of macroeconomic factors on the stock market return for Turkish economy by using quarterly time

series data and applying different tests such as the cointegration test, the (VECM), and the causality tests. They indicate a long-run relationships between the stock market returns and the macroeconomic factors. A study by Patra and Poshakwale (2006) use monthly time series data for stock return and some macroeconomic factors for examining the effect of these factors on the stock market price index. Based on using different statistical techniques, results suggest that the stock market price index has a short-and long-run relationship with money supply, inflation, and trading volume, but not with exchange rate.

2. Method

A dataset of 10 MENA countries, namely; Jordan, Saudi Arabia, Qatar, United Arab Emeritus, Bahrain, Oman, Egypt, Tunisia, Morocco, and Algeria has been used to explore the effect of some main macroeconomic indicators on the stock market price index. Annual data for the period (2000-2019) has been obtained from the sources in Table 1. The macroeconomic variables are: consumer price index (CPI) representing inflation rate, the real effective exchange rate (EXR) representing exchange rate, the real gross domestic product (GDP) representing the economic growth, money supply (MS) representing monetary policy, 3-months treasury bill (IR) representing interest rate, and foreign direct investment as a percentage of GDP, while the dependent variable is the stock market index (SMI) representing the stock market prices. The Stock market index, consumer price index, exchange rate, the real gross domestic product, and money supply are transformed to natural logarithms forms to avoid the problem of heteroscedasticity. So, we can specify our model as follows:

$$LNSMI_t = a_0 + a_1 LNMIS_{t-1} + a_2 LNCPI_t + a_3 LNEXR_t + a_4 LNGDP_t + a_5 LNMS_t + a_6 IR_t + a_7 FDI_t + \mu_t (1)$$

Where, μ_t is the white noise error term.

Variable	*Symbol*	*Measurement*	*Source*
Stock Market Prices	SMI	LN Stock Market Index	https://www.investing.com/indices/world-indices
Inflation	CPI	LN Consumer Price Index	World Bank
Exchange Rate	EXR	LN Real Effective Exchange Rate	Bruegel.com
Gross Domestic Product	GDP	LN Real GDP in USD	World Bank
Money Supply	MS	LN Money Supply	World Bank
Interest Rate	IR	3- months treasury bill interest rate	https://fred.stlouisfed.org/categories/116
Foreign Direct Investment	FDI	Foreign Direct Investment/GDP	World Bank

Table 1. Data Measurement and Sources

To achieve the goal of this study, an appropriate econometrics technique was chosen. To select an appropriate econometric technique for application in this study, some of the dataset testing needs to be applied first. The first test is a unit root one meant to discover the stationarity of variables. If all variables

are stationary at level, we can use the ordinary least square method (OLS). If all variables are stationary at the first level and do not have the long-run relationship (cointegration),an appropriate technique is the vector auto-regressive (VAR) model. If all variables are stationary in the first difference and have a long-run relationship (cointegration), an appropriate technique that needs to be applied is the vector error correction model (VECM). Finally, we use the auto-regressive distributed lag (ARDL), as an appropriate technique, if the variables are mixture of stationary, means some are stationary in levels I(0),and others are stationary at the first difference I(1)as well as have a long-run relationship (Pesaran et al., 2001).

4. Findings and Discussions

Firstly, we conduct the panel unit root test, a necessary test for discovering whether the variables included in the study are stationary or not, then doing the main estimations. The study's result of the panel unit root stationarity test is based on the ADF-Fisher χ^2unit root test. The panel root test results are reported in Table 2 which show a mix order of integration, the stock market price index (LNSMI), and foreign direct investment (FDI)are stationary at levels, while consumer price index (LNCPI), exchange rate (LNEXR), the real domestic product (LNGDP), money supply (LNMS), and interest rate (IR) are stationary at the first difference indicating that the stock market price index (LNSMI) and foreign direct investment are integrated of order zero I(0), and the remaining variables are integrated of order one I(1).These results required us to check whether the variables in the dataset have a long-run relationship or not. This could be done by employing a co integration test.

Table 2. Panel unit root test

ADF-Fisher Unit Root Test. Chi-square						
Variable (level)	***Intercept***	***Intercept & Trend***	***Variable (the first difference)***	***Intercept***	***Intercept & Trend***	***Integrated of Order***
LNSMI	57.34* [0.000]	47.42* [0.004]				I(0)
LNCPI	11.45 [0.993]	8.42 [0.988]	DLNCPI	48.82* [0.000]	46.24* [0.000]	I(1)
LNEXR	14.28 [0.815]	23.10 [0.410]	DLNEXR	73.90* [0.000]	56.72* [0.000]	I(1)
LNGDP	40.63* [0.004]	17.92 [0.592]	DLNGDP	33.69** [0.028]	39.72* [0.005]	I(1)
LNMS	53.87* [0.000]	13.77 0.841]	DLNMS	37.37* [0.010]	49.96* [0.000]	I(1)
IR	21.71 [0.53]	59.71* [0.000]	DIR	102.14* [0.000]	73.27* [0.000]	I(1)
FDI/GDP	44.57* [0.001]	35.76** [0.016]				I(0)

*, ** are significant at 1%, 5% levels, respectively.

Second step is to conduct the panel cointegration test for discovering the long-run relation among study's variables. This study uses three different panel cointegration tests, namely; the Pedroni Residual Cointegration Tests, the Kao Residual Cointegration, and the Johansen Fisher Panel Cointegration Test. The Pedroni (1996) test suggests six different panel cointegration tests to check for the absence of

cointegration. The seven-test relies on four within-dimension methods and three between-dimension methods. For more details about the cointegration tests (see Pedroni, 1996; Kao, 1999). The results of the panel cointegration test of the long-run relationship between the stock price index and the variables of the study for 10 MENA countries are reported in Table 3. The results show that the majority of the empirical results confirm a long-run relationship among variables.

Table 3. Panel cointegration test

1. Test Name: Pedroni Residual Cointegration Tests (No deterministic trend)				
Alternative hypothesis: common AR coefs. (within-dimension)				
	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-0.376	0.648	-0.478	0.683
Panel rho-Statistic	1.807	0.964	1.780	0.962
Panel PP-Statistic	-3.532	0.000*	-4.064	0.000*
Panel ADF-Statistic	-1.907	0.028**	-2.066	0.019**
Alternative hypothesis: common AR coefs. (between-dimension)				
Group rho-Statistic	3.062	0.999		
Group PP-Statistic	-4.814	0.000*		
Group ADF-Statistic	-3.040	0.001*		
Test Name: Pedroni Residual Cointegration Tests (Deterministic intercept and trend)				
Alternative hypothesis: common AR coefs. (within-dimension)				
	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-1.103	0.865	-1.048	0.852
Panel rho-Statistic	4.497	0.993	2.419	0.992
Panel PP-Statistic	-5.040	0.000*	-5.587	0.000*
Panel ADF-Statistic	-3.322	0.000*	-3.360	0.000*
Alternative hypothesis: common AR coefs. (between-dimension)				
Group rho-Statistic	3.560	0.999		
Group PP-Statistic	-6.133	0.000*		
Group ADF-Statistic	-4.467	0.000*		
2. Kao Residual Cointegration Tests				
	t-Statistic	Prob.		
ADF	-5.391	0.000*		
3. Johansen Fisher Panel Cointegration Test (Linear deterministic trend)				
	Statistic	Prob.		
Fisher Stat. (from Trace Test)	321.1	0.000*		
Fisher Stat. (from Max-Eigen Test)	250.4	0.000*		
Johansen Fisher Panel Cointegration Test (Linear deterministic trend, restricted)				
	Statistic	Prob.		
Fisher Stat.(from Trace Test)	74.23	0.000*		
Fisher Stat.(from Max-Eigen Test)	44.14	0.000*		

*, ** are significant at 1%, 5% levels, respectively.

Finally, we test the long-and the short-run impact of the macroeconomic variables on the stock market price indexfor10 MENA countries. According to the results produced from a unit root test which show mix integrated order among the variables, some I(0) and some I(1) and results from cointegration tests regarding the presence of a long-run relationship among variables, the Auto-regressive Distributed Lag (ARDL) model will be an appropriate econometric technique that needs to be applied to discover this relation.

ARDL bounds model can be written as follows:

$$\Delta LSMI_t = \alpha_1 + \alpha_2 LSMI_{t-1} + \alpha_3 LCPI_{t-1} + \alpha_4 LEXR_{t-1} + \alpha_5 LGDP_{t-1} + \alpha_6 LMS_{t-1} + \alpha_7 IR_{t-1} + \alpha_8 FDI_{t-1} + \sum_{i=1}^{n} \beta \Delta LSMI_{t-i} + \sum_{i=0}^{n} \gamma \Delta LCPI_{t-i} + \sum_{i=0}^{n} \delta \Delta LEXR_{t-i} \sum_{i=0}^{n} \rho \Delta LGDP_{t-i} + \sum_{i=0}^{n} \varphi \Delta LMS_{t-i} + \sum_{i=0}^{n} \psi \Delta IR_{t-i} + \sum_{i=0}^{n} \phi \Delta FDI_{t-i} + \mu_t \quad (2)$$

Where Δ is the first difference operator, *n* is the optimum lag length, β, γ, δ,ρ, $\boldsymbol{\varphi}$,ψ, $\boldsymbol{\phi}$are the short-run dynamics of the model and α_2, α_3,α_4, α_5, α_6, α_7, α_8 are the long-run elasticity. μt is the error term.

The error correction form of the ARDL model is presented as follow:

$$\Delta LSMI_t = \alpha_1 + \sum_{i=1}^{n} \beta \Delta LSMI_{t-i} + \sum_{i=0}^{n} \gamma \, \Delta LCPI_{t-i} + \sum_{i=0}^{n} \delta LEXR_{t-i} + \sum_{i=0}^{n} \rho LGDP_{t-i} + \sum_{i=0}^{n} \varphi \Delta LMS_{t-i} + \sum_{i=0}^{n} \psi \Delta IR_{t-i} + \sum_{i=0}^{n} \phi \Delta FDI_{t-i} + \lambda ECM_{t-1} + \mu_t (3)$$

Where, μ_t is the error term, λ is the speed of adjustment parameter and ECM_{t-1} is the error-correction term and measuring the deviation of SMI_t from its long-run value.

Our estimation includes constant and trend variable. We added a trend to the model since the variables exhibit trends. Also, due to fewer time series observations, the lag selection is set at a maximum of one lag. The suitable lag length is selected based on the AIC lag selection criteria (1,1,1,1,1,1).

Table 4 reports the long-run estimation of the panel/ARDL model. We observe that inflation has a negative and significant relationship with the stock market price index at 1% level. If there is an increase in inflation by 1 percent, this leads to a decrease in stock prices by 2.5 percent. This result is consistent with Maghayereh, 2003; Sohail and Hussain, 2009; Eita, 2012, while in contrast with Kumar et al., 2020; Khalid and Khan, 2017; Giri and Joshi, 2017. The results also show an inverse long-run impact of exchange rate, and interest rate on stock market price index, which are significant at 1% level. For the exchange rate, an appreciation in exchange rate by 1percent leads to a decrease in the stock market price index by 1.1 percent. This result is in line with Khan and Khan, 2018, while in contradiction with Kumar et al., 2020; Demir 2019; Khalid and Khan, 2018; Panta, 2020. Whereas for the interest rate, an increase by 1 percent cause a decrease in the stock market price index by 0.05 percent. This result is consistent with Demir, 2019: Khan and Khan, 2018; Khalid and Khan, 2017; Maghayreh, 2003; Eita, 2012,yetit is in contrast with Sohail and Hussain, 2009. Regarding the effect of the economic growth and foreign direct investment on the stock market price index, the results show that they have a positive effect and are significant at 1% level. When there is an increase of 1 percent in the economic growth, the stock market price index increases by 1.05

percent. This result is in line with Kumar et al., 2020; Demir, 2019; Giri and Joshi, 2017; Maghayereh, 2003; Panta, 2020; Eita, 2012. However, an increase in foreign direct investment, as a percentage of GDP, increasesthe stock price index by 3.5 percent. This result is consistent with Demir, 2019. Finally, the result shows an insignificant positive impact of money supply on the stock market price index. This result is in line with Maghayereh, 2003; Kumar et al., 2020, but it is in contrast with Eita, 2012; Khan and Khan, 2018; Panta, 2020. Table5indicates that the value of coefficient of the error correction term (ECM_{t-1}) is negative and significant at 1% level. The coefficient (ECM_{t-1}) is - 0.685. This means that any change in the short-run towards the long-run is corrected by 73.2 percent per year in the stock market price index. This suggests that it needs almost 1.5 year to move from a short-run to a long-run relationship. The normality J-B test is reported at the bottom of Table 5. The result shows that the p-value of 0.430, indicating that the model has a good estimation.

Table 4. Estimates of the Long-Run Coefficients Based on Panel PMG/ARDL Model (1,1,1,1,1,1). Dependent variable is LSMI

Variable	*Coefficient*	*t-Statistic*	*Prob.*
LNCPI	-2.546	-4.867*	0.000
LNEXR	-1.136	-3.054*	0.003
LNGDP	1.048	2.139**	0.035
LNMS	0.152	0.789	0.431
IR	-0.056	-3.772*	0.000
FDI	3.580	3.993*	0.000

*, ** are significant at 1%, 5% levels, respectively. Selected lags based on AIC.

Table 5. Error correction representation of the Model. (1,1,1 1,1,1)

Variable	*Coefficient*	*t-Statistic*	*Prob.*
CointegrationEqu.	-0.685	-4.633	0.000*
D(LNCPI)	0.598	0.969	0.334
D(LNEXR)	0.602	1.913	0.058**
D(LNGDP)	2.076	1.260	0.210
D(LNMS)	1.121	3.293	0.001*
D(IR)	0.113	4.98	0.000*
D(FDI)	-0.149	-0.113	0.910
C	-4.746	-4.656	0.000*
@Trend	0.065	3.228	0.001*
Jarque-Bera	1.691		
Probability	0.430		

*, ** are significant at 1%, 5% levels, respectively.

5. Conclusion

Identifying the factors affecting the stock market price index is essential because of the important effect of the stock market to economic growth and development. The economy of the MENA region is an essential part of the Global economy, especially it contains a group of oil countries having huge revenues from selling petroleum. Therefore, this study explores the effect of the macroeconomic indicators and the stock market price index in a group of MENA countries for the years (2019-2020). The Panel data, the unit root test, the cointegration test, and the Auto-regressive distributed lag (ARDL) are used to achieve the goal of this study. The results report that the (GDP) does have a positive effect on the stock market price index, implying that the increasing of GDP, the per capita income and the individuals' spending increases as well as the unemployment rate decreases, leading to an increase in the firm's profit. As a result, the financial market will be positively affected. The results also show that the stock market price index and foreign direct investment are positively correlated, indicating that the attracting of the flow of money and capital from foreign countries to the local economy can enhance and improve the investments in the stock market. However, inflation and the stock market price index are inversely correlated, implying that the stock returns decline with high inflation as a result of increasing the production costs which leading to decrease the real returns of economic activity, which, in turn, leads to decline the stock prices. Moreover, the stock market price index and exchange rate are negatively correlated, meaning that the imports be more expensive and cash flows could be decreased as well as industries depending on imports could be negatively affected, as a result of decreasing the value of local currency. Furthermore, interest rate and the stock market price index are negatively correlated, indicating that when Federal Reserve Bank raises interest rates, investors go to invest their money in banks rather than in the stock market, and thus the stock market is negatively affected. This study recommends that the governments and policymakers try to increase the Gross Domestic product, and attract the flow of foreign investments to the local economy by providing facilities for investors for encouraging them to invest their money in the local economy. It also recommends that the Central Banks adopt a monetary policy aiming to reduce the money supply in order to decrease the inflation rate. Furthermore, it recommends that future studies be carried out to explore the effect of the macroeconomic indicators on the stock market price index for another region such as the Euro Zone or EMEA. In addition, it encourages conducting future research taking into consideration more macroeconomic variables such as bank credit, industrial production, oil prices, trading volume, exports, and imports. Finally, this study recommends future research extending the period of study to include a longer span.

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