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Article

Evaluating the Interplay of Macroeconomic Indicators and the Amman Stock Exchange: Implications for Contemporary Investment Strategies

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Abstract: This research aims to examine the dynamic interrelationships among pivotal Jordanian macroeconomic indicators, including GDP, CPI, IPI, M2, Worker Remittances (WRMIT), and Amman Stock Exchange Index (ASEI) over the period spanning from 2012 to 2022. The study employs many statistical methodologies, including the Johansen co-integration test, ARDL approach, the Error Correction Model (ECM), and the Granger causality test. The findings of this study robustly affirm the existence of both long-term and short-term relationships between the ASE and the macroeconomic variables. Specifically, the research substantiates a sustained long-term equilibrium association between ASEI and GDP, CPI, M2, IPI, and WRMIT. Furthermore, it identifies a long-term causality running from these economic indicators to the Amman Stock Exchange, as well as a short-term causality from CPI, GDP, and WRMIT to the ASE. These results raise questions about the ASE's operational efficiency, and investors should incorporate prevailing macroeconomic variables into the investment decision process.

Keywords: Amman Stock Exchange; Macroeconomic Variables; Cointegration Test; ARDL approach; Granger Causality Test

1. Introduction

Financial markets are playing fundamental and prominent role in the global and national economy, helping to stimulate liquidity, mobilize savings, and optimize resource allocation in productive sectors, and it is one of the most significant areas for investing money for investors. It also serves as a source of funding for the investments made by exporters' [1]. The economy of every country had increasingly measured by the activity of its securities market, especially in light of the growing globalization. As a result, they are a true mirror of reality that reflects the true image of the economy. Changes in countries' economic policies, such as monetary and fiscal policy, characterize these markets by their sensitivity, and the extent to which these changes affect macroeconomic variables determines their nature. The degree of efficiency of stock exchange, which considered a criterion for its ability to perform its functions. The stock exchange achieves this efficiency if it reflects the information contained therein, especially that of macroeconomic information and the expectations of investors and experts in the daily trading prices [2].

In the financial markets, indices regarded as one of the most essential instruments for measuring financial market performance. The financial market performance measured through fluctuations in

these indicators, as it indicates the levels of stock prices and helps in determining the general direction of prices [3]. Furthermore, indices used to compare and measure changes in stock prices during different periods that reflect the performance of the market and thus the economic situation of the countries.

Since stocks are among the most sensitive assets to market conditions and reflect new developments and information in economic, social, political and international variables. The process of exploring the character and scope of the relationship between financial market indicators, in particular, and many of these variables is one of the topics that receives special attention from scholars, researchers, and economic policymakers in addition to investors and economists, especially since this relationship changes from time to time. The economic literature highlights numerous applied and theoretical studies that have taken place in various economies to test the essence of the connection between stock price indices and these macroeconomic variables. Here, we should mention that the results of many of these studies are not consistent in terms of the presence or absence of a relationship between them, as well as the trends and types of this relationship in different countries [3][5][4].

Many investors, financial analysts, and decision-makers follow with great interest the movements and changes in stock prices, up and down, and they try by various means to collect information to predict the direction of their movements, to take a rational decision to buy or sell, in a way that achieves profits and avoids loss at the individual level. Many studies conducted to determine the factors (especially the economic) that affect by the share price negatively or positively, but the results of these studies were contradictory and disparate, and no agreement reached about the nature of this relationship [5].

The importance of this research lies in its provision of recent evidence from one of the most important emerging markets, which is located within the Middle East. It came to examine the effect of many macroeconomic variables on the Amman Stock Market Return, represented in the degree of response of stock prices to these variables (economic factors), and this becomes an important indicator for investors so that they can reflect the movement of these variables on the nature of their investment decision. Hence on stock prices.

Our research contributes to improve the awareness of the dynamic relationship between various macroeconomic indicators and the performance of ASE. Its originality lies in integrating multiple macroeconomic indicators with a detailed analysis of the causality relationship, thus will fill a gap in the literature within an emerging market framework.

This research based on the two of the fundamental financial theories to justify the relationship between economic indicators and stock prices: the Efficient Market Hypothesis (EMH), proposed by Fama [6], which states that asset prices reflect all available information to achieve market efficiency; and Arbitrage Pricing Theory (APT), developed by Ross [6]. This theory forms the basis for the study's focus on macroeconomics, concluding that macroeconomic factors can be used to predict asset prices.

2. Literature Review

The previous financial literature indicates that there are a number of theoretical frameworks employed by many researchers in order to link the economic variables to the stock markets. One of the most important of these works is the Efficient Market Hypothesis (EMH), and the Arbitrage

Pricing Theory (APT). Fama [6] adopts the EMH, which implies that asset prices reflect all of the available information. In contrast, Ross [6] concluded in his Asset Pricing Theory (APT) that macroeconomic factors could predict asset prices. These two pioneering works served as a reference for subsequent empirical studies in many different national contexts, and many of these studies confirmed and supported this idea, like Nelson [8]; Fama & Schwert [9]; and Chen et al. [10].

Research related to the Jordanian stock market has provided diverse and useful insights. Through employing the methodology of Johansen's co integration test Maghyereh [11] examine the causal relationship among many macroeconomics factors and stock prices in Jordan for the period span from 1987 to 2000. Their results presented that the macroeconomics reflected in the Jordan capital market. Similarly, Al-Sharkas [12] aimed to assess the effect of various macroeconomic factors on the Amman Stock Exchange (ASE) for the period span from March 1980 to December 2003. The study discovered a positive correlation among stock prices, the economic activity, and a negative correlation between stock prices and inflation.

Additional support for this connectivity comes from the ARDL approach employed by Bekhet, and Mater [13], who tested the equilibrium relationship between a number of macroeconomic variables in Jordan (interest rate, exchange rate, industrial production, and money supply) and the stock price index through using the ARDL model. The test period spanned from 1978 to 2010. The study found an equilibrium relationship in the term long term between stock price index and 20macroeconomic variables. However, the results of Al-Nayef's study [5] differ somewhat, as it concluded that for a long-term relationship between the stock index and money supply, also the outcomes reported that there is no long-term equilibrium relationship between the market index and the inflation rate and the industrial production index.

AL-Shubiri [14]inspected the relationship among many economic variables and ASE returns, the outcomes display for the statistically significant between gross fixed capital formation, consumer price index, and money supply on the return of the stocks. On the other hand, several studies conducted on other emerging and developing markets. Maysami et al. [15] aimed to inspect the effect of a number of macroeconomic variables on the Singapore stock market for the period (1995-2001). Their results confirm that the Singapore stock market indices for all sectors re affected by the macroeconomic variables under study, which were identified in varying proportions.

Wasseja et al. [16] analyzed the causal relationship between stock prices in Kenya and selected macroeconomic variables from 1980 to 2012. The study reported that the interest rate and the inflation rate cause changes in stock prices.

Barakat et al. [17] applied Granger causality and Cointegration tests to the Egyptian and Tunisian markets. The study found a co-integration between the variables in both markets and a causal relationship through the market index and four of the macroeconomic variables in the Egyptian market. While in the Tunisian market, the results were similar except for the absence of a causal relationship with the consumer price index.

Both Kaur & Chaudhary [18], and Gopinathan & Durai [19] examined the Indian context, but they used different methodologies. Kaur & Chaudhary [18] employed Cointegration analysis, and they found that only the interest rate was significant in the short run, while the other variables were significant in the long- run. Gopinathan & Durai [19] employed alternating conditional expectations algorithm. This transformed approach revealed compelling evidence of Cointegration, indicating a significant long-run relationship characterized by nonlinearity.

Through using ARDL test Kalam [20] investigate the impact of various macroeconomic factors on the Malaysian Stock Market from 2000 to 2019. According to the analysis, regulators should maintain relatively low interest rates to promote economic activity, enhance the external economic environment governed by rules exchange rate policy, and avoid discretionary measures.

Jin & Guo [21] investigate the dynamic lead-lag relationships between the indices of the stock sector and macroeconomic factors in the markets China and USA. The results provide insight into the dynamic lead-lag relationships between indices of stock sector and macroeconomic indicators in the US and Chinese stock markets. The findings highlight the varying patterns and the impact of market maturity on the predictive power of sector indices as barometers of macroeconomic conditions.

While previous studies in developed markets generally support stronger market efficiency and faster information reflection as suggested by the EMH, emerging markets tend to show weaker efficiency and greater sensitivity to macroeconomic variables due to structural and institutional differences.

Despite numerous studies examining the determinants of stock market performance in Jordan, most current research Bakheet & Matar [13] and Al-Nayef [5] relies on outdated data sources, failing to address the new economic developments that have taken place within the Amman Stock Exchange over the past few years. This study addresses this gap by utilizing more recent and comprehensive data covering the period from 2012 to 2022. Methodologically, this study goes beyond simple regression models by employing a robust multi-test framework including ARDL, VECM models and the Granger causality test to provide a deeper understanding of both short-term volatility and long-term equilibrium relationships. By integrating these elements, this study fills a critical gap in the literature and offers up-to-date empirical evidence for policymakers and investors in the Jordanian context.

Based on the aforementioned literature the study defines two primary sets of hypotheses to test the relationships between macroeconomic variables (GDP, CPI, IPI, M2, and WRMIT) and the stock market index.

Hypothesis number 1: There is a stable long-run equilibrium relationship between Gross Domestic Product (GDP), inflation (expressed by the Consumer Price Index (CPI), Industrial Production Index (IPI), Money Supply (expressed in its broad sense (M2), worker remittance (WRMIT), and Amman Stock Exchange Index (ASEI).

Hypothesis number 2: GDP, CPI, IPI, M2, and WRMIT relate to ASEI in the short run.

3. Methodology

3.1. Data description and Source

Our research based on quarterly data for ASEI and macroeconomic indicator for the period spanning from January 2012 to December 2022. In order to meet the study's objectives. The primary data related to the Amman Stock Exchange index collected from the Amman Stock Exchange's website. Data related to the independent variables: Gross Domestic Product (GDP), inflation, expressed by the consumer price index (CPI), Industrial Production Index (IPI), Money Supply (expressed in its broad sense (M2), and worker remittance (WRMIT).

All variables used in this study obtained from the Central Bank of Jordan. Statistical program Eviews10 employed to conduct the statistical tests.

We specified the following econometric model to inspect the dynamic relationship between variables under study:

$$ASEI = a_0 + a_1 ASEI + a_2 GDP + a_3 CPI + a_4 M2 + a_5 IPI + a_6 WRMIT + \epsilon_t \quad (1)$$

Where ASEI refer to Amman Stock Exchange index, GDP refer to Gross National Product, M2 refer to Money Supply expressed in its broad sense, IPI refer to Industrial Production Index, and WRMIT refer to worker remittance.

Defining the variables of the study:

Dependent variable: Amman Stock Exchange Index (ASEI). The Stock Price Index Weighted by Free Float Market Capitalization is used. Calculated value based on the company's shares available only for trading multiplied by their closing price. The following formula used to calculate the Index:

$$ASEI_T = \sum_{k=1}^{n} (P_{TK} * SH_{TK} * FA_{TK}) \Big/ D_T \quad (2)$$

Where: P_{TK} refers to the closing price for the share of the company K on the time (T).

SH_{TK}: refers to the number of the listed shares for the company K on the time (T).

FA_{TK}: refers to the factor of the company K on the time (T). This factor is between one and zero, and the way of calculation depends upon the total shares listed in the index less the total number of shares the board of directors owns.

D_T: stands for the time's (T) divisor index.

Independent variables:

- Gross Domestic Product (GDP): As it refers to economic growth, it refers to the value of the final commodities and services that the nation's citizens and inhabitants produced within a certain year, which are estimated at market or base prices. Most economic theories hold that this factor significantly affects stock market price levels. This study expects that the growth in the gross national product will result in a rise in the volumes of investment. As a large part of this investment will be financed through the stock market, which will lead to an increase in trading volume and an increase in share prices as a result.
- Consumer Price Index (CPI): Calculated through a weighted average of prices for the representative basket of goods and services. A sample of available goods and services selected in a particular economy, and their prices are determined at the beginning and end of the comparison period. The consumer price index measures inflation rates for us, and we symbolize it with the symbol CPI.
- Money Supply (expressed in its broad sense (M2): Defined as the total purchasing power of individuals and institutions, and it is also defined as the sum of the means of payment accepted in settling financial transactions in general. The money supply divided into M1 (which specifically focuses on currency outside of banks and demand deposits) and M2 categories (encompassing savings and time deposits). M2 used in our research. The increasing in the M2 expected to increase the volume of investments in general.

- Industrial Production Index (IPI): It is an index measuring the volume of units produced for each of the energy, mining, and industrial sectors in Jordan. It's reflected the level of economic activity in the Kingdom, because sudden and unexpected developments in economic activity towards an increase lead to a rise in stock prices, which creates new expectations for an improvement in the general economic situation, which leads to an increase in demand. Shares, and consequently their price increases; we denote it with the symbol IP.
- Worker remittance (WRMIT): It is the process of transferring money by Jordanian workers abroad to their homeland. The workers remittances have very important effects on the overall economy of the countries. Thus, stimulating economic growth, which reflects positively on the financial markets and their share prices. We denote it with the symbol WRMIT.

3.2. Research Method and Model Specifications

Depending on the previous literature, this study adopted the co-integration methodology which proposed by Granger [22], and Johansen [23], [24]. This methodology done through the following steps in performing the standard analysis.

First: Inspection of the stationarity

Estimating the regression equation for economic variables that contain time series through using the Ordinary Least Squares (OLS) approach usually shows t-test values and coefficient of determination with high numbers. Although the relationship between the variables may not carry any statistical significance this known as the Spurious Regression problem. Consequently, the validity of the OLS method relies on several assumptions including that the time series should be stationary. For judging the time series stationarity, the Augmented Dicky Fuller (ADF), and Phillips-Perron (PP) tests are usually used.

ADF test applied to inspect the stationarity of time series according to the following formula:

$$D(X_T) = \propto + \sigma t + \beta x_{T-1} + \sum_{i=1}^{n} D(X_{T-1}) + \varepsilon_T \quad (3)$$

Where: D refer to the first difference in time series, X refer to time series of the study variable's, α refer to constant, σt refer to a time trend coefficient, β refer to the coefficient of presenting process root, and ε refer to the error term.

Second: Determine the lag length

It is important when performing a standardized test in order to specify the length of the appropriate lag for the time series used in the study because of its direct effect on the results of following tests. So, the unrestricted Vector Auto regression model (VAR) utilized to pick out the length of the appropriate lag depending on the many tests: like LR test, Schwarz Criterion (SC). Akaike Information Criterion (AIC) and others.

Third: Johansen's Cointegration Test (1988)

The Johansson co-integration test employed to inspect the presence of a long-term equilibrium connection among the study variables and ascertain the quantity of vectors and long-term equilibrium relationships. Prior to conducting Johansen's Cointegration analysis to determine the number of co-integration relations between the independent and dependent variables, it is necessary to assess whether these variables exhibit the same level of integration. The equation for the Johansen Cointegration test, as proposed by Johansen [24]**错误!未找到引用源。** presented below:

$$X_T = \alpha X_{T-1} + \cdots + \alpha_N X_{T-N} + \beta Z_T + \mu_T \quad (4)$$

Where X_T is the vector for I (1) for dependent and independent variables, Z_T refer to the non-random variable, and μ_T refer to the error correction term.

Fourth: Autoregressive Distributed lag model (ARDL)

Fourth: Autoregressive Distributed lag model (ARDL)

This model created by Pesaran et al. [26] examine the short- and long-term relationships between the variables under the study. The following defines the ARDL approach:

$$\log ASEI = \int \log GDP_t \log CPI_t \log M2_t \log IPI_t \log WRMIT_t \log \mu_t \quad (5)$$

Where μ_t refer to random error, and t refer to time variable.

Fifth: Error-Correction Model (ECM)

This test seeks to confirm whether the research variables have a long-term relationship, additionally, the all-time series of the variables under examination must have equal co-integration prior to the use of this test. If there is a co-integration relationship between the study's variables, it means there is at least one causal relationship in one direction. In order to verify the direction of this relationship error correction model (ECM) is used.

Sixth: The Granger causality test

This test employed to determine the direction of the causal relationship among the variables used in the model, if the variable is X (affects the variable y, this means that the variable X contains information with explanatory power more than the lag time of the variable (Y). The following formula is used and estimated Engle & Granger 错误!未找到引用源。:

$$DX = \alpha_0 + \sum_{i=1}^{m} (\alpha_{1i} DX_{T-i}) + \sum_{i=1}^{m} (\alpha_{2i} DY_{T-i}) + \mu_{1T} \quad (6)$$

$$DY = \theta_0 + \sum_{i=1}^{m} (\theta_{1i} DX_{T-i}) + \sum_{i=1}^{m} (\theta_{2i} DY_{T-i}) + \mu_{1T} \quad (7)$$

Where: X: Amman Stock Exchange Index Return, Y: macroeconomic variables (GDP refer to Gross Domestic Product. CPI refer to inflation. M2 refer to Money Supply. IPI refer to Industrial Production Index. WRIT refer to Worker Remittance), and μ point to error term. Hypothesis H0 = $\alpha 21 = \alpha 22 = \ldots = \alpha 2m$ is the null hypotheses.

If we cannot reject the null hypothesis, then this indicates that the economic variable does not cause the return of the Amman stock market index. Another null hypothesis H0 = $\emptyset 21 = \emptyset 22 = \ldots = \emptyset 2m$. The statistical test (F) value determines the existence of a relationship.

4. Empirical Results

Descriptive Statistics:

The results indicate that the arithmetic means of the return for ASEI has reached (-0.0071) which is close to the median value (-0.0092). As well as the arithmetic, mean value of the GDP returns (0.01866), and the median (0.00508). The CPI returns were (0.00574) which is close to the median value (0.00590). The arithmetic mean for the return of M2 was (0.01417) which is close to the median (0.01522). As for the arithmetic mean of the returns of the IPI were (-0.00736) and the median value (0.00001). In addition, the arithmetic mean of the returns of workers' remittances is (0.00432), and the median is (0.00200).

Table 1. Descriptive statistics.

	ASEI	GDP	CPI	M2	IPI	WRMIT
Mean	-0.0071	0.01866	0.00574	0.01417	-0.00736	0.00432
Med	-0.0092	0.00508	0.00590	0.01522	0.00001	0.00200
Max	0.11628	0.1574	0.02244	0.03974	0.46655	0.1689
Min	-0.0834	-0.11717	-0.01902	-0.027804	-0.356209	-0.1773
S.D	0.0444	0.08091	0.00889	0.013945	0.108384	0.07935
Skewness	0.4343	-0.02885	-0.75412	-0.685900	0.708384	0.21014
Kurtosis	2.9721	1.90293	3.93497	3.523732	12.94200	2.57770
Jarque-Bera	1.3536	2.16233	5.64190	3.863069	180.6906	0.63599
Probability	0.5082	0.33920	0.05954	0.144926	0.00000	0.72760
Sum	-0.3082	0.80241	0.24720	0.609315	-0.316463	0.18592
Sum S. Dev.	0.0830	0.27499	0.00332	0.008167	0.493374	0.26446
Obs	44	44	44	44	44	44

Table No. (1) Also shows the Skewness values, which amounted to (0.4343, -0.02885, -0.75412, -0.685900, 0.708384, 0.21014) for the returns of the study variables (ASEI, CPI, M2, WRMIT, IPI) which approximately close to zero. On another side, the Kurtosis values were (2.9721, 3.93497, 3.523732, 2.57770), which are close to 3 for the study variables except for GDP, and IPI returns. Thus, we conclude that it near to normal distribution for the aforementioned variables.

This confirmed by the Jarque-Bera test for variables (ASEI, GDP, CPI, M2, and WRMIT) where the probability value was higher than the level of significance of 5%, and therefore the series of returns of the mentioned variables are subject to a normal distribution, except for the returns of IPI.

Stationarity of the Time-series:

The ADF test to inspect the stationarity displayed in Table number 2.

Table 2. Unit Root Test.

ADF Test		ASEI	GDP	CPI	M2	IPI	WRMIT
At Level	Intercept	-2.099	-2.450	-2.427	-2.005	- 1.799*	-1.122
	Trend and intercept	-1.400	0.765	-2. 407	-2.139	-3.600*	0.5164
At first differences	None	-1.435	-0.0390	4.153	6.542	-0.865	-0.4108
	Intercept	-5.849 *	-6.240*	-4.878*	-6.042*	-6.414 *	-6.895*
	Trend and intercept	-5.776 *	-6.199 *	-5.318*	-6.780*	-8.328*	-6.817*
	None	-5.823*	-6.127*	-3.788 *	-3.630*	-8.853 *	-6.981*
inference		I (1)	I (1)	I (1)	I (1)	I (0)	I (1)

Source: Prepared by the researcher based on statistical results using E-Views 10. The numbers in parentheses () represent the probability value. C.V: tabulated value at 0.05. *, ** refers to the level of significance 0.01 and 0.05 respectively.

Table (2) shows at the level form for the ADF test statistics for ASEI, GDP, CPI, M2, and WRMIT do not reject the null hypothesis of a unit root, which means the calculated values o for the ADF test are less than their tabular values at level with (Intercept, trend, and intercept, none). The Industrial

Production Index (IPI) shows evidence of stationarity at level under certain specifications, particularly when a trend is included, suggesting that IPI is stationary in levels, I (0).

After taking the first differences, the result of ADF test shows that, the all variables become significant at the level of 1% under all model specifications. Based on the above, the dataset exhibits a combination of I (0) and I (1) variables, where the IPI index is stationary at the level, while the remaining variables are stationary at the first difference except the IPI. This mixed integration arrangement justifies the application of econometric techniques that can accommodate these properties, such as the ARDL boundary testing method for Cointegration.

Table 3. Lag length Criteria.

Lag	(Log L)	(LR)	(FPE)	(AIC)	(SC)	(HQ)
0	459.1953	NA	5.81E-18	-2.27E+01	-22.40643*	-22.56817
1	512.2745	87.58058	2.53E-18	-2.35E+01	-21.7404	-22.87255
2	576.8038	87.11462*	6.88e-19*	-2.49E+01	-21.64688	-23.74943*
3	615.9267	41.07903	8.36E-19	-25.09634*	-20.28303	-23.356

LR refer to likelihood ratio (LR) test – FPE criterion refer to the Final prediction error- AIC refer to the Akaike information criterion- SC refer to the Schwarz information criterion- HQ criterion refer to the Hannan-Quinn information - * refer to selected lag order.

Depending on results of the Vector Auto-Regressive Test (VAR) Lag Order selection criteria for ASEI, GDP, CPI, M2, IPI, and WRMIT that reported in table number (3). The results indicated that two is the recommended lag length depending on LR, FPE, HQ criterions.

To determine whether or not the study variables are co-integrated. The multivariate Johansen co-integration test run based on two different test types. Maximal Eigenvalue and trace tests

Table 4. Johansen Co integration Test.

		Trace test			**Max Eigen**		
Null. Hypo	**Eigenvalue**	t-Stat	Critical value (0.05)	Prob**	t-stat	Critical value (0.05)	Prob**
None*		138.2048	95.75366	0	58.31934	40.07757	0.0002
At most 1*	0.767295	79.88551	69.81889	0.0063	36.41009	33.87687	0.0244
At most 2	0.597577	43.47541	47.85613	0.1214	26.63243	27.58434	0.0658
At most 3	0.486143	16.84298	29.79707	0.6516	7.144963	21.13162	0.948
At most 4	0.16358	9.698021	15.49471	0.3047	5.790047	14.2646	0.6403

None* denotes level 0.05 rejection of the null hypothesis. Prob** denotes p-values from MacKinnon-Haug-Michelis (1999).

The results as shown in Table No.4 shows the existence of 1 cointegrating equation, and This indicates that the variables under examination have only one possible linear combination. As a result, our analysis suggests that the relationship between the ASEI and the GDP, CPI, M2, IPI, and WRMIT is stable over the long term. This result is consistent with the findings of Bekhet, & Mater [13], and Barakat et al. [17] in Egypt and Tunisia, Lee & Brahmasrene [28] in Korea.

In the same contest, we use another approach (ARDL) approach to examine the short- and long-term relationships between the variables under study.

H0: The model's variables do not have any long-term relationships.

Table No.5 report the results of ARDL Bounds Test: The F-Bounds Test examines the presence of a long-run relationship between the variables. If the value of test statistic exceeds the critical values at a significance level in this case the null hypothesis will rejected. This provides evidence in favor of a long-run relationship between the variables.

Table 5. Bounds test result.

F-Bounds Test		**Null Hypo: No levels relationship**		
Test Stat	**Value**	**Sign**	**I(0)**	**I(1)**
			Asymptotic: n=1000	
F-stat	1312%	10%	2.08	3
K	500%	5%	2.39	3.38
		3%	2.7	3.73
		1%	3.06	4.15

Table No.6 section A. report the results of ARDL model (2, 4, 4, 4, 4, and 3). The results showed that CPI, IPI, and M2 have positive and significant impact on ASEI. Also in another side, the GDP has a negative and significant impact on ASEI. The results in Table No.6 section B, report short-run analysis for the ARDL model. CPI, IPI and GDP have a positive and significant impact on the ASEI in the short term. In addition, the results report the M2, and WR have negative and significant impact on ASEI in the short term.

In summary, the empirical evidence demonstrates dynamic link between the ASEI's historical performance and current CPI movement. The levels equation suggests a long-run relationship between ASEI and other variables such as CPI, GDP, IPI, and M2. The F-Bounds Test supports the existence of a long-run relationship. These findings suggest that both short-term and long-term factors contribute to the behavior of ASEI. This outcome is consistent with Jin & Guo [21]; Gopinathan & Durai [19]; Barakat et al. [17], and Bekhet, & Mater [13].

Table 6. Long run and short-run analysis for selected model.

Conditional Error Correction Regression				
Section: A- Long-run analysis				
Variable	**Coefficient**	**S. Error**	**t-Stat**	**Prob.**
C	1707.958	1058.771	1.613152	0.1327
ASEI(-1)*	-0.638422	0.128184	-4.980497	0.0003
CPI(-1)	21.68027	12.12177	1.78854	0.0989
GDP(-1)	-0.942449	0.179109	-5.261864	0.0002
IPI(-1)	8.367808	1.804098	4.638223	0.0006
M2(-1)	0.135338	0.033296	4.064671	0.0016
WRMIT(-1)	1.168224	1.146534	1.018918	0.3283
Section: B-Short-run analysis				
D(ASEI(-1))	-0.326334	0.142245	-2.294164	0.0406
D(CPI)	60.59196	10.22562	5.925502	0.0001
D(CPI(-1))	4.662568	13.66419	0.341225	0.7388
D(CPI(-2))	-2.284995	13.21433	-0.172918	0.8656
D(CPI(-3))	-30.27051	12.44466	-2.43241	0.0316
D(GDP)	0.087544	0.104359	0.838877	0.4179

D(GDP(-1))	0.926283	0.193604	4.784415	0.0004
D(GDP(-2))	0.599378	0.160515	3.734082	0.0029
D(GDP(-3))	0.394654	0.139866	2.821659	0.0154
D(IPI)	2.685673	0.953937	2.815356	0.0156
D(IPI(-1))	6.235775	1.404439	4.440048	0.0008
D(IPI(-2))	1.943772	1.123622	1.729916	0.1093
D(IPI(-3))	2.196282	0.993535	2.210574	0.0472
D(M2)	0.050172	0.029148	1.721322	0.1108
D(M2(-1))	-0.142401	0.025912	-5.495537	0.0001
D(M2(-2))	-0.158046	0.024289	-6.506876	0.0000
D(M2(-3))	-0.110703	0.029493	-3.753581	0.0028
D(WRMIT)	-0.523398	0.396419	-1.320313	0.2114
D(WRMIT(-1))	-2.166248	0.681381	-3.179202	0.0079
D(WRMIT(-2))	-0.946162	0.494185	-1.914591	0.0797

* The t-Bounds distribution and the p-value are incompatible.

VECM estimated as a second step according to the Engel and Granger methodology, which characterized by the fact that it, captures long-term and short-term dynamic relationship among the explanatory variables and the dependent variable; in addition to that, it measures the speed of adjustment to return balance in the model.

Table 7. The VECM Results.

Error Correction:	D(ASEI)	D(GDP)	D(CPI)	D(M2)	D(IPI)	D(WRMIT)
Coint.Eq1	-00.22406	-00.16270	-00.027493	00.064759	-00.48088	00.338761
	-00.09098	-00.06447	-00.0229	-00.02964	-00.23257	-00.13516
	[-2.46279]	[-2.52358]	[-1.20039]	[2.18518]	[-2.06768]	[2.50630]

Table 8. The Estimation of target model.

D(ASEI) = C(1)*(ASEI(-1) - 2.75185526713*CPI(-1) + 7.9450552*GDP(-1) +0.08491329*IPI(-1) -4.524893036*M2(-1) -3.41600783148*WRMIT(-1) - .030385026) + C(2)*D(ASEI(-1)) + C(3)*D(ASEI(-2)) + C(4)*D(CPI(-1)) + C(5)*D(CPI(-2)) + C(6)*D(GDP(-1)) + C(7)*D(GDP(-2)) +(8)*D(IPI(-1)) + C(9)*D(IPI(-2))+ C(10)*D(M2(-1)) + C(11)*D(M2(-2)) +C(12)*D(WRMIT(-1)) + C(13)*D(WRMIT(-2)) + C(14).

	Coefficient	S. Error	t-Stat	Probability
C (1).	-00.22406	00.090978	-2.462786	00.0207
C (2).	-00.409273	00.199101	-2.055608	00.05
C (3).	-00.068451	00.190552	-00.359225	00.7223
C (4).	-1.180383	00.374560	-3.151385	00.0124
C(5)	-1.125116	00.337890	-3.329829	00.0061
C (6).	-1.316356	00.394654	-3.335470	00.0026
C (7).	-00.949761	00.306439	-3.099342	00.0046
C (8).	00.48582	00.062435	00.7781210	00.4435
C (9).	-00.21033	00.083127	-00.253020	00.8022
C (10).	-00.798572	00.567216	-1.407879	0.1710
C (11).	-00.585321	00.541831	-1.080266	00.2899
C (12).	00.798188	00.238655	3.344520	00.0025
C (13).	00.512993	00.159838	3.209465	00.0035
C (14).	00.000343	00.006382	00.053822	00.9575

From table number 7, and 8 the VECM and target model indicates that the value of ECT a long run causality running from GDP, CPI, M2, IPI, WRMIT to ASEI. The estimated ECM (-1) equilibrium correction coefficient equal to (-0.22406) has a negative sign and it is significant at 5%. ECM coefficient (-1) absolute value OF ASEI points out to the speed of amendment to the equilibrium after the shock of the short-term, 22.4% of the disequilibrium generated by the shock of the previous months concur back to the long-term equilibrium in the current month.

Additionally supporting the hypothesis of short-term causality from GDP, CPI, and WRMIT to ASEI. As for testing the presence or absence of a relationship as well as causality direction in the short term, Table No. 9 reports the outcomes of the Granger causality test between ASEI and all of the study variables.

Table 9. Granger causality tests.

Null Hypo	Obs	F-Stat	Prob.
CPI → ASEI	41	0.21495	0.8076
ASEI → CPI		0.20708	0.8139
GDP →ASEI	41	5.40778	0.0087
ASEI → GDP		3.34738	0.0461
IPI →ASEI	41	2.2734	0.1176
ASEI →IPI		0.59253	0.5582
M2 →ASEI	41	0.00904	0.991
ASEI →M2		0.50007	0.6106
RMIT→ASEI	41	1.51762	0.2329
SEI→WRMIT		2.26099	0.1189

Table No. (9) Pointed to the presence of bidirectional causality between ASEI and GDP. In addition, there is non-directional causality between ASEI and CPI, M2, IPI. Moreover, WRMIT.

Causality Analysis versus VECM

The difference between bidirectional causality in the Granger test and unidirectional causality in the VECM is not a mistake, but a functional distinction. While the Granger test identifies causality over time and the movements of short-term predictions, other aspects of the model describe the error correction process leading to equilibrium. Thus, the results of these models indicate that although there is a bidirectional interaction between these variables in the short run, they follow a specific and orderly path toward long-term (unidirectional) equilibrium.

5. Discussion and Policy Implication

This paper inspects the short-term dynamic relationship between ASEI and a number of Jordanian macroeconomic indicators as follows:

- Firstly, ASEI lagged period has a negative impact on the current period. Whereas the two-legged periods of ASEI show significant impact on the current period. Thus, investors and traders tend to base future expectations on past performance in this market. This result casts doubt on the efficiency of the Amman financial market, as this indicates that there is a possibility of exploiting these available opportunities to earn an abnormal return by exploiting the ineffective conditions of this market. This categorically contradicts the conclusions drawn by EMH.

- Secondly, with a significant coefficient of -1.18, inflation (CPI) related negatively to index return of ASE in the short run. This means that 1.18 times the system will correct the disequilibrium of its previous period. In order to arrive at an equilibrium steady state position. This finding supported by an identical study conducted in Pakistan by Zahid et al. [29] beside others like Pal & Mittal [30]; Tarika & Seema [31]; Mukherjee & Naka [32]; Chen et al. [10], and Fama [33].
- Thirdly, with a significant coefficient of -1.316, Gross Domestic Product (GDP) in the short run negatively correlated to stock prices. This means 1.32 times the system will corrects its previous period disequilibrium, in order to reach an equilibrium steady state position. This outcome supports the study's null hypothesis, according to which there is a significantly relationship between GDP and the ASEI. However, they differ from the general economic trend that explains generally the positive relationship between the GDP and the stock markets. From our point of view, the increase in gross domestic product can have a negative effect on the stock prices. In the same contest, unexpected increase in gross domestic product is true that it increases optimism about the future, which increases the movement of trading on stocks, and thus the rise in their prices, but if the expected increase in the GDP led to an increase in the M2 and thus an increase in inflation rates. This will negatively affect stock prices and returns because of the unbridled rise in inflation. This finding supported by identical study conducted in Kenya by Arshad et al. [34] and Acikalin et al. [35].
- Fourthly, with a significant coefficient of 0.798, worker remittances (WRMIT) positively correlated to the prices of stock in the short run. In order to achieve an equilibrium steady state position, the system must rectify its prior period disequilibrium 0.798 times. A 1% increase in workers' remittances will lead to a 0.798% increase in the shares' returns on the Amman Stock Exchange, and a 1% decrease will lead to a decrease in the shares' returns on the ASEI by the same amount, 0.798% in the short term. This positive relationship between WRMIT and ASEI can explained by that the workers' transfers considered one of the important sources that feed the foreign reserves, and foreign direct investment, tourism income, national exports of goods and services, and investment portfolios in the Amman Stock Exchange, meaning that these available resources employed in local investment, including stock market investments. Workers' remittances also affect in the status of current account and the balance of payments. Workers' remittances also affect economic growth, which in turn encourages the investment of these resources in fixed and financial assets, the most important of which is stocks, which raise their prices and returns. Thus, any increasing in the workers' remittances expect to have a positive and direct impact on the shares' returns. This finding is supported by a similar study conducted in Jordan by Al Oshaibat, [36], Billmeier & Massa [37]
- Fifthly, in the same contest through applying ARDL approach. That IPI is significantly influences the ASEI across both short and long run. In the Conditional Error Correction Regression equation, the coefficient for IPI (-1) (lagged value of IPI) is estimated to be 8.367808. This suggests that a 1% increase in the lagged Industrial Production Index is associated with an approximate 8.367808% increase in the ASEI, assuming other variables remain constant. The coefficient has a t-statistic of -4.638223 and a p-value of 0.0006,

indicating statistical significance. This finding aligns with many studies, such as Fama [33]; Chen & Ross [10]; McMillan [38]; Dasgupta [39], and others.

- Sixthly, the result of Money Supply (M2) variable appears to have a significant impact on the ASEI in both the short and the long run. In the Conditional Error Correction Regression equation, the coefficient for M2 (-1) (lagged value of M2) is estimated to be 0.135338. This means that a 1% increase in the lagged Money Supply is associated with a 0.135338% increase in the ASEI, holding other variables constant. The coefficient has a t-statistic of 4.064671 and a p-value of 0.0016, indicating statistical significance. This indicate M2 plays a role in influencing the ASEI in both the short and the long run. An increase in the M2 is associated with a positive impact on the ASEI, implying that a larger money supply may contribute to increased investment and trading activity in the stock market. The aforementioned finding confirmed by identical study conducted in the Jordan market like; Al-Sharkas [12]; Maysami et al.[15]; AL-Shubiri [14]; AL-Naif [5], and others.

Based on the aforementioned results, we propose the following recommendations Jordanian financial authorities and investors first, improving market efficiency enhancing transparency and prompt disclosure to prevent the exploitation of historical patterns for abnormal profit. Second: Managing monetary policy: Central banks' balance growth, inflation, and monitor the money supply (M2) to ensure they direct liquidity toward industrial production and not speculation. Third: Encouraging expatriates to invest through high-yield investment instruments by directing their savings towards the stock market and industrial projects. Finally Supporting the industrial sector: Considering the Industrial Production Index (IPI) as a key indicator, and supporting industry to ensure the long-term stability and growth of the Amman Stock Exchange.

6. Conclusion and Recommendations

This study aimed to inspect the dynamic relationship between the ASEI and a number of Jordanian macroeconomic indicators, namely; GDP, CPI, M2, IPI, and Worker Remittance (WRMIT). The study employs many statistical methodologies, including the Johansen co-integration test, ARDL approach, the Error Correction Model (ECM), and the Granger causality test.

Based on the results of Johansen Co integration test confirmed for a stable long-term equilibrium relationship among the ASEI and GDP, CPI, M2, IPI, WRMIT. The results of the VECM model confirmed a long-run causal flow originating from all independent variables toward the ASEI. Also confirmed for short-run causality running from CPI, GDP and WRMIT to ASEI.

Also based upon ARDL approach, in conclusion, the analysis demonstrates a significant relationship between lagged values of ASEI and current changes in CPI. The levels equation suggests a long-run relationship between ASEI and CPI, GDP, IPI, M2, and WRMIT. The F-Bounds Test provides evidence that a long-term relationship exists. These findings suggest that both short-term and long-term factors contribute to the behavior of ASEI.

Granger Causality test confirmed a bidirectional causality of Granger type between ASEI and GDP. In addition, there is non-directional causality between ASEI and CPI, M2, and IPI.

Based on the results of the aforementioned test, which showed the presence of a significant positive relationship between ASEI and GDP, WRMIT in the long and short run. Also, a significant negative relationship with CPI in the long and short term. Besides from the fact that the ASEI and GDP have a short-term causal relationship. This leads to doubt about the efficiency of the Amman

Stock Exchange and this indicates the existence of the possibility to exploit existing opportunities to make an abnormal return from the state of the inefficiency of this market.

Overall, the study's unique contributions lie in its focus on specific variables, the time period covered, the use of various statistical tests and criteria, and the examination of both long run and short-run relationships. These differences distinguish it from previous studies and contribute to the understanding of the relationship between the study variables.

Our study recommendation to the investors in the Amman Stock Exchange must take into their considerations the changes taking place in the macro economy as important and influential factors when making their decisions to invest in this market. Therefore, they can develop a base for dealing in this market, in order to achieve extraordinary profits, especially in light of the inefficiency of this market.

Finally, the results of this study should receive the attention of those in charge of the affairs of the Amman Stock Exchange, to strengthen the aspects related to market efficiency, raise the level of financial disclosure, and increase the transparency of financial statements.

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