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Macroeconomic determinants of stock market returns: Evidence from Oman

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ABSTRACT

This paper aims to analyze the long- and short-term effects of macroeconomic factors on stock market returns in the Sultanate of Oman, particularly the effects of inflation (CPI), interest rates (IR), foreign exchange reserve (FER), money supply (M2), per capita gross domestic product (GDP), trading balance (TB), and oil prices (OP) on the returns of the main index of the Muscat Stock Exchange (MSX30). Additionally, the paper aims to examine whether the effects changed after the low oil price crisis at the end of 2014. The autoregressive distributed lag (ARDL) model was employed to analyze quarterly data for the full sample period (2009 Q2–2022 Q4), and for the oil price crisis period (2014 Q4–2022 Q4). The findings indicate that FER and per capita GDP had positive long-term effects on the returns of the MSX30, while M2 had a negative effect. It was also found that FER and OP had a negative effect in the short run, and the short-term impact of IR and TB were positive. Moreover, the findings during the oil price crisis indicate that the M2 continued to have a negative long-term impact, while in the short run, FER had a positive impact and TB had a negative impact.

Contribution/Originality: This research offers investors and policymakers in Oman some valuable recommendations because there is no such study in Oman as an emerging and oil-dependent economy. Moreover, two important variables were added, foreign exchange reserve and oil prices, which have been omitted by most of the existing related literature.

1. INTRODUCTION

Capital markets are crucial to any economy in terms of promoting growth and development; therefore, understanding the macroeconomic factors influencing the performance of capital markets is crucial for both policymakers and market practitioners.

For stock market participants, changes in macroeconomic indicators hold crucial information. It is assumed that investors take the data into account while calculating the appropriate discount rate and the expected flow of dividends from equities, and this, in turn, has an impact on stock returns (Chen, Roll, & Ross, 1986; Pearce & Roley, 1983). Researchers have been studying the relationship between risk and return for decades. The quantitative relationship between risk and return dates back to the portfolio theory proposed by Markowitz (1952). The sources of risk that affect stock returns can be classified into firm-specific risk and market risk. Since investors can diversify (at least 30 stocks are needed to form a well-diversified portfolio (Statman, 1987)), the capital market theory concentrates on pervasive, or "systematic," risk, which posits that the pricing of huge stock market aggregates will only be influenced by factors related to broad economic conditions as the most likely source of investment risk (Chen et al., 1986).

The capital asset pricing model (CAPM) proposed by Sharpe (1964) introduced the first simple linear quantitative relationship between risk and return, stating that the expected return of capital assets can be defined by the market risk premium. Whereas, the arbitrage pricing theory (APT) proposed by Ross (1976) suggests that instead of linking the expected return to one source of risk (market risk), it is better to determine the real causes of market risk, which are the macroeconomic factors. Since then, multiple studies have examined the effect of macroeconomic indicators on stock returns.

When the APT model was tested by Fama (1981) and Fama (1990), he discovered a strong correlation between stock returns and macroeconomic factors as sources of market or systematic risk, such as industrial production, yield curve, interest rate, and inflation. Chen et al. (1986) found that industrial production, expected and unexpected inflation, the spread between high- and low-grade bonds, and the difference between long and short interest rates are highly priced in the stock market. Moreover, the famous efficient market hypothesis proposed by Fama (1970) asserts that all information and facts regarding changes in macroeconomic factors will have an impact on stock prices, and the competition among profit-seeking investors would ensure that the knowledge of macroeconomic variables is completely reflected in current stock prices (Megaravalli & Sampagnaro, 2018).

Similar studies have used single, multiple, and different macroeconomic variables to examine which factors have the most significant effect on stock returns in developed economies (see Pearce and Roley (1983); Geske and Roll (1983); Burmeister and McElroy (1988); Chen et al. (1986); Hamao (1988); Kaneko and Lee (1995); Kwon and Shin (1999); Anderson, Bollerslev, Diebold, and Wu (2005); Chen, Jiang, Li, and Xu (2016); Abbas, McMillan, and Wang (2018); Camilleri, Scicluna, and Bai (2019) and Demir (2019)).

Macroeconomic factors have also been found to significantly affect stock prices in emerging economies (see Yusof and Majid (2007); Chinzara (2011); Hassan and Al Refai (2012); Lai, Cheng, Li, and Chien (2013); Khan, Tantisantiwong, Fifield, and Power (2015); Kotha and Bhawna (2016); Jamaludin, Ismail, and Ab Manaf (2017); Kwofie and Ansah (2018); Chang, Meo, Syed, and Abro (2019); Olokoyo, Ibhagui, and Babajide (2020); Huy, Loan, and Pham (2020) and Tabash, Babar, Sheikh, Khan, and Anagreh (2022)). The literature on emerging countries is far less than that on developed countries, but all studies on both developed and emerging economies reveal contradictory results. For example, Kotha and Bhawna (2016); Kwofie and Ansah (2018) and Chang et al. (2019) found a positive relationship between inflation and stock market return; however, Jamaludin et al. (2017); Megaravalli and Sampagnaro (2018); Asravor and Fonu (2020); Olokoyo et al. (2020) and Huy et al. (2020) found a negative relationship.

Yusof and Majid (2007) noted that the characteristics of emerging markets differ from those of developed markets because developing economies' political and economic systems differ from those of emerging economies. Additionally, risk and return profiles fluctuate according to the economic and political frameworks of developing countries. For instance, relative to developed markets, risks and returns in emerging markets are observed to be higher (Ciaessens, Dasgupta, & Glen, 1995; Harvey, 1995). In the existing literature on both developed and emerging economies, the results depend on multiple factors, such as the sample period and the empirical methodology (Kaneko & Lee, 1995), and the choice of model and the choice of macroeconomic variables (Aguiar & Broner, 2006).

Oman is an emerging market and an oil-dependent economy that has been hit by a severe low oil price crisis. Arvanid and Nayar (2020) stated that a downward trend in oil prices reduces private investment and raises concerns regarding a potential slowdown in individual and industrial demand, both of which have an impact on effective demand. They found that oil prices in Oman affect multiple macroeconomic variables, including GDP, deposits, net exports, and consumption, in the long run. According to Chiweza and Aye (2018), uncertainty around oil prices has a major impact on changes in real output and numerous macroeconomic indicators but has little impact on interest rates, where a modest contribution is observed.

Al-Mawali, Hasim, and Al-Busaidi (2016) found that the oil industry has a considerable and positive impact on Oman's GDP and that this impact extends to all other non-oil industries as well. Low oil prices that persisted from 2014 until 2021 significantly hampered Oman's macroeconomic performance. Moreover, according to Naifar and Al Dohaiman (2013), economies in the Gulf Cooperation Council (GCC) that are dependent on oil are marked by a great deal of uncertainty and a high level of volatility in exports and government revenue. Oil price variations have a significant impact on the government budget in such countries, as well as the stock market and macroeconomic indicators.

Oman's nominal GDP, a measure of economic activity, fell by 14.1% in 2015, 5.1% in 2016, 4.3% in 2019, and 17% in 2020. Moreover, exports, government revenue, and overall economic activity have all been negatively impacted by the low oil prices (CBO Report, 2019). No study has yet been carried out to examine the influence of macroeconomic factors on equity returns on the Omani stock market.

This paper aims to identify the long- and short-run effects of a group of macroeconomic indicators on the Omani stock market returns. This group includes inflation, which is measured by the consumer price index (CPI), interest rates (IR), foreign exchange reserve (FER), money supply (M2), gross domestic product (GDP), trading balance surplus[1] (TB), and oil prices (OP). The reason for selecting 2009 Q2 as the starting quarter is because this is when the Omani economy started to recover from the consequences of the global financial crisis, as reflected by the GDP growth from about four billion Omani Rials (OMR) in the first quarter of 2009 to 4.1 billion OMR in 2009 Q2. At the same time, the MSX30 had risen from 4,628 points at the end of 2009 Q1 to 5,612 points at the end of 2009 Q2. Moreover, the paper examines the long- and short-term effects (from 2014 Q4 to 2022 Q4) after the low oil price crisis, which negatively affected GDP and the MSX30 starting from the fourth quarter of 2014 (see Figure 1).

This paper contributes to the existing literature by studying the macroeconomic determinants of the Omani stock market returns as an emerging and oil-dependent economy by analyzing seven macroeconomic variables, including oil prices and foreign exchange reserves. This paper also adds to the existing knowledge by shedding light on whether oil price shocks in oil-dependent economies change the nature of macroeconomic indicators' effects on stock market returns. The results of such research are expected to be valuable in helping to achieve Oman's vision for 2040, specifically the economic and development pillars, by enhancing and aligning the fiscal, monetary, investment, trade, labor market, and industrial policies in a manner that contribute to the development and implementation of economic plans. The results are expected to be beneficial to all investors, businesses, or individuals through better knowledge of the factors that affect stock market returns.

This study includes as many important macroeconomic variables as possible according to their effect found by previous studies. Unfortunately, collecting monthly data for all macroeconomic variables in this study was impossible. Quarterly data for foreign direct investment (FDI) is available only after 2017 Q3, and industrial production index (IPI) data is only available before 2012 with no data at all thereafter. Hassan and Al Refai (2012) suggested that IPI can be used as a proxy to measure real economic activity, but they argued that since oil is an essential input for production, oil prices can be used as a proxy for real economic activity in Jordan (oil importer). Then, oil prices should be of greater importance for an oil-exporting country such as Oman.

The remainder of this paper is structured as follows: The literature review is covered in Section 2; the data and its sources are covered in Section 3; the methodology is explained in Section 4; Section 5 discusses the empirical results; and the conclusion and recommendations for further study are covered in Section 6.

2. LITERATURE REVIEW

The relationship between macroeconomic indicators and stock returns has been covered extensively. The existing literature offers various theoretical frameworks to investigate the connection between macroeconomic

[1] Throughout the entire period of the study, the trade balance was in surplus.

factors and stock returns, including APT (Ross, 1976) and the efficient market hypothesis (Fama, 1970). Since then, numerous studies have been carried out to investigate the impact of macroeconomic indicators on stock returns, depending on these ground theories as mentioned in the introduction, such as Chen et al. (1986).

In the empirical literature, there has been some debate about the nature and direction of the relationship between macroeconomic indicators and stock returns. This holds true for studies in both developed and developing economies. Researchers have found contradictory results regarding the effect of macroeconomic indicators on stock market returns.

For example, Fama (1981) demonstrated a negative correlation between the inflation rate and stock returns. Negative stock returns will be observed during inflationary periods because of the positive correlation between stock returns and fundamental variables that influence the cost of capital, such as the average real rates of return on capital and business productivity, which decrease when inflation rises.

Bodie (1976) came to the same conclusion, that both anticipated and unexpected inflation hurt actual return on equity. Kaul (1987) also discovered a negative relationship between inflation and stock returns, and he explained that the reason for such a negative relationship is due to counter-cyclical money responses.

Geske and Roll (1983) suggested a positive correlation between stock returns and inflation based on the fact that equities can be used to hedge against inflation because they represent claims on real assets. But only a few researchers, such as Luintel and Paudyal (2006), have uncovered evidence that is compatible with this positive relationship. However, empirical research has, for the most part, shown an inverse correlation between stock returns and inflation (Li, Narayan, & Zheng, 2010).

The literature on developing economies has also provided contradictory results, for example, Asravor and Fonu (2020); Huy et al. (2020); Issahaku, Ustarz, and Domanban (2013); and Olokoyo et al. (2020) found a negative relationship between inflation and stock returns in Ghana, Nigeria, Ghana, and Vietnam, respectively, while Chang et al. (2019); Kotha and Bhawna (2016); Kwofie and Ansah (2018) and Kuntamalla and Maguluri (2022) concluded a positive relationship in Pakistan, India, Ghana, and India, respectively.

Mookerjee and Yu (1997) in Singapore, Akbar, Khan, and Khan (2012) in Pakistan, and Hassan and Al Refai (2012) in Jordan examined the relationship between foreign exchange reserve (FER) and stock returns and discovered a significant, negative, long-run relationship between FER and stock returns. The accumulation of foreign exchange reserves is a sign that the central bank is actively attempting to limit the flow of money on the foreign exchange market, which could have a long-term negative impact on the stock market returns. Increases in FER can also result in an expansion of M2, which lowers stock prices by raising the discount rate (Hassan & Al Refai, 2012).

Because the inflation rate is directly proportional to the rate of growth of money, an increase in M2 may increase the discount rate and decrease stock prices (Fama, 1981). On the other hand, a negative relationship could occur if the monetary growth that stimulates the economy led to an increase in stock market capital flows, which, in turn, raises stock prices (Mukherjee & Naka, 1995). Many authors have examined how stock prices react to changes in M2. According to Pearce and Roley (1983); Cornell (1983) and Asravor and Fonu (2020), money supply has a negative impact on stock prices, but Kotha and Bhawna (2016) discovered a positive correlation in India, and Jamaludin et al. (2017) found no relationship.

The current real value of cash flows would change if the predicted level of real production changed, and changes in the rate of productive activity in the economy should affect cash flow, which, in turn, should affect stock returns (Chen et al., 1986). An explanation for some of the cross-sectional volatility in the average asset returns can be found in news regarding projected GDP growth. An increase in output causes speculation about an increase in future cash, which then causes stock prices to rise (Vassalou, 2003). Olokoyo et al. (2020) and Huy et al. (2020) found a positive relationship between GDP and stock market returns, whereas Celebi and Hönig (2019) found no relationship.

Investments in real activity are discouraged by an increase in interest rates as debt instrument returns become more alluring. A higher interest rate also results in a greater discount rate when valuing stocks, which lowers the current value of expected future dividend cash flows (Mun, 2012). Both mechanisms state that a positive interest rate (IR) shock will lower stock returns.

Findings by Gjerde and Saettem (1999) support the negative relationship. However, Flannery and James (1984) reported a positive relationship between interest rates and stock returns in accordance with the Fisher hypothesis that nominal interest rates are positively correlated with inflation.

The findings in the literature on developing economies are inconsistent. Studies by Kotha and Bhawna (2016); Chang et al. (2019) and Olokoyo et al. (2020) discovered a negative correlation between IR and stock returns, but Asravor and Fonu (2020) and Huy et al. (2020) came to the opposite conclusion and showed a positive correlation. Hassan and Al Refai (2012) did not conclude such a relationship in Jordan, and Chellaswamy, Natchimuthu, and Faniband (2020) also concluded no relation in China and India.

It is frequently maintained that any list of systematic elements that affect the returns and pricing of the stock market must include oil prices (Chen et al., 1986). Due to its significant volatility, oil price is a major macroeconomic component that contributes to unstable economic conditions and has an impact on the stability of the global financial system. Countries that export oil and those that import it are impacted by the volatility of oil prices (Naifar & Al Dohaiman, 2013).

Based on the idea that higher oil prices contribute to reducing real consumption and result in higher production costs, which may restrain the economy and restrict the variety of investment opportunities, most of the empirical results from developed and developing economies demonstrate that stock markets are negatively impacted by rising positive oil price shocks (see Hassan and Al Refai (2012); Abbas et al. (2018) and Demir (2019)). Sim and Zhou (2015) found that when the US market is doing well, significant drops in the price of oil can have a positive impact on US stock returns, whereas positive oil price shocks have a limited impact.

Only a few studies, such as Gjerde and Saettem (1999), found a positive relationship between oil prices and stock returns. Tabash et al. (2022) found a positive relationship in Pakistan during the Covid-19 period and no relation before the Covid-19 period.

According to Hardouvelis (1987), since an increase in the trade deficit is accompanied by a decrease in short-term interest rates, it is impossible to interpret it as good news for upcoming cash flows. As a result, an increase in stock prices is most likely.

There are only a few studies that look at the connection between trading balance (TB) and stock returns. Hardouvelis (1987) in the USA and Kwon and Shin (1999) in Korea found a positive relationship. However, a recent study by Chang et al. (2019) found a negative correlation in Pakistan.

Although previous research has shown that economic fundamentals have significant predictive power for both developed and developing equity markets, the results are inconsistent and are sensitive to the selected models, the macroeconomic variables chosen for the regression, the statistical method, and the state of the economy. Additionally, no study examines the influence of macroeconomic variables on equity returns in the Omani stock market. Accordingly, this study aims to fill this gap.

3. DATA

This study considers seven macroeconomic variables as independent variables and the Muscat Stock Exchange (MSX30) as the dependent variable. The MSX30 is a major index that tracks the performance of the 30 most profitable firms trading on the Muscat Stock Exchange, which is a capitalization-weighted index. The selection of macroeconomic variables is based on the related literature, and an effort has been made to incorporate all critical variables, but some quarterly data was impossible to collect, as mentioned in the introduction.

Accordingly, this study considers the consumer price index (CPI), interest rates (IR), foreign exchange reserve (FER), money supply (M2), gross domestic product (GDP), trading balance (TB) surplus, and oil prices (OP) as the macroeconomic variables used to measure the effect on the returns of the main index of the MSX30. Quarterly data from 2009 Q2 to 2022 Q4[2] and from 2014 Q4 to 2022 Q4[3] was used. All the data was collected from the Omani National Center for Statistics and Information (NCSI).

Figure 1 illustrates the relationship between the macroeconomic variables (real values) and the MSX30. It is clear that there is a gradual decrease in the value of the MSX30 from the end of 2014, with a small rise beginning in 2021 but still lower than the peak levels in 2014.

Table 1 provides the descriptive statistics for all the variables under consideration in real values before converting all series into the logarithmic growth form by subtracting the current quarter's logarithmic value from the prior quarter's logarithmic value, i.e., $\Delta \ln X_t = \ln x_t - \ln x_{t-1}$. Figure 2 represents the relationship between the macroeconomic variables and the MSX30 after converting to logarithmic growth values.

The econometric model of the study is as follows:

$$\Delta lnMSX_{30t} = \alpha_0 + \beta_1\,\Delta lnCPI_t + \beta_2\,\Delta lnFR_t + \beta_3\,\Delta lnGDP_t + \beta_4\,\Delta lnIR_t + \beta_5\,\Delta lnM_{2t} + \beta_6\,\Delta lnOP_t + \beta_7\,\Delta lnTB_t + \mathcal{E}_t \qquad (1)$$

In Equation 1, $\alpha 0$ is the constant, β 1, β 2,……, β 7 are the model factors, and $\mathcal{E}t$ is the idiosyncratic error.

Table 1. Descriptive statistics.

Variable	Notation	Unit	Source	Mean	Maximum	Minimum	Std. dev.
MSX30 (Muscat Securities Exchange Major Index)	MSX30	Point	National Center for Statistics and Information (NCSI)	5,332	7,484.2	3,448.3	1,083.8
Consumer price index (the base year is 2012)	CPI	Point		101.8	109.9	89.6	5.1
Foreign exchange reserve	FER	Million Omani Rials (OMR)		6,226	8,271	4,280	951
GDP per capita	GDP	Million OMR per capita		1,944	2,421	1,287	306
Interest rate (money market rate)	IR	Rate (%)		0.68	2.73	0.05	0.83
Money supply (Broad money M2)	M2	Million OMR		14,242	20,767	7,587	4,168
Oil prices (quarterly based on the average daily settlement price of the contracts for the sale of Oman oil on the Dubai Mercantile Exchange (DME)	OP	US$/BBL		74.05	119.13	34.77	24.81
Trading balance (surplus)	TB	Million OMR		1,482	3,027	128	772

[2] The second quarter of 2009 was chosen as the start of the entire study period in order to neutralize the effect of the global financial crisis.

[3] The fourth quarter of 2014 was chosen as the start of the second period because this is when the low oil prices crisis started.

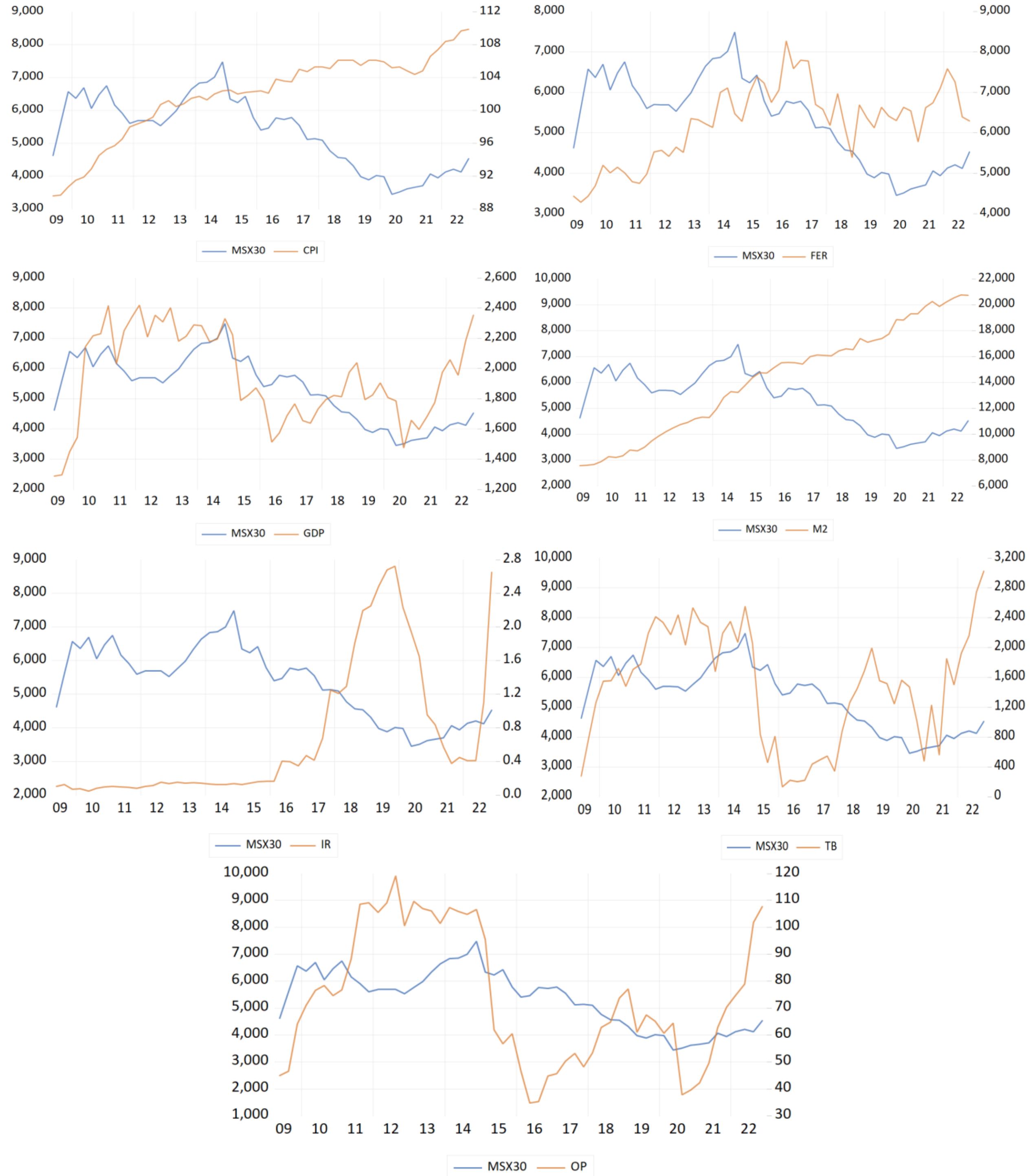

Figure 1. Macroeconomic variables and the MSX30 (real values).

4. METHODOLOGY

The maximum likelihood-based technique of Johansen (1991) and the usual residual-based approach given by Engle and Granger (1987) were both heavily utilized in earlier literature to examine the cointegration between macroeconomic variables and stock returns. But under those models, stationary data is a mandatory prerequisite, in other words, both methods require the model's underlying variables to be integrated to the same level.

Determining if the data set is stationary is crucial for time series analysis. Over a given period, the data set is said to be stationary if its mean and variance remain constant.

The autoregressive distributive lag (ARDL) methodology developed by Pesaran, Shin, and Smith (2001) does not require the data to be stationary, and it can be used if the variables are integrated at level I(0), or at first difference

I(1). Additionally, the ARDL model produces reliable findings from a single equation estimation and yields solutions for both the short-run and long-run explanations regarding factors that influence stock returns, even for tiny observations.

Accordingly, the ARDL model made famous by Pesaran et al. (2001) was employed to analyze the econometric model in Equation 1.

The data set's stationarity is examined using the augmented Dickey–Fuller (ADF) unit root test, devised by Dickey and Fuller (1981), to make sure that only I(0) and I(1) integrations are included in the estimation of the ARDL model and to rule out higher-order integrated variables beyond I(1). In the following step, Equation 1 was converted into a linear ARDL model as follows:

$$\Delta lnMSX30t = \alpha_0 + \sum_{i=1}^{n1} \beta_{i1} \Delta lnMSX30_{t-1} + \sum_{i=1}^{n2} \beta_{i2} \Delta lnCPI_{t-1} + \sum_{i=1}^{n3} \beta_{i3} \Delta lnFER_{t-1} + \sum_{i=1}^{n4} \beta_{i4} \Delta lnGDP_{t-1} + \sum_{i=1}^{n4} \beta_{i5} \Delta lnIR_{t-1} + \sum_{i=1}^{n6} \beta_{i6} \Delta lnM2_{t-1} + \sum_{i=1}^{n7} \beta_{i7} \Delta lnOP_{t-1} + \sum_{i=1}^{n8} \beta_{i8} \Delta lnTB_{t-1} + \alpha_1 lnMSX30_{t-1} + \alpha_2 lnCPI_{t-1} + \alpha_3 lnFER_{t-1} + \alpha_4 lnGDP_{t-1} + \alpha_5 lnIR_{t-1} + \alpha_6 lnM2_{t-1} + \alpha_7 lnOP_{t-1} + \alpha_8 lnTB_{t-1} + \varepsilon_t \quad (2)$$

Equation 2 contains variables with alphas which display the long-term relationship, while variables with summation signs display the dynamics of error correction. The ARDL bounds test is employed to examine the cointegration and the long-run relationship.

The ARDL bounds technique uses the F-test to test the null hypothesis of no cointegration (H_0): ($\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = \alpha_7 = \alpha_8 = 0$) against the alternative hypothesis of cointegration (H_1): ($\alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq \alpha_5 \neq \alpha_6 \neq \alpha_7 \neq \alpha_8 \neq 0$) to look at potential cointegrated relationships between the variables.

The lower and upper bound values suggested by Pesaran et al. (2001) are compared with the F-statistic that was derived from the bounds test.

Rejection of the null hypothesis indicates cointegration between macro indicators and stock returns. Then, the following error correction model (ECM) is analyzed to capture the short-term effect of macro indicators on stock returns.

$$\Delta lnMSX30t = \alpha_0 + \sum_{i=1}^{n1} \beta_{i1} \Delta lnMSX30_{t-1} + \sum_{i=1}^{n2} \beta_{i2} \Delta lnCPI_{t-1} + \sum_{i=1}^{n3} \beta_{i3} \Delta lnFER_{t-1} + \sum_{i=1}^{n4} \beta_{i4} \Delta lnGDP_{t-1} + \sum_{i=1}^{n4} \beta_{i5} \Delta lnIR_{t-1} + \sum_{i=1}^{n6} \beta_{i6} \Delta lnM2_{t-1} + \sum_{i=1}^{n7} \beta_{i7} \Delta lnOP_{t-1} + \sum_{i=1}^{n8} \beta_{i8} \Delta lnTB_{t-1} + \lambda ECM_{t-1} + \varepsilon_t \quad (3)$$

Equation 3 contains n_1, n_2, n_3, n_4, n_5, n_6, n_7, and n_8 as the lag lengths, ECMt represents the error correction term, and a corrective mechanism for the deviations from equilibrium is implied by a negatively estimated and significant λ parameter. This shows how quickly short-run modifications are made to the long-run equilibrium relationship.

Moreover, multiple diagnostic test statistics were used, such as the Ramsey RESET test for model specifications, serial correlation, the Breusch–Godfrey LM test,[4] a heteroskedasticity test, and a histogram normality test. Finally, the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) were employed to check the model's structural stability.

All previous steps were conducted for the entire study period (2009 Q2–2022, Q4), then repeated for the period after the low oil price crisis period (2014 Q4–2022 Q4).

[4] This test is frequently referred to as an LM test for serial correlation because it is based on the concept of Lagrange multiplier testing.

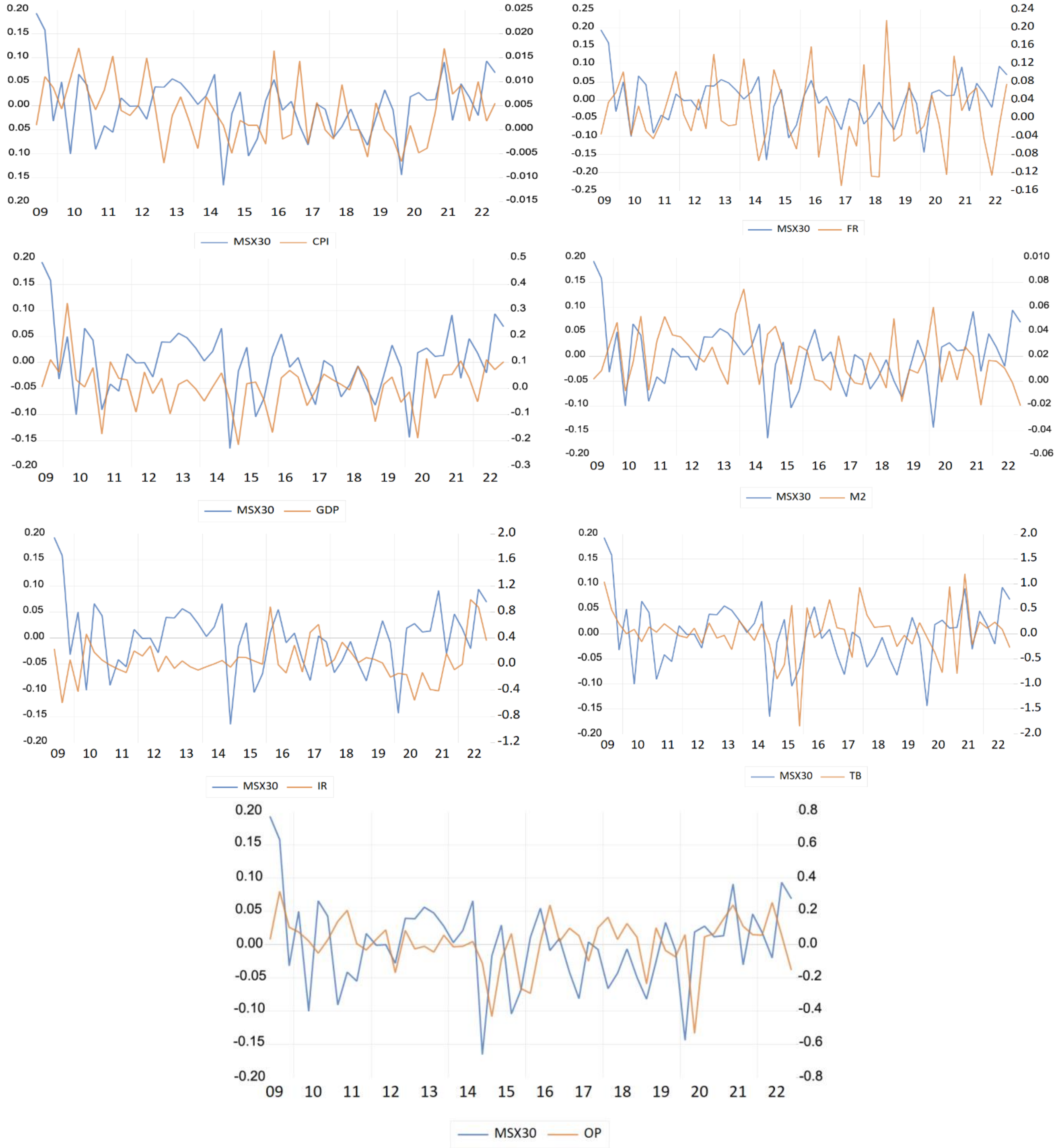

Figure 2. Macroeconomic variables and MSX30 (in growth values).

5. RESULTS AND DISCUSSIONS

This study employs the ADF unit root test to determine the nature of stationarity for the time series data used. First, the test was conducted for the entire study period (2009 Q2–2022 Q4). Table 2 below contains the results. Panel A demonstrates the ADF results with constant, with constant and trend, and without constant and trend. Most of the variables have a unit root and thus are not stationary at the I(0) level, such as MSX30, CPI, GDP, and M2. Whereas Panel B indicates that all variables are stationary at first difference I(1).

Table 2. Unit root test results for the entire study period (2009 Q2–2022 Q4).

	Panel A: Augmented Dickey–Fuller (ADF) unit root test at level					
	With constant		With constant & trend		Without constant & trend	
	T-statistic	Prob.	T-statistic	Prob.	T-statistic	Prob.
MSX30	-3.6162	0.0086*	-3.4895	0.0511 no	-3.5876	0.0006*
CPI	-6.3563	0.000*	-6.7273	0.000*	-1.4942	0.1251 no
FER	-7.8854	0.000*	-8.1205	0.000*	-7.7693	0.000*
GDP	-3.2209	0.0247*	-3.189	0.0986 no	-3.2573	0.0016*
IR	-3.409	0.0157*	-3.7907	0.0265*	-2.1818	0.0293*
M2	-1.9468	0.3088 no	-3.2413	0.0885 no	-0.9343	0.3067 no
OP	-6.0059	0.000*	-5.9512	0.000*	-6.0338	0.000*
TB	-10.1545	0.000*	-10.0498	0.000*	-10.2175	0.000*
	Panel B: Augmented Dickey–Fuller (ADF) unit root test at first difference					
	With constant		With constant & trend		Without constant & trend	
	T-statistic	Prob.	T-Statistic	Prob.	T-statistic	Prob.
d(MSX30)	-6.8359	0.000*	-6.9686	0.000*	-6.9189	0.000*
d(CPI)	-8.5733	0.000*	-4.4194	0.0051*	-8.6621	0.000*
d(FER)	-7.3601	0.000*	-7.2752	0.000*	-7.4262	0.000*
d(GDP)	-6.9946	0.000*	-7.5247	0.000*	-4.1859	0.0001*
d(IR)	-8.5462	0.000*	-8.5102	0.000*	-8.574	0.000*
d(M2)	-3.9694	0.0034*	-4.0309	0.0143*	-3.955	0.0002*
d(OP)	-8.8079	0.000*	-8.72	0.000*	-8.8906	0.000*
d(TB)	-7.0338	0.000*	-6.9424	0.000*	-7.1035	0.000*

Note: * indicates significance at 5%; "no" = not significant.

Table 3. Unit root test results for after the oil price crisis period (2014 Q4–2022 Q4).

	Panel A: Augmented Dickey–Fuller (ADF) unit root test at level					
	With constant		With constant & trend		Without constant & trend	
	T-statistic	Prob.	T-statistic	Prob.	T-statistic	Prob.
MSX30	-5.2054	0.0002*	-5.7994	0.0002*	-5.2769	0.000*
CPI	-5.6868	0.000*	-5.7973	0.0002*	-2.8161	0.0064*
FER	-4.8313	0.0005*	-5.492	0.0005*	-4.8115	0.000*
GDP	-6.3597	0.000*	-6.2224	0.0001*	-6.4714	0.000*
IR	-2.5518	0.116 no	-2.0086	0.568 no	-1.757	0.075 no
M2	-2.3954	0.152 no	-2.3316	0.404 no	-1.6702	0.089 no
OP	-4.5903	0.0009*	-4.8254	0.0026*	-4.6662	0.000*
TB	-8.0346	0.000*	-8.3084	0.000*	-8.1668	0.000*
	Panel B: Augmented Dickey–Fuller (ADF) unit root test at first difference					
	With constant		With constant & trend		Without constant & trend	
	T-statistic	Prob.	T-statistic	Prob.	T-statistic	Prob.
d(MSX30)	-8.9842	0.000*	-3.6297	0.0459*	-9.0696	0.000*
d(CPI)	-7.104	0.000*	-6.9718	0.000*	-7.2135	0.000*
d(GDP)	-7.009	0.000*	-6.8755	0.000*	-6.9975	0.000*
d(FER)	-9.2478	0.000*	-4.2127	0.0137*	-9.4063	0.000*
d(IR)	-3.2058	0.0299*	-4.4194	0.0051*	-3.1995	0.0024*
d(M2)	-6.835	0.000*	-6.6359	0.000*	-6.7709	0.000*
d(OP)	-4.3253	0.0021*	-4.3233	0.0100*	-4.3749	0.0001*
d(TB)	-5.2046	0.0002*	-5.1538	0.0013*	-5.3213	0.000*

Note: * denotes significance at 5%; "no" = not significant.

In Table 3, Panel A represents the same ADF unit root test but after the crisis period (2014 Q4–2022 Q4). The results of the ADF test indicate that two variables, IR and M2, are not stationary at level I(0). But it is clear from Panel B that all variables are stationary at first difference I(1). Since all variables are stationary at the first level in both periods studied, we proceed to conduct the ARDL cointegration test.

The first step in the ARDL model is the bounds test to determine whether cointegration exists. It is essential for the F-statistic from the bounds test to exceed the upper bound's critical value in the table prepared by Pesaran et al. (2001). This means that cointegration is a prerequisite for taking further action. Table 4 indicates that the F-statistic value for the bounds test is higher than the upper bound value at a 5% significance level for both periods of the study. Accordingly, cointegration exists between the macroeconomic variables and the MSX30 returns, thus we can move to estimate the long- and short-run relationships between the macroeconomic variables and the MSX30 returns, as presented in Tables 5 and 6, respectively.

Table 4. Results of bounds test.

Model	F-statistic	Significance level	Lower bound I(0)	Upper bound I(1)	Decision
*Δ*LnMSX30 (Entire study period)	5.681	5%	1.97	3.18	Cointegration
*Δ*LnMSX30 (After the oil price crisis period from 2014 Q4 to 2022 Q4)	4.689	5%	1.97	3.18	Cointegration

Panel A in Table 5 shows the results of the long-run analysis for the entire study period, and the results indicate positive long-term effects for foreign exchange reserve (FER) and per capita GDP on the MSX30 and a negative effect for M2. The greatest effect on the MSX30 is caused by FER (β = +0.915), which means that a 1% increase in FER causes a 0.91% increase in MSX30 returns. Panel B shows that the error correction term $COINTEQ_{t-1}$[5] has the correct negative sign and is statistically significant (significance level = 0.000). The value of the $COINTEQ_{t-1}$ coefficient (-97.12%) indicates how quickly any disequilibrium will be corrected, or the rate of adjustment to the long-run equilibrium, so any disequilibrium from the previous quarter is nearly repaired by 97% in the next quarter. In other words, the dependent variable will return to equilibrium at a rate of 97% per quarter. The results also show that in the short run, FER and OP had a negative effect on the MSX30 returns, while the short-term impact of IR and TB was positive. FER continues to have the greatest effect, even in the short run, but this time in a negative way (β = -0.462), which means that in the short run, a 1% increase in the FER decreases the MSX30 return by 0.462%.

Panel A in Table 6 indicates that during the oil price crisis, there was no long-run effect for any of the macroeconomic indicators, except for M2, which continued to negatively affect MSX30 returns in the long run. Panel B in Table 6 shows that the error correction term $COINTEQ_{t-1}$ also has the correct negative sign and is statistically significant (significance level = 0.000). The value of the $COINTEQ_{t-1}$ coefficient (-77.9%) indicates that any disequilibrium from the previous quarter is nearly repaired by 77.9% in the next quarter. In other words, the dependent variable will return to equilibrium at a rate of 77.9% per quarter. Additionally, Panel B presents only two variables that affected the MSX30 in the short run during the crisis; FER had a positive effect (β = +0.31), while TB had a negative effect (β = -0.452). Finally, the results in Tables 5 and 6 show that during the low oil price crisis, the effect of macroeconomic factors on the returns of the MSX30 suffered a significant adjustment.

Panel C in Tables 5 and 6 shows that all significance levels for all diagnostic tests were more than 5%, which means that there is no serial correlation problem, the variance of errors is stable across observations, the residuals are normally distributed, and there are no specification errors in the model.

Finally, Figure 3 indicates that the green line in all four parts of the figure stays within the boundaries of the 5% significance level, which indicates that all coefficients and the ECM are stable.

[5] The error correction (EC) term is represented in EViews as CointEq(-1).

Table 5. ARDL estimation for the entire study period (2009 Q2–2022 Q4).

Panel A. Long-run analysis		
Regressor	**Coefficient**	**Significance level**
CPI	0.377	0.799
FER	0.915	0.0188*
GDP	0.377	0.0124*
IR	-0.031	0.4395
M2	-0.714	0.0258*
OP	-0.059	0.8222
TB	-0.007	0.9458
Panel B. Short-run analysis		
Regressor	Coefficient	Significance level
D(FER)	-0.317	0.0001*
D(FER(-1))	-0.462	0.0008*
D(FER(-2))	-0.453	0.0004*
D(FER(-3))	-0.278	0.0015*
D(IR)	-0.020	0.3533
D(IR(-1))	0.069	0.0027*
D(OP)	-0.019	0.7085
D(OP(-1))	-0.014	0.8590
D(OP(-2))	-0.131	0.0718
D(OP(-3))	-0.107	0.0341*
D(TB)	0.008	0.7091
D(TB(-1))	0.005	0.8886
D(TB(-2))	0.073	0.0298*
D(TB(-3))	0.056	0.0039*
$COINTEQ_{t-1}$ (ECT)	-0.972	0.0000*
Panel C. Diagnostic tests		
Test	F-statistic	Significance level
Breusch–Godfrey serial correlation LM test	0.698	0.5062
Breusch–Pagan–Godfrey heteroskedasticity test	1.016	0.4780
Jarque–Bera residual normality test	3.946	0.1390
Ramsey RESET test for specification errors	0.669	0.4204

Note: * denotes significance at the 5% level.

Table 6. ARDL estimation after the oil price crisis period (2014 Q4–2022 Q4).

Panel A. Long-run analysis		
Regressor	**Coefficient**	**Significance level**
CPI	5.346	0.0775
FER	-0.306	0.4101
GDP	0.031	0.9070
IR	-0.039	0.2818
M2	-1.707	0.0207*
OP	0.025	0.8664
TB	-0.075	0.1985
Panel B. Short-run analysis		
Regressor	Coefficient	Significance level
D(FER)	0.317	0.0445*
D(FER(-1))	-0.462	0.2542
D(TB)	-0.453	0.0084*
D(TB(-1))	-0.278	0.0857
$COINTEQ_{t-1}$ (ECT)	-0.779	0.0000
Panel C. Diagnostic tests		
Test	F-Statistic	Significance level
Breusch–Godfrey serial correlation LM test	0.688	0.5159
Breusch–Pagan–Godfrey heteroskedasticity test	0.362	0.9613
Jarque–Bera residual normality test	1.886	0.3895
Ramsey RESET test for specification errors	0.566	0.5781

Note: * denotes significance at the 5% level.

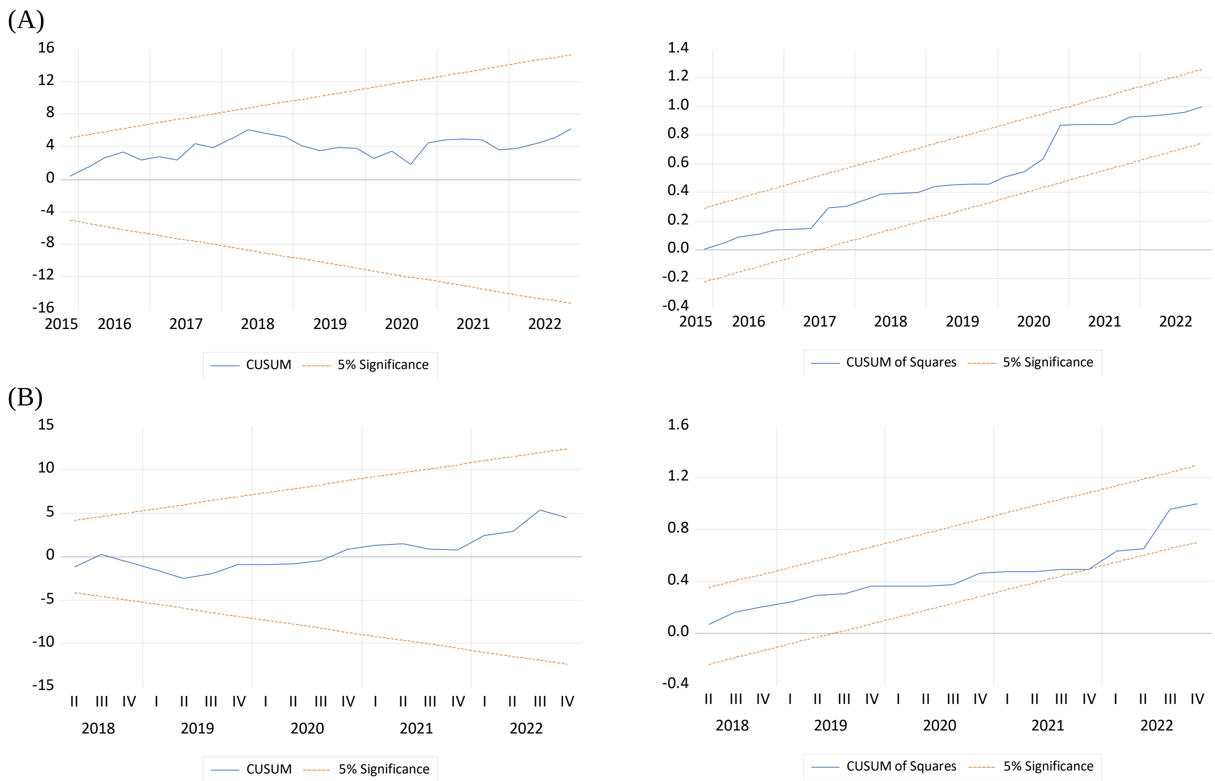

Figure 3. Cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMSQ).

Note: (A) represents the entire study period (2009 Q2–2022 Q4), and (B) represents the period after the oil price crisis (2014 Q4–2022 Q4).

6. CONCLUSION

This study has tried to assess how macroeconomic parameters affect stock returns in the Sultanate of Oman using quarterly data for two periods (2009 Q2–2022 Q4 and 2014 Q4–2022 Q4) during the oil price crisis. The ARDL bounds testing approach was employed to capture the long-run and short-run effects of CPI, FR, GDP, IR, M2, OP, and TB on the returns of the main index of the Muscat Stock Exchange (MSX30). The findings indicate that throughout the entire study period (2009 Q2–2022 Q4), FER and per capita GDP had positive long-term effects on MSX30 returns, while M2 had a negative effect. Whereas in the short run, FER and OP had a negative effect, but the short-term impact of IR and TB was positive. Moreover, the findings during the oil price crisis (2014 Q4–2022 Q4) indicate that M2 continued to have a negative long-term impact. FER had a positive impact in the short term, while TB had a negative short-term impact. Oil prices had a short-run effect on stock returns only in the entire study period with no effect during the crisis.

The results of this study for the entire period are consistent with the majority of literature regarding the positive effects of FER, GDP, and TB and the negative effects of M2, FER, and OP, as mentioned in the literature review. However, the positive short-term effect of IR is interesting; its positive effect may be because Oman depends widely on Islamic banking. Moreover, it seems that investors in Oman do not consider broad fluctuations in the CPI supply to be informative.

Overall, the findings show that the nature of the relationship between macroeconomic variables and the returns on the Omani stock market underwent a significant change during the low oil price crisis, which is in contrast to the literature stating that FER and TB had the opposite effect during the crisis.

Unfortunately, collecting monthly data for all macroeconomic variables used in this study was impossible, especially for GDP, which is only available in a quarterly frequency. Quarterly data for foreign direct investment (FDI) is available only after 2017 Q3, and industrial production index (IPI) data is only available before 2012 with no data thereafter.

There is still room for more thorough results from the current investigation. It would be interesting to study how the stock market is affected by macroeconomic variables in another oil-dependent country by integrating different macroeconomic variables. Since some studies have demonstrated a nonlinear relationship between macroeconomic variables and stock returns, e.g., Gopinathan and Durai (2019), future studies could also use nonlinear ARDL methods (NARDL). The Sultanate of Oman's governments, as well as local and international institutional and individual investors, may be the study's main beneficiaries. Finally, it is recommended that the government and investors should be more concerned about the long-run negative money supply effect on the Omani stock market returns.

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