

# Moderating Effects of Oil Price on the Impact of Macroeconomic Variables on Stock Market Performance

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## Abstract

*This study makes examination of the moderating effects of oil price on the impact of inflation, exchange rate and interest rate variables on stock market performance as proxied by the Tanzania All Share Index. It uses monthly time series from January 2009 to December 2019. The model capturing the direct impact of the macroeconomic factors on the index of stock market shows that exchange rate and interest rate exert positive and significant impact on the stock market performance, while, inflation has negative and significant effects on the stock market performance. The moderating effect model shows that oil price has a moderation effect on the effect of inflation on stock market performance. It also reveals that the impact of exchange rate on stock market performance is strengthened by changes in oil price thus suggesting a positive moderation. The results imply that a growing economy and oil importing country like Tanzania needs to properly model its macroeconomic variables with oil price in order to improve performance of stock market.*

**Keywords:** Exchange rate, Interest rate, Oil price, Stock market index and Arbitrage Pricing Theory

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## **Introduction**

Stock market plays a significant role in the economic development as it encourages investment through pooling together the users and suppliers of financial resources. The performance of the stock market can significantly influence investors' decisions basing on the analysis of the risks and rewards offered in the market. Economic events such as inflation, interest rate and currency movements are among the drivers of the movement in stock indices and hence the stock market performance (Tripathi & Seth, 2014; Peiro, 2016). Such economic factors affect the cashflows and the discount factor, the two key elements of stock valuation models.

An earlier work by Ross (1976) found the existence of a relationship between stock returns and macroeconomic factors. Since then, there have been several empirical studies on the relationship (Amata, Muturi & Mbewa, 2016; Barakat, Elgazzar & Hanafy, 2016; Chen et al, 1986; Hasan & Sharif, 2019; Jamaludin, Ismail & Ab Manaf, 2017 and Tripathi & Seth, 2014) with majority attempting to understand the direct impact of macroeconomic factors on stock market performance.

In general, the results are mixed in terms of the direction of the effect of such variables on the market performance. For example, inflation was found to impact negatively the stock market performance in some studies (Hasan & Sharif, 2019; Jamaludin *et al*, 2017), while other studies found a positive relationship (Barakat *et al*, 2016; Tiwari, Dar, A, Bhanja, Arouri, & Teulon, 2015). Similarly, interest rate was found to be positive by Asamoah, Agana, & Sakyi, (2016); Mutuku and N'genyi, (2015) and negative in Amarasinghe, (2015) and Amata *et al*, (2016). The conflicting results may suggest that there are other intervening variables which affect the impact of macroeconomic variables on stock performance which prior studies ignored. The current study attempts to analyse such effect by introducing an oil price as a moderating variable.

In Tanzania, studies on the effect of macroeconomic variables on the performance of stock market appear scanty. Epaphra and Salema (2018) studied the impact of macroeconomic variables on stock prices of ten listed firms in Tanzania. Also, Gwaihula (2018) examined the macroeconomic factors affecting the stock market performance. While the two studies have shed light into the macroeconomic – stock market nexus in Tanzania, they provide mixed results in effects of some variables. Apart from using a longer time frame, the present study improves from the two studies by analyzing the moderating effect of oil price in the relationship between inflation, interest rate and exchange rate on stock market performance. The selected macroeconomic variables have been commonly used (Asamoah et al, 2016; Barakat et al, 2016; Gwaihula, 2018 and Mutuku and N'genyi, 2015) and were chosen due to their theoretical significance in explaining country's economic conditions (Epaphra & Salema, 2018).

Fluctuations of the price of oil, the leading imported commodity in Tanzania accounting for about 25% of imports (Bank of Tanzania, 2020), can have profound impact on stocks and other economic activities. The listed companies at the Dar es Salaam Stock Exchange (DSE) use oil in differing proportion depending on the nature of their business activities. The fluctuations of oil price as moderating other macroeconomic variables would impact the performance of those companies and the stock market in general. The impact could be to scale

up or down or alter the direction of the effect of individual macroeconomic variable on the equity market performance.

The main objective of the current study is thus to examine the moderating effect of oil price on the impact of macroeconomic factors on stock market performance. Specifically, an attempt is made to examine the moderating effects of oil price on the impact of inflation, interest rate, exchange rate on stock market index in Tanzania. The study also investigates the direct effects of such variables on the performance of the stock market.

The main justification regarding the oil price changes having a moderating effect on economic factors and stock market performance is the weakening relationship between oil price changes and economic growth. An earlier study by Hamilton (1996) highlights the relationship between oil price changes and economic output to weaken over time. Further, Bergmann (2019) note such a weakened relationship to be brought about by the greater flexibility of other macroeconomic channels to absorb the oil price shocks. For instance, some countries respond to rising oil prices by adopting expansionary monetary policy. In that regard it becomes apparent to establish the relationship between macroeconomic factors and stock market by integrating the oil price in such a relationship to determine the impact of the integration.

The study draws both practical and theoretical contributions. Based on the role of stock market as well as the significance of the macroeconomic variables in the economic affairs of the country, the study offers the following contributions: First, policy makers and regulators need to understand the impact of such an interaction to aid them in the formulation of prudent policies and in ensuring standard regulations are set. An oil importing and small economy such as Tanzania has no power in influencing the price of oil, in that regard the adoption of other macroeconomic variables modeled with the oil price can be significant in bettering the economy. Specifically, while formulating the interest rate policies, it is important to have a balanced interest rate that will encourage investment. Second, findings are important in forecasting stock market performance, hence investors can analyse the impact of various economic variables while making their investment decisions. Third, the study contributes to the body of knowledge by introducing oil price as a moderating variable while applying the Arbitrage Pricing model in analyzing how the strength and direction of the association between macroeconomic factors and stock market is impacted.

The organization of the rest of this paper is such that, an introduction is followed by theoretical framework, which is followed by hypothesis development and description of the methodology and data used. The study then presents the empirical results and discussion before it makes the conclusion.

## **Theoretical Framework**

The performance of stock market is gauged by the stock market indices which are the weighted average market capitalization of individual stocks in the given market or market segment. The performance is thus dependent upon the returns of individual stocks which represent the change in price of stock over time. Returns of stock are affected by the risk factors which are regarded in this context as macroeconomic variables which includes; inflation, interest rates and exchange rate. Inflation is the general increase in price, which can be measured by the consumer price index. Interest rate is the monetary charge in relation to

borrowing, and can be measured by the short-term borrowing in the form of Treasury Bills rate. Exchange rate represent the price of one currency expressed in another currency.

According to Ross (1976)'s Arbitrage Pricing Theory (APT), such risk factors are significant in pricing of financial assets. The theory postulates that, in the absence of arbitrage opportunities, the risk factors are linearly related to the expected return on the financial assets. The systematic risk factors include macroeconomic ones such as inflation, interest rate, exchange rate, money supply and GDP.

Mathematical representation of the theory is written as;

$$E(r_j) = r_f + \beta_1 RP_1 + \beta_2 RP_2 + \dots + \beta_n RP_n$$

Where,

$E(r_j)$ - Expected return on stock;

$RP_n$ - Risk premium associated with a factor n

$\beta_n$ - Sensitivity of asset price to a factor n

$r_f$ - Risk free rate

The APT did not specify the exact number of variables to include in the model. This allows testing for sensitivity of expected return by subjecting it to various macroeconomic patterns. As such, the model can be modified into various forms in attempt to determine the effect of the risk factors on the stock returns (Wang et al, 2011). Among such modifications includes, modelling the interacting effect in the form of moderation of a variable on the impact other variables have on the stock returns. In this case, oil price is made to interact with inflation, interest rate and exchange rate and factored in the model to establish the effects.

The APT is complimented by the stock valuation model by Williams (1938) in determining equity value subject to risk factors. According to the model the value of equity is dependent on the amount of dividend (cash flow) and the cost of capital (discount rate). The association is such that, equity relates directly to the cash flow and inversely to the discount rate. In relation to APT and macroeconomic variables, the model relates increases in equity value with all variables that causes increases in cash flow of the company. Also, an increase in stock returns is positively associated with all variables that cause a decline in the discount rate (Ferrer *et al*, 2016).

The relationship between inflation and stock market performance is demonstrated by the Fishers' hypothesis (1930), and later on by Fama (1981). According to Fisher (1930), nominal interest rate carries the information content regarding the expected rate of inflation, thus implying a higher inflation rate would require increases in nominal interest rate to compensate an investor for the erosion of purchasing power due to inflation. This means equity returns can be used as a hedge against inflation, since equity represents the ownership of income generated by the real assets (Tiwari et al, 2015). In that case expected increases in inflation is

associated with a raise in value of the nominal interest rate. Modeling this effect on APT it will show a positive effect of the expected inflation on the stock returns.

Conversely, Fama developed the proxy hypothesis that challenges the inflation-hedging hypothesis. Accordingly, Fama (1981) stated that the real output has a positive relationship with the equity returns, while it is negatively linked with the inflation. Thus, the negative association between inflation and equity return is “induced” by the negative association between inflation and real output. In this case, economic activities are reduced with increases in the rate of inflation and the effect is passed on to reduce the corporate profitability. Reduction in economic activities reflects the reduced cashflows which according to the stock valuation will result to decline in stock returns.

According to the stock valuation model, interest rate has a negative effect on the stock market performance. This is because, interest rate represents the discount rate which varies inversely with the stock market performance. Similarly, higher interest rates are likely going to induce investors to invest in the interest paying securities which will render stock unattractive causing the decline in the stock returns.

Exchange rate and stock market relationship is analysed based on the Flow Oriented Model by Dornbusch & Fisher (1980). The model states that changes in exchange rate causes changes in stock prices since exchange rate affects firms’ cash flow. The model is rooted on the trade balance suggesting that changes in the currency have impact on the international competitiveness of companies by impacting the prices of input and output (Dash & Sahu, 2018; Moore & Wang 2014). The effect of exchange rate on cash flow of the firm depends on whether the firm is an importing or exporting one (Khan, 2019). For importing firms, depreciation of the local exchange rate increases import costs thus decreases firms’ competitive edge resulting to decline in profitability and ultimately causes fall in equity values. Conversely, depreciation of the local currency improves the sales and profitability of exporting firms thus causing increase inequity value.

## **Hypotheses Development**

The empirical works are found in both developed and developing economies with differences in approaches and methodologies adopted. The development of hypotheses is based on the synthesis of the available empirical and theoretical literatures as well as the stylized facts.

Chen et al. (1986) investigated the applicability of APT in equity pricing in the US and concluded that systematic economic news has effects on the returns and pricing of financial assets. Peiro (2016) assessed the relationship between equity prices and macroeconomic factors in Europe concluding the existence of such a relationship. Other studies such as Hasan and Sharif (2019), Tripathi and Seth (2014) and Barakat et al, (2016) have also assessed the macroeconomic factors and stock market performance nexus and underscore the existence of relationship among those variables.

Hasan and Sharif (2019) investigated the impact of inflation on the stock market index in Bangladesh and noted inflation rate had a negative relationship with the stock market index. Jamaludin et al. (2017) obtained negative and significant linkages between inflation and stock market returns in support of the proxy hypothesis. Those two studies were conducted in a

developing economy, similar to the present study, their approach however, were on the analysis of the direct impact of inflation on stock market.

In Tanzania, previous studies found conflicting results in regard to the effect of inflation. Epaphra and Salema (2018) found the effect inflation had a negative and significant effect in some stocks while Gwaihula (2018) found inflation as not a significant variable to affect the stock performance. However, this study argues that raising inflation would have a negative effect on the performance of the firms and the performance of the stock market. This is because, inflation impact on the price of commodities and increases the cost of production (Sathyanarayana & Gargesa, 2018). Therefore, this study hypothesizes that:

*H1: Inflation has a negative effect on stock market performance in Tanzania.*

With regard to interest rates, when the central bank raises interest it would attract investment in interest paying securities thus reducing the excess liquidity, which may force a decline in the prices (Epaphra & Salema, 2018). Similarly, the decision to increase interest rate may trigger investors to move their funds to interest paying securities, which would cause low demand for stock and ultimately a fall in stock price.

An empirical work by Amarasinghe (2015) investigated the association between interest rate and equity price in Colombo. Author found a negative and significant relationship between interest rate and equity price. Similarly, Asamoah *et al*, (2016) examined the effect of interest rate on stock market capitalization in Ghana using autoregressive distributed lag bound tests. Authors report the existence of a long run relationship between interest rate and stock market capitalization. Further they show existence of positive association between interest rate and stock market capitalization in the long run while a negative association was found in the short run. Amata *et al* (2016) found a significant negative relationship between interest rate and stock market returns in Kenya. Specifically, the authors found in the long run, a unit increase in interest rate resulted to a decrease in stock market volatility by 0.12%. Similarly, Barakat *et al*, (2016) found a negative effect of interest rate on stock market index in Egypt due to investors tendency to shift funds from the stock market to bondmarkets.

Studies by Epaphra and Salema (2018) and Gwaihula (2018) found a negative effect of interest rate on the stock market performance, suggesting the effect to be the result of substitution effects by investors to invest in interest bearing investments in the periods of higher interest rates. From time to time the Bank of Tanzania has been changing the interest rate in attempt to foster economic growth. The changes in the interest rate are likely to have impact on businesses and investments in the country. This study hypothesizes that:

*H2: Interest rate has a negative effect on the stock market performance in Tanzania.*

Moore & Wang (2014) obtained a negative and significant relationship between exchange rate and equity market performance in the Asian countries. Similarly, findings of Boako, Omane-Adjepong & Frimpong, (2016) using daily data of exchange rates and stock returns in Ghana are in favour of the flow-oriented model, suggesting specifically that exchange have negative effect on the stock returns. Jamil & Ullah (2013) applied cointegration technique and

found the existence of negative and significant relationship between exchange rate and stock prices in Pakistan.

In Tanzania, there are mixed results pertaining to the effect of exchange rate on the stock market performance. While Epaphra and Salema (2018) found a significant positive effect, Gwaihula (2018) found no significant effects in such relationship. The difference could be attributed to the differences in the performance variables used, where, the former used aggregate returns and the later used performance index. The current study uses performance index and improve from the Gwaihula (2018) by expanding the time frame. As the country is a net importer (Magai, 2022), it is expected that depreciation of the local currency would result to decrease in stock market performance. It is thus hypothesized that;

*H3: Exchange rate has a negative effect on the stock market performance in Tanzania.*

Oil has a major role in facilitating economic activities as it is among the significant energy sources. Movements in oil prices can have impact on the performance and profitability of firms and ultimately on the performance of stock market. Increases in oil price leads to increases in the production cost that can result to lower profitability and lower equity value (Arouri, 2012; Cunado & Garcia, 2014; Jiménez-Rodríguez & Sánchez, 2012; Katircioglu *et al*, 2015). On the other hand, oil price is linked to the macroeconomic factors such as inflation, exchange rate, interest rate and GDP. Tanzania being a country that relies mostly on importation of raw materials and other commodities, increase in oil prices may lead to erosion of export competitiveness. Higher oil prices may also result to decline in real output which is regarded as decline in cashflow, causing a decline in stock returns in accordance with the stock valuation (Mukhtarov *et al*, 2020). The impact of the interaction of higher oil price and higher inflation on stock market is expected to be amplified. As a result, this study hypothesizes that;

*H4: Oil price has a positive moderating effect on the relationship between inflation and stock market performance in Tanzania.*

With regard to interest rate, an increase in interest rate is associated with the decline in stock market performance due to the substitution effect, increase in the finance cost and a decline in the cash flow (Amata *et al*, 2016; Asamoah *et al*, 2016). Increases in oil price will reduce the economic activities which further may have a negative implication to the cashflow in the listed firms (Bergmann, 2019). By proxy, the aggregate effect of the interaction between interest rate and oil price is likely to have a further negative effect on the stock market performance. It is thus hypothesized that;

*H5: Oil price has a positive moderating effect on the relationship between interest rate and stock market performance in Tanzania.*

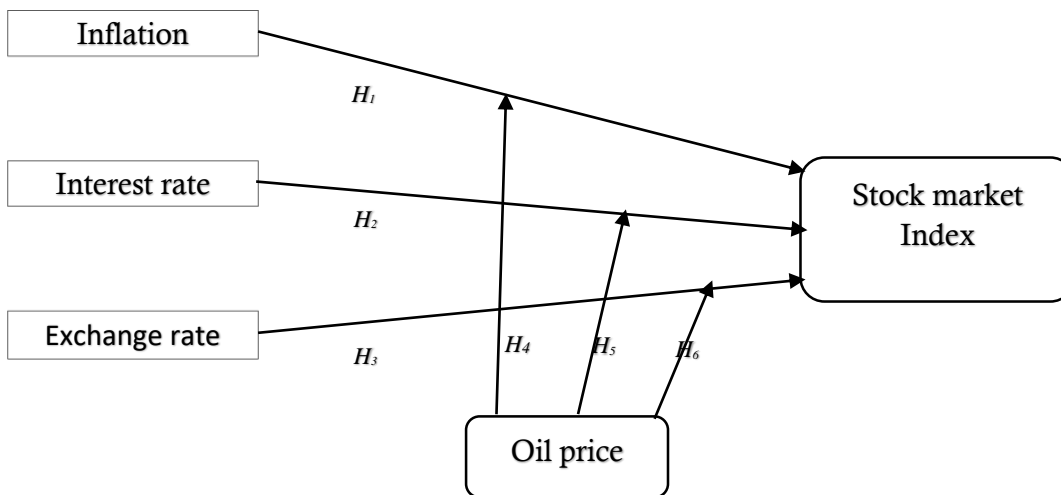
The stock market performance will be adversely affected with the depreciation of local currency if the underlying market has listed firms with more import values that exports. Higher oil price is likely to further catalyse the impact of depreciation of the local currency on the stock return. Thus, for example, since the price of oil is denominated in USD, an increase in oil price can be associated with appreciation of USD. In such a situation the impact of

exchange rate-oil price interaction on stock market performance can be further strengthened than the effect of individual variable.

*H6: Oil price has a positive moderating effect on the relationship between exchange rate and stock market performance in Tanzania.*

Based on the Arbitrage Pricing Theory and the aforementioned empirical studies, there exist a relationship between oil price, macroeconomic variables and stock market performance. Such a relationship can be established by considering the moderating role of oil price in the relationship between macroeconomic variables and stock market index as shown in Figure I.

**Figure I: Conceptual Framework**



## Methodology

The study employed monthly data spanning from January 2009 to December 2019 collected from the Dar es Salaam Stock Exchange and the Bank of Tanzania. The Dar es Salaam Stock Exchange all share index (DSEI), which is a market weighted index of all firms listed at the DSE, presented the performance of equity market in this study. The inflation rate is measured by the consumer price index (CPI). The monthly exchange rate data is obtained by the end of the month. The 91-day treasury bill rate is used to represent the interest rate and oil price used is the price per barrel of crude oil in USD determined as the average of Brent, Dubai and West Texas Intermediate obtained from the Bank of Tanzania database. Data for exchange rate and oil price were transformed to natural logarithms while those for interest rate and inflation rate were not converted since they are ratio data and represent small numbers. This was done to ensure data uniformity and to obtain the desirable statistical properties consistent with previous studies (Hasan & Sharif, 2019; Peiro, 2016; Tripathi & Seth, 2014).

This study developed two models, covering the main (direct) effects and interaction model (covering the moderating effect) adopting with modification from Katircioglu *et al.*, (2015).



Equation 1 captures the direct effects of the variables on the performance of the market. Equation 2 specifies the interaction effect of oil price on the market performance.

$$\ln dsei_t = \gamma_0 + \gamma_1 int_t + \gamma_2 infl_t + \gamma_3 \ln exch_t + \varepsilon_t \dots \dots \dots 1$$

$$\ln dsei_t = r_f + \beta_1 int_t + \beta_2 infl_t + \beta_3 \ln exch_t + \beta_4 \ln Op_t x int_t + \beta_5 \ln Op_t x infl_t + \beta_6 \ln Op_t x \ln exch_t + \varepsilon_t \dots \dots \dots 2$$

Where, *Int*, *infl*, *exch*, *op* and *dsei* represents the interest rate, inflation, oil price and stock market index respectively.

### **Data Analysis**

Analysis of the data involved the following steps; first, the unit root test was performed by employing the Augmented Dick Fuller test (ADF) to establish if the variables are stationary. Then, diagnostic tests were performed on data to test for autocorrelation and normality. The Engle Granger test was applied in testing for cointegration. Once the existence of cointegration between the variables was established, the Error Correction Model (ECM) was conducted to investigate the relationship between variables as specified by the model. Using ADF, the unit root tests found all variables, except inflation, to be non-stationary at level with t-statistics ranging from -1.51 to 0.335. Inflation was found to be stationary and significant at 5% level. The non-stationary variables were differenced once and became stationary.

Diagnostic tests were conducted to determine the reliability of coefficients for decision making. The Breusch Godfrey test for autocorrelation has a test result of 0.085 and p-value of 0.77 indicating that there is no autocorrelation. This implies that the absence of identifiable relationship between the values of the error term. Breusch-Pagan test result of 40.38 (p-value of 0.29) for heteroscedasticity indicate absence of heteroscedasticity implying equal variances for the error terms of all variables. Shapiro Wilk test for normality results has a p value of 0.1764 which is greater than the 0.05 level of significance. Thus, there is no enough evidence to reject the null hypothesis and it can be concluded that the residuals are normally distributed.

The Engle Granger test was employed to determine the presence of long run relationship among the variables. Unlike both the Johansen and the bounds test for cointegration, which are carried in a one-step procedure, the Engle Granger test follows two-steps. The first involves estimating a normal OLS model and generating the residuals. After that, the generated residuals are tested for stationarity. If the residuals are not stationary, then there is no long run relationship among the variables. Otherwise, a long run relationship exists. The Engle Granger Test for cointegration has ADF test values of -1.45 and -1.67 at level for model 1 and model 2 respectively which are lower than the 5% critical value of -1.95. This shows that there is no long run relationship among the variables since all the residuals are non-stationary which in turn allows us to estimate the error correction model (ECM).

### **Results and Discussion**

The estimation of the stock market performance was done by the use of the ECM. ECM was used due to its greater ability to estimate the short term and long term effects involved in time

series observations (Ning, Wah & Erdan, 2019). The choice of the model is also motivated by its ability to restore to an equilibrium state a variable that is in disequilibrium in the long run. All exogenous variables were interacted with oil price. Table 1 presents the estimation for the stock market performance for the two models.

The error correction coefficient is positive and significant for the two models indicating that the system does not seem to adjust to equilibrium in the event of a shock. For the system to converge to equilibrium, then it is a requirement that the error correction terms possess negative and significant coefficients. Also, the results show adjusted R-squared values of 0.774 and 0.742 for models 1 and 2 respectively indicating that the included variables are relevant to explain the behaviour of stock market index. It can thus be concluded that the models are acceptable for estimations. As stated earlier, estimations are made with regard to the main effect (direct) model and the moderating effect model.

The main effect model shows that inflation has a negative and significant effect on the stock market performance. The results are in support of hypothesis,  $H_1$  that inflation has a negative effect on stock market performance. Results show that a 1% increase in inflation will result to a decline in the stock market index by 0.108%. This indicates the substitution effect that a higher inflation makes people shift funds from investment to consumption. Moreover, investors translate increases in inflation as an indicator for low investment due to a decline in economic activities, which then results to lower prices. The findings are also in support of the proxy hypothesis that increases in inflation has a negative impact on the economic growth which ultimately is reflected in the drop in the stock market index. Such results are also consistent with the hypothesis stated and empirical findings of Hasan and Sharif (2019) and Jamaludi et al (2017). Further, the results agree with those found by Epaphra and Salema (2018) in Tanzania, despite differences in measurement of performance in the two studies.

On the other hand, exchange rate has a positive and significant effect on stock market index. This defies the priori expectations however it means depreciation of Tanzanian currency is associated with better performance of the stock market. This could imply that, if investors with foreign currency purchase more shares, they would create more demand for shares and hence an increase in share price. The findings are similar to those found by Epaphra and Salema (2018), although they analysed the exchange rate and stock price rather than the overall market index. The findings are however contrary to other empirical results such as Dash and Sahu (2018) and Nguyen (2019) that concluded on the negative effect of exchange rate on the stock market performance.

With regards to the interest rate, results show that it has a positive and significant effect on the stock market performance. Increases in interest rate leads to an increase in the stock market index. This could mean that investors are willing to invest on relatively higher risky stocks than to invest in interest paying securities due to anticipation of the higher return they could get from stocks. The findings are consistent with those by Ferrer *et al*, (2016) who argue the positive association to be a result of the flight to quality effects caused the decrease in bond yield due to higher demand, which positively correlates with a decline in price of stocks due to lower demand. However, the results are contrary to other studies Barakat et al (2016), Peiro (2016), that show a negative effect. That means increases in interest rate caused increases in the cost of capital and induces investors to opt investing in higher interest paying securities

rather than stock market, thus causing a decline in the index. Results are also contrary to those found by Epaphra and Salema (2018) in Tanzania which may be due to the differences in the specifications of the performance variables used.

The findings of the moderating model are also presented in Table 1. The coefficients of interaction term involving oil price and inflation is positive, suggesting positive moderation effects of oil price. Specifically, oil price positively moderates the effect of inflation on the stock market performance. That is the impact of inflation on performance of the market is higher when the oil price is high. High inflation tends to reduce investment and other economic activities, which results to lower market performance. Such impact is more enhanced during the rising oil prices, since higher oil price for the net oil importing economy raises the cost of production thus minimizing the firm profitability. The pronounced moderation effect shown is also associated with similarity in effects by both oil price and inflation as they both affect negatively the stock market performance (Bergmann, 2019; Jamaludin et al, 2017; Kitatia et al, 2015; Usman & Siddiqui, 2019). In that case, their interaction effect tends to magnify the effect on the stock index.

**Table I: Estimation of Stock Market performance using Error Correction Model**

<b>Variables</b>	<b>(Model 1)</b>	<b>(Model 2)</b>
d(exch)	1.308(-0.125) <sup>***</sup>	-10.122(-1.305) <sup>***</sup>
d(infl)	-0.108(-0.025) <sup>***</sup>	-0.526(-0.115) <sup>***</sup>
d(Int)	0.040(-0.045) <sup>***</sup>	-0.422(-0.174) <sup>***</sup>
d(opinfl)		0.015(-0.065) <sup>***</sup>
d(opint)		-0.205(-0.101) <sup>***</sup>
d(opexch)		2.460(-0.112) <sup>***</sup>
ECM	0.545(-0.060) <sup>***</sup>	0.629(-0.084) <sup>***</sup>
Constant	0.005(-0.004)	0.006(-0.004) <sup>**</sup>
Observations	130	130
R <sup>2</sup>	0.784	0.755
Adjusted R <sup>2</sup>	0.776	0.742
Residual Std. Error	0.010 (df = 124)	0.011 (df = 121)
F Statistic	92.105 <sup>***</sup> (df = 5; 124)	44.124 <sup>***</sup> (df = 8; 121)

*Note: t-statistics in parenthesis: \*p<0.10, \*\*p<0.05, \*\*\*p<0.01*

The effect of interest rate on market performance on the other hand is negatively moderated by the changes in oil price. This implies that, although interest rate bears a positive impact on the equity market performance, oil price affects negatively such a relationship. It also means that an increase in interest rate when oil price increase causes the reduction in the market index. The negative direct effect of oil price on stock index causes the previously positive effect of interest rate on stock index to reverse the sign of the effect. As a result, in the presence of high oil price, any increase in interest rate will cause investors to move funds from stock market to interest paying securities resulting in the decline of the stock index. The findings reflect the substitution behaviour in investment as suggested by Barakat et al (2016), Peiro

(2016) that increases in interest rate (in this case given oil price rising) can make stock market less attractive for investment, hence a drop in its index.

As for exchange rate, the effect of interacting exchange rate with oil price is much larger than what was obtained before interaction, indicating that oil price positively moderates the effect of exchange rate on equity market performance. With a coefficient of 2.460, a one percent increase in the interacted exchange rate leads to about 2.46 percent increase in the stock market index. The positive moderation of oil price on the impact of exchange rate on stock market performance further suggests the depreciation of a currency given the rise in oil price for the oil importing economy such as Tanzania.

## **Conclusion**

The paper made attempt to determine the moderating impact of oil price on the effect of the selected macroeconomic factors on the stock market performance in Tanzania. This was achieved first by determining the direct impact of macroeconomic factors on the stock index and then establishing such an impact as moderated by the oil price.

The study findings show that there is a direct effect of inflation, interest rate and exchange rate on stock market performance. The effect is such that; higher inflation causes reduction in the performance which may be due to increases in input costs by the listed firms as well as erosion of the purchasing power among the investors. Also, interest rate increases results to improvement in stock market performance. Moreover, the depreciation of the Tanzanian currency is associated with the rise in the performance of the stock market. In light of the study findings, policy makers and regulators should be prudent in setting optimal interest rates that will spur the stock market performance but also implement measures that aim at stabilizing inflation and exchange rate. The findings also indicate that there is an indirect effect caused by the moderation of oil price on the effect of inflation, interest rate and exchange rate on stock market performance. The moderation effect of oil price enhances the negative effect that inflation has on the stock market performance. The interaction effect between oil price and interest rate has a negative effect on the stock market performance, suggesting a negative moderation effect of oil price. Also, the positive effect of the exchange rate on stock market performance is further enhanced by its interaction with oil price, evidencing a positive moderation effect of oil price. The results on moderation effects of oil price shed light to investors, policy makers and regulators to model such an interacting effect in determining the performance of the stock market. Regulators needs to implement measures to maintain oil price such to avoid the adverse effects on other macroeconomic variables and the stock market in general.

The current study has not considered the asymmetric effects of oil price as suggested by studies like Akinsola & Odhiambo, (2020). Future studies may consider modeling the asymmetric properties of oil price changes in moderating the impact of macroeconomic variables and stock market performance. Also, future studies may consider studying such moderation effects sector wise.

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### **References**

- Akinsola, M. O., & Odhiambo, N. M. (2020). Asymmetric effect of oil price on economic growth: Panel analysis of low-income oil-importing countries. *Energy Reports*, 6(1), 1057-1066.
- Amarasinghe, A. (2015). Dynamic relationship between interest rate and stock price: Empirical evidence from Colombo Stock Exchange. *International Journal of Business and Social Science*, 6(4), 92-97.
- Amata, E. O., Muturi, W., & Mbewa, M. (2016). Relationship between macro-economic variables, Investor herding behaviour and stock market volatility in Kenya. *International Journal of Economics, Commerce and Management*, 4(8), 36-54.
- Arouri, M. E. H. (2012). Stock returns and oil price changes in Europe: A sector analysis. *The Manchester School*, 80(2), 237-261.
- Asamoah, L., Agana, J., & Sakyi, D. (2016). Does interest rate matter to the Ghanaian stock market? *International Journal of Management Practice*, 9(2), 159-172.
- Bank of Tanzania (2020). *Monthly Economic Review*. Directorate of Economic Research and Policy, Bank of Tanzania.
- Barakat, M. R., Elgazzar, S. H., & Hanafy, K. M. (2016). Impact of macroeconomic variables on stock markets: Evidence from emerging markets. *International Journal of Economics and Finance*, 8(1), 195-207.
- Bergmann, P. (2019). Oil price shocks and GDP growth: Do energy shares amplify causal effects? *Energy Economics*, 80(c), 1010-1040.
- Boako, G., Omane-Adjepong, M., & Frimpong, J. M. (2016). Stock returns and exchange rate nexus in Ghana: A Bayesian quantile regression approach. *South African Journal of Economics*, 84(1), 149-179.
- Chen, N. F., Roll, R., & Ross, S. A. (1986). Economic forces and the stock market. *Journal of Business*, 59(3), 383-403.
- Cunado, J., & de Gracia, F. P. (2014). Oil price shocks and stock market returns: Evidence for some European countries. *Energy Economics*, 42(2), 365-377.
- Dash, M., & Sahu, A. (2018). A study of interaction between exchange rates and stock market prices. *International Journal of Economics and Business Research*, 15(4), 541-549.
- Dornbusch, R., and Fisher, S. (1980). Exchange rates and the current account. *American Economic Review*, 70(5), 960-971.
- Epaphra, M., & Salema, E. (2018). The impact of macroeconomic variables on stock prices in Tanzania. *Journal of Economics Library*, 5(1), 12-41.

- Fama, E. F. (1981). Stock returns, real activity, inflation, and money. *The American economic review*, 71(4), 545-565.
- Ferrer, R., Bolós, V. J., & Benítez, R. (2016). Interest rate changes and stock returns: A European multi-country study with wavelets. *International Review of Economics & Finance*, 44(1), 1-12.
- Fisher, I. (1930). *The Theory of Interest*. New York: Macmillan Publishers.
- Gwaihula, R. (2018). Examining key macroeconomic factors influencing the stock market performance: Evidence from Tanzania. *International Journal of Academic Research in Accounting, Finance and Management Sciences*, 8(2), 228-234.
- Hamilton, J. (1996). This is what happened to the oil price-macro-economy relationship. *Journal of Monetary Economics*, 38(2), 215-220.
- Hasan, E., & Sharif, S. (2019). Do Macroeconomic variables affect stock market performance? A case study of DSEX and DS30 Index of Dhaka Stock Exchange. *Business and Economic Research*, 9(3), 182-203.
- Jamaludin, N., Ismail, S., & Ab Manaf, S. (2017). Macroeconomic variables and stock market returns: Panel analysis from selected ASEAN countries. *International Journal of Economics and Financial Issues*, 7(1), 37-45.
- Jamil, M., & Ullah, N. (2013). Impact of Foreign Exchange rate on stock prices. *Journal of Business and Management*, 7(3), 45-51.
- Jiménez-Rodríguez, R., & Sánchez, M. (2012). Oil price shocks and Japanese macroeconomic developments. *Asian-Pacific Economic Literature*, 26(1), 69-83.
- Katircioglu, S., Katircioglu, S., & Altun, O. (2018). The moderating role of oil price changes in the effects of service trade and tourism on growth: The case of Turkey. *Environmental Science and Pollution Research*, 25(35), 35266-35275.
- Katircioglu ST, Sertoglu K, Candemir M, Mercan M. (2015). Oil price movements and macroeconomic performance: Evidence from twenty-six OECD countries. *Renew Sustain Energy Review* 44(1), 257–270.
- Khan, M. K. (2019). Impact of exchange rate on stock returns in Shenzhen stock exchange: Analysis through ARDL approach. *International Journal of Economics and Management*, 1(2), 15-26.
- Kilian, L., & Park, C. (2009). The impact of oil price shocks on the US stock market. *International Economic Review*, 50(4), 1267-1287.
- Kitatia, E., Zablonb, E., & Maithyac, H. (2015). Effect of macro-economic variables on stock market prices for the companies quoted on the Nairobi securities exchange in Kenya. *International Journal of Sciences: Basic and Applied Research*, 21(2), 235-263.
- Magai, P. S. (2022). Trade and Foreign Direct Investment in Tanzania: Do they Matter for Economic Growth?. *Tanzanian Economic Review*, 11(2).
- Moore, T., & Wang, P. (2014). Dynamic linkage between real exchange rates and stock prices: Evidence from developed and emerging Asian markets. *International Review of Economics & Finance*, 29(1), 1-11.
- Mukhtarov, S., Aliyev, S., & Zeynalov, J. (2020). The effects of oil prices on macroeconomic variables: Evidence from Azerbaijan. *International Journal of Energy Economics and Policy*, 10(1), 72-80.
- Mutuku, C., & Ng'enyi, K. L. (2015). Macroeconomic variables and the Kenyan equity market: A time series analysis. *Business and Economic Research*, 5(1), 1-10.

- Ning, Y., Wah, L. C., & Erdan, L. (2019). Stock price prediction based on error correction model and Granger causality test. *Cluster Computing*, 22(2), 4849-4858.
- Nguyen, V. H. (2019). Dynamics between exchange rates and stock prices: Evidence from developed and emerging markets. *International Journal of Business and Finance Research*, 13(1), 73–84.
- Peiro, A. (2016). Stock prices and macroeconomic factors: Some European evidence. *International Review of Economics & Finance*, 41(2), 287-294.
- Ross, S., (1976). The Arbitrage theory of capital asset pricing. *Journal of Economic Theory* 13(1), 341-360.
- Sathyanarayana, S., & Gargesa, S. (2018). An analytical study of the effect of inflation on stock market returns. *IRA-International Journal of Management & Social Sciences*, 13(2), 48-64.
- Tiwari, A. K., Dar, A. B., Bhanja, N., Arouri, M., & Teulon, F. (2015). Stock returns and inflation in Pakistan. *Economic Modeling*, 47(1), 23-31.
- Tripathi, V., and Seth, R. (2014). Stock market performance and macroeconomic factors: The study of Indian equity market, *Global Business Review*, Vol. 15(2), 291-316.
- Usman, M., & Siddiqui, D. A. (2019). The effect of oil price on stock market returns with moderating effect of foreign direct investment & foreign portfolio investment: evidence from Pakistan stock market. *Asian Journal of Economic Modelling*, 7(2), 45-61.
- Wang, S., Yang, X., Cheng, J., Zhang, Y., & Zhao, P. (2011). The amendment and empirical test of arbitrage pricing models. *Journal of Applied Finance & Banking*, 1(1), 163-177.
- Williams, J., B. (1938). *The Theory of Investment Value*. Harvard University Press.