p-ISSN: 2708-2474
e-ISSN: 2708-2482

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Global Management Sciences Review
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# GMSR

## GLOBAL MANAGEMENT SCIENCES REVIEW

HEC-RECOGNIZED CATEGORY-Y

VOL. X, ISSUE III, SUMMER (SEPTEMBER-2025)

DOI (Journal): 10.31703/gmsr
DOI (Volume): 10.31703/gmsr.2025(X)
DOI (Issue): 10.31703/gmsr.2025(X-III)

Double-blind Peer-review Research Journal
www.gsrjournal.com


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www.humapub.com
Doi:https://dx.doi.org/10.31703

## Article title

# Interplay of Oil and Gold Prices and the Stock Performance: An Empirical Evidence from KSE - 100 Index, Pakistan


## Abstract

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**Keywords:** Oil Prices, Gold Prices, Stock Exchange Performance, KSE-100, Pakistan.


**Authors:**

**Ahmed Sameer:** MS Scholar, Department of Management Science, Faculty of Management Sciences, National University of Modern Languages (NUML), Islamabad, Pakistan.

**Hidayat Ullah Khan:** (Corresponding Author) Associate Professor, Department of Economics, Faculty of Management Sciences, National University of Modern Languages (NUML), Islamabad, Pakistan.
Email: (masmaleo@yahoo.com)

**Javed Anwar:** Lecturer, Department of Economics, Faculty of Management Sciences, National University of Modern Languages (NUML), Islamabad, Pakistan.


**Pages:** 104-113
**DOI:**10.31703/gssr.2025(X-III).10
**DOI link:** https://dx.doi.org/10.31703/gmsr.2025(X-III).10
**Article link:** http://www.gmsrjournal.com/article/interplay-of-oil-and-gold-prices-and-the-stock-performance-an-empirical-evidence-from-kse-100-index-pakistan
**Full-text Link:** https://gmsrjournal.com/article/interplay-of-oil-and-gold-prices-and-the-stock-performance-an-empirical-evidence-from-kse-100-index-pakistan
**Pdf link:** https://www.gmsrjournal.com/jadmin/Auther/31rvIolA2.pdf


## Global Management Science Review

p-ISSN: 2708-2474 e-ISSN: 2708-2482
DOI(journal): 10.31703/gmsr
Volume: X (2025)
DOI (volume): 10.31703/gmsr 2025(X)
Issue: III (Summer-September 2025)
DOI(Issue): 10.31703/gmsr.2025(X-III)

Home Page
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Volume: X (2025)
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Issue: III-Summer (September-2025)
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Doi:https://dx.doi.org/10.31703

## Citing Article

| 10 | Interplay of Oil and Gold Prices and the Stock Performance: An Empirical Evidence from KSE - 100 Index, Pakistan | | |
|---|---|---|---|
| Authors | Ahmed Sameer<br>Hidayat Ullah Khan<br>Javed Anwar | DOI | 10.31703/gmsr.2025(X-III).10 |
| | | Pages | 104-113 |
| | | Year | 2025 |
| | | Volume | X |
| | | Issue | III |

### Referencing & Citing Styles

| | |
|---|---|
| APA | Sameer, A., Khan, H. U., & Anwar, J. (2025). Interplay of Oil and Gold Prices and the Stock Performance: An Empirical Evidence from KSE - 100 Index, Pakistan. *Global Management Sciences Review*, *X*(III), 104-113. https://doi.org/10.31703/gmsr.2025(X-III).10 |
| CHICAGO | Sameer, Ahmed, Hidayat Ullah Khan, and Javed Anwar. 2025. "Interplay of Oil and Gold Prices and the Stock Performance: An Empirical Evidence from KSE - 100 Index, Pakistan." *Global Management Sciences Review* X (III):104-113. doi: 10.31703/gmsr.2025(X-III).10. |
| HARVARD | SAMEER, A., KHAN, H. U. & ANWAR, J. 2025. Interplay of Oil and Gold Prices and the Stock Performance: An Empirical Evidence from KSE - 100 Index, Pakistan. *Global Management Sciences Review,* X**,** 104-113. |
| MHRA | Sameer, Ahmed, Hidayat Ullah Khan, and Javed Anwar. 2025. 'Interplay of Oil and Gold Prices and the Stock Performance: An Empirical Evidence from KSE - 100 Index, Pakistan', *Global Management Sciences Review*, X: 104-13. |
| MLA | Sameer, Ahmed, Hidayat Ullah Khan, and Javed Anwar. "Interplay of Oil and Gold Prices and the Stock Performance: An Empirical Evidence from Kse - 100 Index, Pakistan." *Global Management Sciences Review* X.III (2025): 104-13. Print. |
| OXFORD | Sameer, Ahmed, Khan, Hidayat Ullah, and Anwar, Javed (2025), 'Interplay of Oil and Gold Prices and the Stock Performance: An Empirical Evidence from KSE - 100 Index, Pakistan', *Global Management Sciences Review,* X (III), 104-13. |
| TURABIAN | Sameer, Ahmed, Hidayat Ullah Khan, and Javed Anwar. "Interplay of Oil and Gold Prices and the Stock Performance: An Empirical Evidence from Kse - 100 Index, Pakistan." *Global Management Sciences Review* X, no. III (2025): 104-13. https://dx.doi.org/10.31703/gmsr.2025(X-III).10. |

e-ISSN: 2708-2482 Volume: X (2025) Issue: III-Summer (September-2025) p-ISSN: 2708-2474

Global Management Sciences Review
www.gmsrjournal.com
DOI: http://dx.doi.org/10.31703/gmsr

Pages: 104-113 URL: https://doi.org/10.31703/gmsr.2025(X-III).10 Doi: 10.31703/gmsr.2025(X-III).10

Title

# Interplay of Oil and Gold Prices and the Stock Performance: An Empirical Evidence from KSE - 100 Index, Pakistan

Authors:

**Ahmed Sameer:** MS Scholar, Department of Management Science, Faculty of Management Sciences, National University of Modern Languages (NUML), Islamabad, Pakistan.

**Hidayat Ullah Khan:** (Corresponding Author) Associate Professor, Department of Economics, Faculty of Management Sciences, National University of Modern Languages (NUML), Islamabad, Pakistan.
Email: (masmaleo@yahoo.com)

**Javed Anwar:** Lecturer, Department of Economics, Faculty of Management Sciences, National University of Modern Languages (NUML), Islamabad, Pakistan.

## Abstract

*This study unravels the link among oil and gold prices on the stock performance in terms of performance of prices of oil firms in the KSE-100. We employ an autoregressive distributed lag (ARDL) framework for the analysis of long-run and short-run association amongst oil and gold prices, oil companies' stocks prices to analyze the stock market performance for a period from 1998 to 2021. The findings indicate that oil prices have a positive significant effect on the stock market performance, which suggests that a rise in the oil prices improves stock market performance. Conversely, increasing gold prices, inflation and gross capital formation negatively affect stock market and oil companies' performance.*

**Keywords:** Oil Prices, Gold Prices, Stock Exchange Performance, KSE-100, Pakistan

## Contents



## Introduction

There are several ways to invest money such as investment in gold, foreign currencies, stocks and bonds etc. The returns from the investment can be used for reinvestment or other future needs. Gold, in particular, offers considerable benefits to the investors, including capital gain as it is widely regarded as a reliable and relatively safe investment. Many of the past studies show a considerable correlation between gold prices and stock markets (Saeed et al. 2018; Sheikh et al. 2020).

Oil prices exert a considerable influence on industrial costs and have an influence on both industrialized and underdeveloped economies directly and indirectly. Rising oil prices can reduce corporate earnings, indicating a strong association among energy prices and variations in stock market indices. Energy prices have a vital involvement in shaping stock market indices investment and prices of other commodities as well (Aggarwal and Manish 2020, Cai et al. 2020; Najaf, Najaf and Yousaf 2016; Najaf and Najaf 2016).

The unequal influence of energy prices and gold prices on stock market indices in Pakistan is examined by Saeed et al. (2018). The ARDL methodology is used to identify the interdependence of crude oil and gold prices with equity market performance along with the dynamic connections between oil and gold price movements and stock market performance over the short and long run. Long run impact shows the asymmetric relation of commodity price trends for oil and gold with fluctuations in equity prices. On the other hand, short run impact validates the uneven linkage between movements in oil prices and stock prices. Empirical results further confirm the presence of a significant inverse correlation between exchange rate variations and stock market performance.

Sheikh et al. (2020) investigate the association amongst macroeconomic variables and equity market prices pre and post 2008 economic crisis, covering the time period from 2004 to 2018. The analysis identified a short run lopsided association amongst crude-oil prices, gold-prices and equity market prices considering the 2008 economic crunch. However, the study does not provide any guidance for policymakers to improve equity market performance (Hanif 2020).

Shabir, Kousar and Batool (2020) explored the co-movements between energy prices, gold prices and the equity market indices from 1991 to 2016, employing ADF test, correlation analysis and ARDL model. Owing to the restricted sample size, the study did not include a structural break unit root test as a part of its analytical framework (Rahman 2020).

Shirazi and Meibodi (2020) examines the impacts of energy price fluctuations on the performance of Iranian equity market for the time period 1991-2017 by using a nonlinear ARDL model through quarterly data. The results show that upward and downward movements in energy prices, along with variations in industrial production and lending rates, have significant immediate and extended effects on the equity market indices. Positive oil price shocks boost the market more than negative ones reduce it. The market's response also varies depending on the direction of these economic changes, with different speeds and times needed to stabilize. Financial players, both the energy sector and state decision-makers, should introduce forward-looking policies to account for these asymmetric effects when managing oil price fluctuations (Köse and Ünal 2020; Lamouchi and Alawi 2020).

Najaf, Najaf and Yousaf (2016) investigate the association among crude oil rate, gold values and equity market dynamics using secondary data from the KSE covering the years from 1996 to 2013. However, the study utilizes a simple correlation matrix to establish the relationships among oil prices, gold prices, and equity market dynamics. The analysis reveals a positive association amongst oil prices and equity market dynamics. Ansar and Asghar (2013) reported a direct relationship amongst crude oil rates and equity market dynamics in Pakistan. However, owing to the restricted sample size, reversed causality amongst crude oil rates and equity market dynamics could not be established (Basit 2013).

The principal focus of this paper is to examine the relationship amongst crude oil rates, gold prices, and stock market performance. The currency conversion rate, foreign private portfolio investment, GDP, and CPI are used to evaluate stock market performance, while some important variables, such as oil prices and gold prices, are excluded. Furthermore, other studies have employed time spans of multiple years, such as from 2008 to 2018 (Sheikh et al. 2020; Siddiqui and Muhammad 2014). Using the ARDL technique, this study tries to fill this research gap by integrating additional factors and extending the time period.

## Overview of Karachi Stock Market (KSE)

The Karachi Stock Exchange is Pakistan's oldest stock exchange, with a large number of listed companies. Various efforts have been made in Pakistan to encourage international investment; however, political stability has been identified as a major factor affecting it more than in other stock exchanges in Asia. The Karachi Stock Exchange's success over the past few decades has been extraordinary. It started its operations with five companies, known as the KSE-50, and a total market capitalization of Rs. 37 million. Despite the challenges, the Karachi Stock Exchange has shown remarkable growth and resilience (Najaf, Najaf and Yousaf 2016).

The KSE has provided a foundation for capital formation to a wide spectrum of participants, including individual and institutional investors, since its inception. The KSE instituted the KSE-100 index in 1991, while the conventional (KSE30) and Islamic (KMI30) came into operation towards the end of

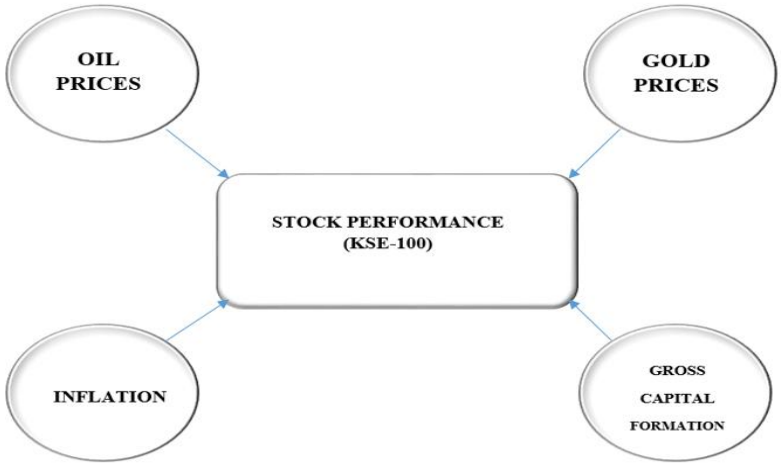
1990s to cope with the growing number of public companies and market transactions that emerged by the late 1980s. Subsequently, the KSE was fully automated with the launch of the Karachi Automated Trading System (KATS) in 2002, earning as the "Best Performing Stock Market in the World." Later, in 2012, the PSX was officially instituted through the integration of the Karachi, Lahore, and Islamabad Stock Exchanges.

## Model Formulation and Data

This study investigates the effect of crude oil rates and gold value on equity market dynamics and the performance of oil companies using the KSE-100 as evidence. WDI, SBP, Macro Trends and overseas Pakistani friends are main sources for data collection. The analysis is carried out by using two different models to evaluate the link among oil prices, gold value, equity market dynamics, and oil companies' performance.

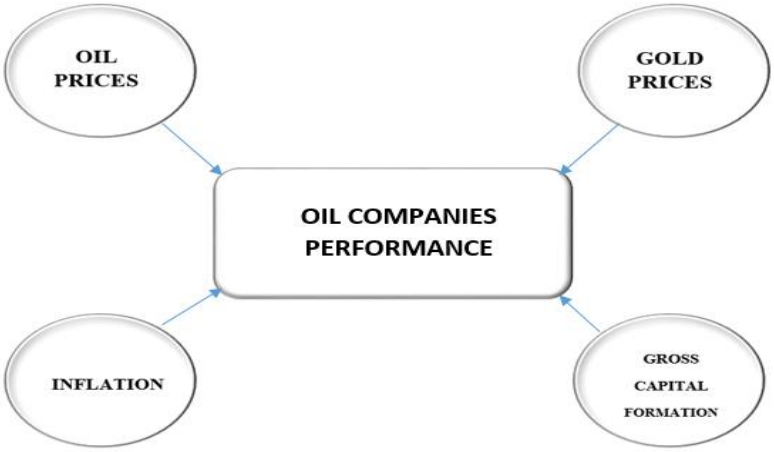
### Figure-1

*Model-1 Stock Market Performance*




### Figure-2

*Model-2 Oil Companies Performance*




## Data Description:

### KSE-100

As the benchmark indicator of Pakistan equity market, the KSE-100 reflects the trends in the share prices of 100 top firms of the country. This index provide us an expanded view of the Pakistani stock market as well as various companies from different sectors such as oil, gas, and banking sector. KSE-100 data is sourced from the Statistical Supplements of central bank of Pakistan (SBP) spanning years from 1998 to 2021.

## Oil Companies Performance

Oil Companies Performance captures the financial strength and stock market returns of petroleum-

related firms operation under PSX. This index provide us an expanded view of the oil companies' performance. KSE-100 data is obtained from the Statistical Supplements of SBP spanning years from 1998 to 2021.

## Oil Prices

Oil prices refers to cost of barrel of crude oil, and these prices are affected by multiple elements which can have significant repercussions for the economies, industries, and financial markets worldwide. Oil prices data is collected from the macro trends from 1998 to 2021.

## Gold Prices

Gold prices represents the current market value of gold, a precious metal, estimated in terms of specific unit for weight, such as grams or tolas. These prices are fluctuated by the various factors as well as supply and demand, economic conditions, and political instability. The pricing of the gold is a key element for global financial markets. Data on gold prices is obtained from the Overseas Pakistani Friends, covering time span of 1998 to 2021.

## Inflation

The consistent rise in the estimated value of commodities across time is known as inflation. It is typically expressed as an annual percentage, the rate at which prices are rising. Data on annual inflation is collected from World Developing Indicators (WDI) from 1998 to 2021.

## Gross Capital Formation

Gross Capital Formation (GCF) is the macroeconomic indicators that measures the value of all tangible and intangible assets produced within an economy over a specific time period. Data for GCF is obtained from the World Developing Indicators (WDI) from 1998 to 2021.

## Description of Descriptive statistics (Model-1)

### Table 1

*Descriptive Statistics (Model-1)*

| | Stock Market Performance | Oil Prices | Gold Prices | Inflation | Gross Capital Formation |
|---|---|---|---|---|---|
| Mean | 9.18 | 9.58 | 9.96 | 1.90 | 23.38 |
| Median | 9.42 | 9.69 | 10.29 | 2.02 | 23.24 |
| Maximum | 10.77 | 10.25 | 11.74 | 3.01 | 24.21 |
| Minimum | 6.78 | 8.32 | 8.36 | 0.93 | 22.66 |
| Std. Dev. | 1.30 | 0.54 | 1.09 | 0.55 | 0.49 |
| Skewness | -0.49 | -0.65 | -0.09 | -0.07 | 0.39 |
| Kurtosis | 1.95 | 2.59 | 1.68 | 2.11 | 1.84 |
| Observations | 24 | 24 | 24 | 24 | 24 |

## Performance of the Stock Market (KSE-100)

The average annual stock performance (KSE-100) is 9.18 percent. The median of (KSE-100) is close to mean, indicating that the data is symmetrical. In 2021, the growth rate was significantly high at 10.77, while it was lower at 6.78 percent. The variation of the KSE100 over time is 1.30, reflecting the dispersion from the mean value.

## Oil Prices

The average annual increase in oil prices is 9.58 percent. The median of oil prices is close to mean, indicating symmetrical data. Oil prices in 2021 were much higher at 10.25%, compared to 8.32% in 1998. The standard deviation of oil prices is 0.54, indicating dispersion from the mean.

## Gold Prices

Data in Table-1 indicate a 9.96% rise in the gold prices. Symmetry of the data is reflected from the value of median of the gold prices which is close to mean value. In 2021, gold prices were significantly high at 11.74 percent, while gold prices were lower at 8.36 percent in 1998. The standard deviation of gold prices is 1.09, reflecting the dispersion from the mean value.

## Inflation

The average annual increase in inflation is 9.96 percent. The median inflation rate is close to mean, indicating symmetrical data. In 2021, inflation was significantly high at 3.01 percent, while it was lower at 0.93 percent in 1998. The standard deviation of inflation is 0.55, reflecting the dispersion from the mean value.

## Gross Capital Formation

The average annual Gross Capital Formation (GCF) is 23.38 percent. The median GCF is close to mean, indicating symmetrical data. In 2021, GCF was significantly high at 24.21 percent, while it was lower at 22.66 percent in 1998. The standard deviation of GCF is 0.49, reflecting the dispersion from the mean value.

## Description of Descriptive Statistics (Model-2)

Table 2

*Descriptive Statistics (Model-2)*

| Statistics | Oil Companies Performance | Oil Prices | Gold Prices | Inflation | Gross Capital Formation |
|---|---|---|---|---|---|
| Mean | 9.59 | 4.16 | 4.33 | 0.82 | 10.16 |
| Median | 9.57 | 4.21 | 4.47 | 0.88 | 10.10 |
| Maximum | 10.24 | 4.45 | 5.10 | 1.31 | 10.51 |
| Minimum | 9.08 | 3.61 | 3.63 | 0.40 | 9.84 |
| Std. Dev. | 0.31 | 0.23 | 0.48 | 0.24 | 0.21 |
| Skewness | 0.16 | -0.65 | -0.09 | -0.07 | 0.39 |
| Kurtosis | 2.33 | 2.59 | 1.68 | 2.11 | 1.84 |
| Jarque-Bera | 0.55 | 1.83 | 1.78 | 0.81 | 1.94 |
| Probability | 0.76 | 0.40 | 0.41 | 0.67 | 0.38 |
| Sum | 230.21 | 99.81 | 103.82 | 19.79 | 243.74 |
| Sum Sq. Dev. | 2.28 | 1.26 | 5.19 | 1.33 | 1.05 |

## Oil Companies

The average annual performance of oil companies is 9.59 percent. The median performance is close to mean, indicating symmetrical data. In 2021, the performance was significantly high at 10.24 percent, while it was lower at 9.08 percent in 1998. The standard deviation of the performance is 0.31, reflecting the dispersion from the mean value.

## Oil Prices

The average annual increase in oil prices is 4.16 percent. The median oil prices is close to mean, indicating symmetrical data. In 2021, oil prices were significantly high at 4.45 percent, while the oil prices were lower at 3.61 percent in 1998. The standard deviation of oil prices is 0.23, reflecting the dispersion from the mean value.

## Gold Prices

The average annual increase in gold prices is 4.33 percent. The median oil prices is close to mean, indicating symmetrical data. In 2021, gold prices were significantly high at 5.10 percent, while the gold prices were lower at 3.63 percent in 1998. The standard deviation of gold prices is 0.48, reflecting the dispersion from the mean value.

## Inflation

The average annual increase in inflation is 0.82 percent. The median inflation rate is close to mean, indicating symmetrical data. In 2021, inflation was significantly high at 1.31 percent, while it was lower at 0.41 percent in 1998. The standard deviation of inflation is 0.24, reflecting the dispersion from the mean value.

## GCF (Gross Capital Formation)

The average annual Gross Capital Formation (GCF) is 10.16 percent. The median GCF is close to mean, indicating symmetrical data. In 2021, GCF was significantly high at 10.51 percent, while it was lower at 9.84 percent in 1998. The standard deviation of GCF is 0.21, reflecting the dispersion from the mean value.

## Estimations, Results, and Discussions:

### Stationarity Status of Model-1 Variables

Unit root is a technique used to check the stability of parameters. The results of ADF test for Model-1 is represented in Table-3. According to the results, gold prices are stationary at level zero I(0), while KSE-100, oil prices, inflation and GCF are stationary level one I(1) at 5% significance level.

Table 3

*Unit Root Test of Model-1*

| Variables | Test Statistics | Probability | Integration Order |
|---|---|---|---|
| Ln(KSE-100) | -4.04 | 0.0054 | I(1) |
| Ln(Oil Prices) | -4.84 | 0.0009 | I(1) |
| Ln(Gold Prices) | -4.93 | 0.0046 | I(0) |
| Ln(Inflation) | -4.99 | 0.0006 | I(1) |
| Ln(GCF) | -4.88 | 0.0008 | I(1) |

## ARDL (Autoregressive Distributed Lag) Model -1

This study uses the ARDL modeling framework to investigate enduring linkages among variables possessing varying integration levels. This modeling test relies on the F-test to identify long-term connections between variables. In this technique, the lower critical bound indicates no co-integration when all parameters are statistically stable at level I (0). Conversely, the upper critical bound suggests co-integration when all variables are statistically stable at level I (1).

The F-statistics has been used to compare the ARDL-based cointegration approach results with the critical lower and upper bounds, as shown in Table-4. The empirical evidence reveals that the variables have a long-term association, as the projected F-statistics value of 6.164 is higher than the upper boundary value of 4.57 at the 5% confidence level.

Table 4

*Bound Tests of Model-1*

| F-Bounds Test | | Null Hypothesis: No levels relationship | | |
|---|---|---|---|---|
| Test Statistic | Value | Significance Level | I(0) | I(1) |
| | | | Asymptotic: n=1000 | |
| F Statics | 6.16 | 10% | 3.03 | 4.06 |
| K | 4 | 5% | 3.47 | 4.57 |
| | | 2.50 | 3.89 | 5.07 |
| | | 1% | 4.40 | 5.72 |
| Actual Sample Size | 23 | Significance Level | Finite Sample: n=35 | |
| | | 10% | 3.37 | 4.51 |
| | | 5% | 4.04 | 5.30 |
| | | 1% | 5.60 | 7.17 |
| | | Significance Level | Finite Sample: n=30 | |
| | | 10% | 3.43 | 4.62 |
| | | 5% | 4.15 | 5.54 |
| | | 1% | 5.86 | 7.58 |

## Long-Run Coefficients from the ARDL Model

The long-term estimates derived from the ARDL model through co-integration technique are reflected in Table-5. According to the findings, the stock market performance is positively and significantly influenced by oil prices, indicating a 0.65% boost in stock market performance with 1% increase in crude oil rate. On the other hand, equity market returns are negatively and significantly influenced by gold rate, indicating a 0.99% decline in stock market performance with 1% increase in gold prices. Similarly, stock market performance is negatively and insignificantly influenced by gold prices, indicating a 0.21% decline in stock market performance with 1% increase in inflation. Moreover, stock market performance is negatively and insignificantly influenced by GCF, indicating a 1.36% decline in stock market performance with 1% increase in GCF.

Table 5

*ARDL Long-Run Results of Model-1, Stock Market Performance*

| Variables | Coefficients | Level of Significance | Standard Error |
|---|---|---|---|
| Ln(Oil Prices) | 0.65 | 0.05 | 0.15 |
| Ln(Gold Prices) | -0.99 | 0.05 | 0.29 |
| Ln(Inflation) | -0.21 | 0.05 | 0.15 |
| Ln(GCF) | -1.36 | 0.05 | 0.51 |

## Short Run and ECM Regression

Table-6 presents the short-run coefficients, revealing that oil prices positively and significantly impact stock performance. Specifically, a one percent increment in crude oil rate is presumed to enhance equity market returns by 0.58%. Conversely, gold prices have a negative but not statistically significant effect, with a 1% increase in gold prices leading to a 0.16% decline in stock performance. Inflation has a negative and significant effect, showing that a one percent increment in price hike results in a 0.31 reduction in equity market returns. Gross Capital Formation also negatively and significantly impacts stock performance, with 1% increase in GCF leading to a 1.04% decline in stock performance. The Error Correction Model coefficient is -0.33, indicating that any disequilibrium in the model will correct itself at a rate of 0.33% per year.

The Granger Causality test aims to find out whether the variables are causing each other in reverse or not. The empirical evidence suggests that none of the factors are causing each other in reverse as the p-value is greater than 0.05. Similarly, CUSUM chart (Figure-3) demonstrates that all variables are stable at 5% level of significance, as all variables lie within the chart critical regions. The test results uphold the null hypothesis, confirming that each factor is stable over the observed period.

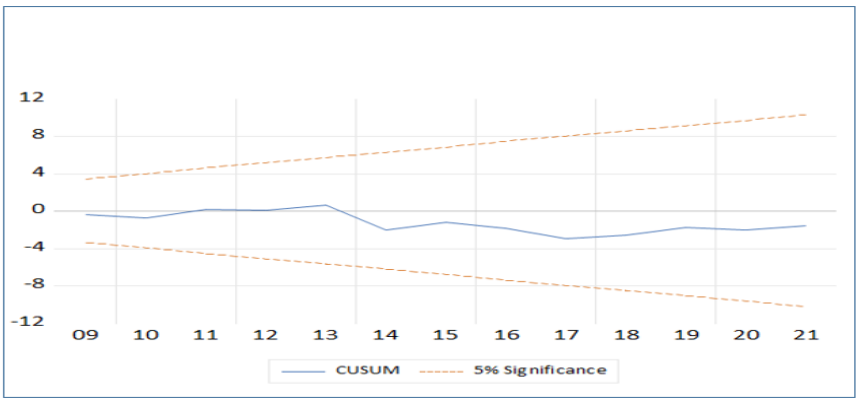
Table 6

*Short-Run and ECM Empirical Findings of ARDL Model-1 - Stock Market Performance*

| Variables | Coefficients | Level of Significance | Standard Error |
|---|---|---|---|
| Ln(Oil Prices) | 0.58 | 0.05 | 0.16 |
| Ln(Gold Prices) | -0.16 | 0.05 | 0.24 |
| Ln(Inflation) | -0.31 | 0.05 | 0.11 |
| Ln(GCF) | -1.04 | 0.05 | 0.35 |
| CointEq(-1) | -0.33 | 0.10 | 0.09 |

Figure 3

*CUSUM Chart – Model-1*




## Stationarity Status of Model-2 Variables

Unit root is the technique used to check the stability of the parameters. The results of ADF test for Model-2 is represented in Table-7. According to the results, gold prices are stationary at second difference I(2), GCF at level zero I(0) while Oil Company performance, oil prices, and inflation are stationary level one I(1) at 5% level of significance.

Table 7

*Unit Root Test of Model-2*

| Variables | Test Statistics | Probability | Integration Order |
|---|---|---|---|
| Ln(OC) | -3.08 | 0.0038 | I(1) |
| Ln(Oil Prices) | -4.36 | 0.0027 | I(1) |
| Ln(Gold Prices) | -4.83 | 0.0010 | I(2) |
| Ln(Inflation) | -5.19 | 0.0004 | I(1) |
| Ln(GCF) | -2.54 | 0.0135 | I(0) |

## ARDL (Autoregressive Distributed Lag) Model -2

This study uses the ARDL modeling framework to investigate enduring linkages among variables possessing varying integration levels. This modeling test relies on the F-test to identify long-term connections between variables.

The F-statistics has been used to compare the ARDL bound test results with the critical lower and upper bounds, as shown in Table-8. The empirical evidence reveals that the variables have a long-term association, as the projected F-statistics value of 6.02 is higher than the upper boundary value of 3.49 at the 5% confidence level.

Table 8

*Bound Test of Model-2*

| F Bounds Test | | Null Hypothesis: No levels Relationship | | |
|---|---|---|---|---|
| Test Statistic | Value | Significance Level | I(0) | I(1) |
| K | 6.02 | | Asymptotic: n=1000 | |
| | 4 | 10% | 2.2 | 3.09 |
| | | 5% | 2.56 | 3.49 |
| | | 2.50% | 2.88 | 3.87 |
| | | 1% | 3.29 | 4.37 |
| Actual Sample Size | 23 | Significance Level | Fini3.29te Sample: n=35 | |
| | | 10% | 2.46 | 3.46 |
| | | 5% | 2.95 | 4.09 |
| | | 1% | 4.09 | 5.03 |
| | | Significance Level | Finite Sample: n=30 | |
| | | 10% | 2.53 | 3.56 |
| | | 5% | 3.06 | 4.22 |

## ARDL - Long Run Results

Table-9 shows the long-run coefficients computed using an ARDL technique for co-integration. The empirical results indicate that crude oil rates have a direct and significant influence on oil companies' performance. Explicitly, a one percent increment in crude oil rates is presumed to boost oil companies' performance by 1.31%. Conversely, gold prices have a negative but statistically significant impact, with a one percent increment in gold rates leading to a 1.14% drop in oil companies' returns. According to the results, inflation has negative and insignificant impact on oil companies' performance, reflecting a 0.29% decline in oil companies' performance with increase in inflation by 1%. Similarly, Gross Capital Formation (GCF) has an inverse yet non-significant influence on oil companies' performance, suggesting that a 1% increase in GCF would result in a decline in oil companies' performance by 1.65 %.

Table 9

*ARDL Long Run Results Model-2 – Oil Companies Performance*

| Variables | Coefficients | Level of Significance | Standard Error |
|---|---|---|---|
| Ln(Oil Prices) | 1.31 | 0.05 | 0.41 |
| Ln(Gold Prices) | -1.14 | 0.05 | 0.43 |
| Ln(Inflation) | -0.29 | 0.05 | 0.29 |
| Ln(GCF) | -1.65 | 0.05 | 1.00 |

## Short Run and ECM Regression

Table-10 presents the short-run coefficients, revealing that oil prices positively and significantly impact oil companies' performance. Specifically, a one percent increment in crude oil rates is presumed to enhance equity market returns by 0.61%. Conversely, gold prices have a negative but not statistically significant effect, with a 1% increase in gold prices leading to a 0.92% decline in oil companies' performance. Inflation has a direct and substantial effect, showing that a one percent increment in inflation lead to a 0.02% boost in oil companies' performance. Gross Capital Formation has also negatively and significantly impacts oil companies' performance, with 1% increase in GCF leading to a 1.61% decline in stock performance. The Error Correction Model coefficient is -0.92, indicating that any disequilibrium in the model will correct itself at a rate of 0.92% per year.

The Granger Causality test aims to find out whether the variables are causing each other in reverse or not. The empirical evidence suggests that none of the factors are causing each other in reverse as the p-value is greater than 0.05. Similarly, CUSUM chart (Figure-4) demonstrates that all variables are stable 5% level of significance, as all variables lie within the chart critical regions. The test results uphold the null hypothesis, confirming that each factor is stable over the observed period.

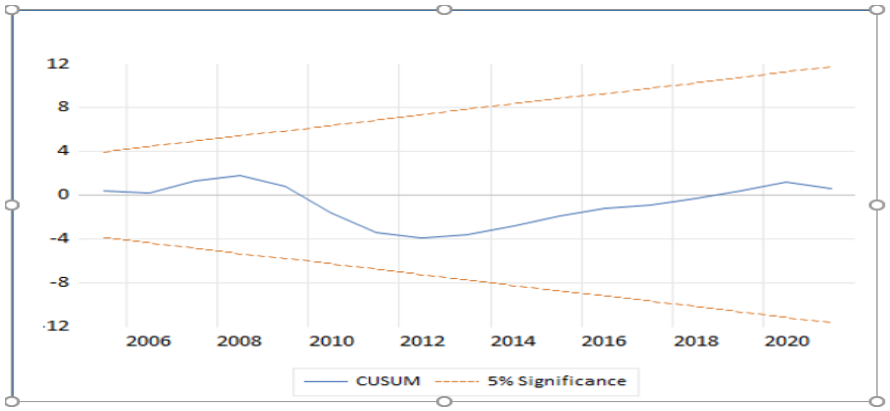
### Table 10

*Short Run and ECM Regression Model-2 – Oil Companies Performance*

| Variables | Coefficients | Level of Significance | Standard Error |
|---|---|---|---|
| D(Oil Prices) | 0.61 | 0.05 | 0.35 |
| D(Gold Prices) | -0.92 | 0.05 | 0.49 |
| D(Inflation) | 0.02 | 0.05 | 0.23 |
| D(GCF) | -1.61 | 0.05 | 0.74 |
| CointEq(-1) | -0.92 | 0.05 | 0.14 |

### Figure 4

*CUSUM Chart – Model-2*




## Conclusion

The study investigates the influences of gold rate and crude oil rates on the performance of oil firms and equity market returns using a series of temporarily structured data from 1998 to 2021. The ADF method is used for stability of the variables and ARDL method is applied to look at the stable long-term equilibrium and short-term dynamic interactions among gold rates, crude oil rates, oil companies and stock market performance. Granger Causality and CUSUM tests reflect zero reverse causality and stability of the variables.

Empirical evidence demonstrates that crude oil rates have positively and significantly impact on equity market returns, indicating that rising crude oil rates enhance equity market performance. A subsequent model confirms that higher prices also boost the performance of oil companies. Conversely, increasing gold prices, inflation and gross capital formation negatively affect equity market and crude oil firms' performance, excluding the positive impact of inflation on oil companies' performance in short run.

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