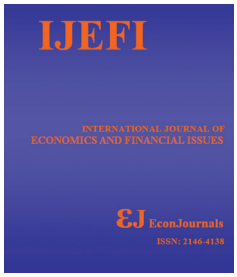

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Investor Sentiment and South African Commodity Market Returns: Evidence from Switching Conditions

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ABSTRACT

The commodity market of emerging markets has over the years been a firm favourite among investors wanting to diversify their holding due to its safe heaven properties. Until recently, such properties have been criticised by academics due to its inability to provide portfolio protection during sentiment induced markets and market uncertainty. To this end, the objective of the study is to examine the effect of investor sentiment on South African commodity market returns during stable and volatile market conditions. In doing so, the study used monthly data for the period March 2007 to January 2024 to construct an investor sentiment index and test it against gold and oil returns. The findings of the Markov regime-switching model revealed that the return of gold is negatively significantly affected by investor sentiment in a bull regime, but oil returns is positively significantly affected by investor sentiment in the same regime. In a bear regime, investor sentiment has a positive significant effect on gold returns but in the same regime investor sentiment has a negative significant effect on oil returns. Moreover, the returns of gold and oil demonstrate bullish behaviour over the sample period. The findings demonstrate that during market uncertainty and sentiment induced markets, investors can incorporate gold in their portfolio to enhance diversification and limit losses, but the incorporation of oil will not yield any safe heaven properties. Similarly, the commodity market demonstrates adaptive behavioural as such financial market authorities must develop policies to reduce the alternating efficiencies caused by market conditions as it leads to miss-pricing and irrational investors.

Keywords: Investor Sentiment; Oil and Gold Returns; Markov-regime Switching; Market Conditions
JEL Classifications: G1; G4; Q3; Q38

1. INTRODUCTION

The commodity market globally has been faced with many challenges due to the ongoing war between Russia and Ukraine and the constant fighting in the middle east (Fang and Shao, 2022). These events have caused the pricing of gold and oil to deviate from its fundamental value resulting in miss-pricing. Irrational investors have since seen such mispricing and have entered the market to take advantage of the miss-pricing by earning excessive returns (Aizenman et al., 2025). These irrational investors have caused sentiment induced markets which lead to the creation of bearish markets globally (Moodley et al., 2025a). In attempt to understand how these bearish markets contribute to the return of oil and gold, many academics attempt to analyse the effect of investor sentiment on the returns of gold and oil (Nakhli et al., 2025; Niu et al., 2024; Sun et al., 2024). The findings are mixed, some studies find that gold and oil returns are influenced by financial market uncertainty (Balcilar et al., 2017; Li et al., 2022). However, some studies demonstrate that safe-haven properties are still relevant as financial market uncertainty has no significant effect on commodity market returns (He et al., 2019; Yousaf et al., 2022). Despite these mix findings, emerging market academics fail to examine how sentiment influence commodity market returns, despite investor sentiment being the fundamental reason for miss-pricing of commodity market securities. In attempt to rectify this glaring hole in literature, this study examines the effect of investor sentiment on South African commodity market returns under changing market conditions. In achieving the desired objective,

two research questions are devised. (1) What effect does investor sentiment have on South African commodity market returns in a bull and bear regime; 2 What market conditions is dominant among the South African commodity market returns.

The achievement of the research questions contributes to literature in various ways. The study develops a novel market-wide investor sentiment index unique to South Africa, which considers foreign investor participation. Thus, the new constructed index provides more accurate insights into the level of sentiment in the market as sentiment is driven not only by local investors but so to by foreign investors. Moreover, the study introduces new evidence on the effect sentiment driven behaviour has on commodity market returns in South Africa, which is non-existent. This provides investors with key information on asset selection and portfolio diversification amidst market uncertainty and sentiment induced markets, thereby reducing investors exposure to risk and enhancing return perspective. Furthermore, this study provides key implications for policy makers. That being, it is found that excess market participation cause sentiment induced markets and market anomalies such as bull and bear conditions, therefore, new policies must be developed to control market participation to ensure financial market stability. Lastly, the study settles the long-lasting debate regarding market efficiency by demonstrating that the South African commodity market express adaptive behaviour, suggesting that there exist periods of efficiency and inefficiency which are determined by the prevailing market conditions.

The remainder of the paper is outlined as follows; Section 2 presents the literature review, which considers both the theoretical conceptualisation and empirical review. Section 3 emphasizes the methodology, highlighting the data and empirical models used in the study. Section 4 provides the empirical results and discussion of results, whereas Section 5 presents the conclusion, highlighting the implications, limitations, and recommendations for future research.

2. LITERATURE REVIEW

The fundamental principles of finance that underpin the objective of this study can be related to the behavioural finance (BF) school of thought. This school of thought refutes the classical financial theory such that it suggests that investor behaviour is a determining factor of asset prices and the efficiency of markets. That being, investors are not always rational as demonstrated by the efficient market hypothesis (EMH) as they based their decisions on past experiences which dictate their current decisions. Thus, they make use of heuristics to determine the most optimal decision when faced with many options. This type of behaviour has evolved throughout the years in what is now known as sentiment driven investors. According to behaviouralist, sentiment driven investors do not make use of technical or fundamental analysis to determine their optimal investment, rather they rely on the general perceptions in the market and is guided by the trading activities of other investors. These investors are known as noise traders, such that they evolve in the market when mispricing occur, as they enter the market to take advantage of the miss-pricing and thereafter leave the market. These behavioural traits cause asset prices to fluctuate which influence portfolio diversification and the return perspective for investors, making financial markets inefficient. Given the intense debate between the two schools of thought, Lo (2004) introduced the adaptive market hypothesis (AMH) to mitigate the unresolved debate. According to the AMH, financial markets attribute alternating efficiencies in what is known as adaptive behaviour. This implies that financial markets are neither efficient as proposed by EMH or inefficient as suggested by BF, rather there occur periods of efficiency and inefficiency owing to bull and bear market conditions. Consequently, the effect investor sentiment has on commodity market returns will alternate with market conditions, meaning that the effect will not be linear, rather it will present nonlinear interactions dictated by the state of the market.

Many academics have embraced the proposition of Lo (2004) and examined the nonlinear effect, for example, Du et al. (2016) examined the effect of investor sentiment on oil returns in the United States (US). The academics used the monthly Baker and Wurgler (2006) investor sentiment index, and the monthly West Texas Intermediate crude oil (WTI) returns for the period January 1986 to November 2014. The findings of the quantile regression model indicate that investor sentiment is an important determinant of oil price returns, such that periods of high/low sentiment predicts high/low oil returns in the long-horizon as appose to the short-horizon. Coherent with this, Balcilar et al. (2017) examined the nonlinear effect of investor sentiment on gold returns. Using intraday data for the period 2004-2011 and a causality-in-quantile approach, the academics find that the economic attitudes revealed by Search index, proxied for investor sentiment, is an important determinant of gold future returns trading on the New York exchange. More specifically, the findings reveal that investor sentiment in the upper and lower quantiles cause deviations in gold price returns. These findings contradict the save heaven proposition, as gold returns are influenced by investor sentiment in periods of market distress.

Similarly, He et al. (2019) investigated the asymmetrical causal relationship between individual investor sentiment and oil market returns. The academics also make use of high frequency data, such that weekly data for the period July 1987 to July 2017 is used to regress the nonlinear autoregressive distribution lagged model (NARDL) and a nonlinear granger causality test. The findings reveal that the American Association of Individual Investors (AAII) index and WTI returns have a bidirectional relationship, meaning that the effect is two-sided, investor sentiment effect oil returns, whereas oil returns effect individual investor sentiment in the market. Moreover, investor sentiment has a positive significant effect on oil returns before the global financial crises (GFC), but the effect is negative during and after the GFC. The findings are inline with Li et al. (2022) who also examined the asymmetrical effect of investor sentiment on oil returns, but the focus was on China. The structural vector autoregression (SVAR) model demonstrated that investor sentiment (proxied by the web crawler investor sentiment index) has a dynamic effect on oil returns in China. That being, investor sentiment has an alternating effect on oil returns at upward and downward trends in oil returns. These findings signify the important of controlling sentiment in the market as it influences

commodity market returns despite the proposition of safe heaven characteristics associated with commodity returns.

Yousaf et al. (2022) examined the effect of online investor sentiment on financial market asset classes. The data comprised of daily frequencies for the period February 2018 to November 2021 and included the newly constructed SandP500 Twitter Sentiment Index, whereas the asset classes comprised of bitcoin returns, oil return and exchange rates. Using the mean-based connectedness approach the findings illustrate that online investor sentiment and oil returns are interconnected during periods of bull and bear market conditions. However, the connectedness is higher during stable market conditions as appose to bear market conditions like COIVID-19. These findings suggest that oil returns provide safe heaven properties and could be used to enhance portfolio diversification during extreme market events. Conversely, Zhao et al. (2023) used the lexicons methodology to construct an online text sentiment index to examine its nonlinear effect on international oil prices. In doing so, the study used monthly data from January 2012 to May 2022 to estimate the SVAR model. The results suggest that online sentiment has a significant influence on oil returns, where the effect is negative during bear market conditions, like COVID-19, but positive during bull market conditions (stable conditions).

In a more recent study, Darvishan et al. (2024) used the non-probability sampling method to determine the effect of investor sentiment on Iran gold returns. The academics imposed a questionnaire to gage the level of sentiment in the Iran gold market, where 384 individuals responded. The findings revealed that investor sentiment influences gold market returns in Iran. Moreso, the volatility of the returns is determined by the levels of bullish and bearish sentiment in the market. The findings conclude that EMH cannot adequately, explain price deviations in emerging markets, suggesting the EMH is not a robust theory to explain miss-pricing in gold returns. Sun et al. (2024) also examined the effect of investor sentiment on gold returns but they constructed an investor sentiment index using ChatGPT. The findings of the granger causality tests indicates that investor sentiment has a positive and negative effect on gold returns and gold future returns in China. The effect is said to alternate during bull and bear market conditions, where the effect is positive during bear conditions and negative during bull market conditions. The finding emphasises the alternating effect proposed by AMH, suggesting its dominance in empirical literature.

The review of empirical literature reveals that majority of literature that attempts to examine the effect of investor sentiment on gold and oil returns under bull and bear market conditions is centred in the international setting. To the knowledge of the author, no study exists in South Africa, despite many investors using gold and oil returns as a safe haven property admits bearish market conditions. The non-existence of literature raises serious implications for both, investors, and policy makers as it is not known how South African investor sentiment influences gold and oil returns at changing market conditions, limiting investor's ability to develop appropriate risk management strategies to mitigate excess volatility and enhance returns. Moreover, policy makers run a threat of not controlling sentiment levels in the commodity market as there is no understanding how sentiment is driven in the said market, which exposes the commodity market to excess noise traders and instability. Consequently, it's important to examine the effect of investor sentiment on South Africa commodity market returns under bull and bear market conditions.

3. DATA

This study utilizes monthly data spanning the period from March 2007 to January 2024. The selected timeframe is intended to capture significant historical market events, notably the 2007-2008 Global Financial Crisis and the COVID-19 pandemic—both of which are critical for estimating the Markov regime-switching model. The choice of monthly data frequency is driven by data availability, as the variables used to construct the investor sentiment index are only available on a monthly basis. In addition, the study incorporates futures prices for gold and oil, rather than spot prices. This decision is based on the view that spot prices may not fully reflect global information asymmetries related to supply, demand, and inventory levels (Gande and Parsley, 2004). Specifically, gold futures traded on the Commodity Exchange (COMEX) (contract code GC1) and West Texas Intermediate (WTI) crude oil futures traded on the New York Mercantile Exchange (NYMEX) (contract code CLI) are employed. These contracts represent the shortest maturity futures actively traded in their respective markets. According to Chantziara and Skiadopoulos (2008), short-term contracts are preferable as they tend to be more liquid and better capture prevailing market dynamics.

3.1. Measuring Investor Sentiment

The review of empirical literature identifies two main types of investor sentiment measurements: direct and indirect. Direct measures include, but are not limited to, market-based sentiment, social media sentiment, media-derived sentiment, and sentiment driven by non-fundamental factors (Hu et al., 2021). Indirect measures, on the other hand, primarily involve survey-based sentiment indicators. Among these various approaches, market-based sentiment is the most commonly utilized in financial market research. Baker and Wurgler (2006) argue that a market-wide investor sentiment measure is preferable to individual proxies or survey-based indicators. Supporting this view, studies by Brown and Cliff (2004), Beer and Zouaoui (2011), and Stambaugh et al. (2012) have shown that market-wide sentiment indices outperform individual proxies and alternative sentiment measures. Based on this, the market-wide investor sentiment index developed by Muguto et al. (2019) will be enhanced and updated for the study's sample period. This will lead to the creation of a new investor sentiment index, which makes a significant contribution to emerging market research, particularly in the context of South Africa. Notably, this new index is the first of its kind in South Africa to incorporate the sentiment of both foreign investors and general consumers. As it is based on the South African financial market, the index is especially relevant to this study and is expected to produce robust results, consistent with the findings of Muguto et al. (2019). Baker and Wurgler (2006) emphasize the importance of regularly updating investor sentiment indices to ensure

accurate representation of sentiment during a given sample period. Furthermore, it is a common practice in the literature to adopt and adapt sentiment indices from previous research. For example, Aristei and Maerelli (2014) employed Spyrou's (2013) sentiment index but modified it for their specific sample period. The investor sentiment proxies used in this study are listed in Table 1 below:

Table 1: Investor sentiment proxies

Investor sentiment proxy	Explanation
Share turnover ratio	The share turnover proxy is retained in this study's investor sentiment index, as found in the index of Muguto et al. (2019). The proxy is calculated by taking the total volume of shares traded and dividing by the number of average shares listed in the South Africa stock market. The variable selection follows that of Baker and Stein (2004), as the academic argues that noise traders are high when there are short-sale characteristics in the market because the arbitrate of rational investors do not drive noise traders out the market. This causes stock prices to be overvalued. Studies such as Rupande et al. (2019), Muguto et al. (2022), and Muzindutsi et al. (2023) used the proxy for investor sentiment.
Advance/decline ratio index	The advance/decline ratio index is retained in this study's investor sentiment index, as found in the index of Muguto et al. (2019). It is measured by the number of advancing and declining shares, adjusted for their volume (Brown and Cliff, 2004, 2004). Positive sentiment is indicated by positive market breadth, whereas negative sentiment is indicated by negative market breadth. Consequently, many studies have used it as a measure of market sentiment; these include Muguto et al. (2019), Reis and Pinho (2020), and Gong et al. (2022).
Equity-issue ratio	The equity-issue ratio is retained in this study's investor sentiment index, as found in the index of Muguto et al. (2019). The calculation of the proxy entails taking the number of issued shares of total equity and dividing by the total issue of debt in South Africa. Baker and Wurgler (2006; 2007) argues that elevated share issues predict low market returns. That being, companies wanting to expand will issue share when sentiment in the market is high, making equity overvalued. Thus, overvaluation is associated with high sentiment periods because sentiment-induced investors underestimate risk and overestimate returns. (Barker and Wurgler, 2006). Studies by Muguto et al. (2019) and Muzindutsi et al. (2023) use the proxy to measure market sentiment.
South African volatility index	The South African Volatility Index (SAVI) will replace the Rand/Pound bid-ask spread in the Muguto et al. (2019) investor sentiment index. This is done as including both the Rand/Dolar bid-ask spread, and Rand/Pound bid-ask spread as done by Muguto et al. (2019) will enhance high correlation levels. Consequently, by adding the SAVI proxy it will remove the correlation bias, which contributes significantly to the robustness of the constructed market-wide sentiment index. The SAVI provides the 90-day future level of volatility associated with the entire financial market of South Africa. High levels of volatility indicate fear among investors in the market. Rupande et al. (2019) used the index as a proxy for market sentiment.
Rand/dollar bid-ask spread	The bid-ask spreads remain within this study's investor sentiment index, as found in the index of Muguto et al. (2019). It is determined by the demand for domestic securities, where negative sentiment attributed to poor economic performance shows a decline in capital inflows. This causes the bid-ask spread to increase as foreign investors omit rand-denominated securities (Hengelbrock et al., 2011). Studies by Muguto et al. (2019), Rupande et al. (2019), and Muguto et al. (2022) used it as a proxy for market sentiment.
South African consumer confidence index	The consumer confidence index (CCI) is added additionally to the study's constructed investor sentiment index. This is done because financial markets consist of investors with different financial statuses, high-end individuals and lower-end individuals (Junaeni, 2020). Consequently, it is important that the market-wide investor sentiment captures both types of investors and is not isolated to high-end individuals which distorts the level of sentiment. The CCI provides household consumption and savings prospects based on their financial status (OECD, 2022). Although stock prices do not affect consumers' opinions, the index is highly correlated with sentiment in the financial market (Rahman and Shamsuddin, 2019). This is because market participants' financial status dictates their ability to participate in financial markets; if they do not have income, they will not participate, but the opposite holds if they do have income. Hence, high-value signs reflect increased consumer confidence in future economic conditions, allowing investors to participate in financial markets. Koy and Akkaya (2017) demonstrate that CCI has evolved as a critical measure for sentiment following the financial crises. Hamurcu (2021) found that the index as a proxy for sentiment influences the Turkish stock market. Therefore, the proxy will contribute to the South African context as previous studies in South Africa (Muguto et al., 2019, Rupande et al., 2019, Muzindutsi et al., 2023) did not capture consumer sentiment in their sentiment index, which is a vital flaw given that these domestic consumers also participate in the South African financial market.
CNN fear and greed index	The CNN fear and greed index will replace the term structure of interest proxy proposed in the Muguto et al. (2019) index. This is done to increase the robustness of the constructed investor-sentiment index as investors participating in the South African financial market is not isolated to domestic investors, but also foreign investors (Liu, et al., 2020). According to the annual report by the JSE (2023), the countries with the highest foreign investments in South Africa consist of United States (US), United Kingdom (UK) and China. Given that this study constructs an investor sentiment index for the South African financial market which is based on the JSE. It is essential to select the country with the biggest stock exchange as it will provide a better gauge for foreign sentiment. Therefore, in the absence of a direct proxy for foreign investor sentiment in South Africa, the CNN fear and greed index is used as a proxy in this study. The Fear and Greed Index is a global index that comprises seven different proxies that CNN uses to formulate a market sentiment index for the US financial market. The proxy is unique to this study as previous South African studies (Muguto et al., 2019, Rupande et al., 2019, Muzindutsi et al., 2023) have not captured sentiment of foreign investors in the South African financial market. Moreover, Beirne and Renzhi (2024) argues that in any market-wide investor sentiment index, it is essential for foreign market participation to be captured as financial markets are not isolated to domestic investors but also foreign investors, Consequently, studies by Liutvinavicius et al. (2017), Halliday (2018), and Chen et al. (2021) used the index as a measure for market sentiment.

Source: Moodley et al. (2024)

4. MODEL SPECIFICATION

4.1. Markov Regime-Switching Model

To achieve the study's objective, it is necessary to employ a nonlinear model capable of distinguishing between bull and bear market conditions. Accordingly, the Markov regime-switching model is selected. This model is particularly suitable because it incorporates a latent state variable that evolves according to a first-order Markov chain (Hamilton, 1989). Unlike other nonlinear models that assume regime changes occur exogenously and at fixed intervals, the Markov regime-switching model allows for endogenous regime shifts at variable points in time (Camacho et al., 2018). The general specification of the Markov regime-switching model is as follows:

$$\Delta \acute{E}_t = \mu_{ct} + \alpha_{0ict}\Delta SENT_t + \varepsilon_{c_t,} \quad \text{Where } \varepsilon_{ct}, i.i.d(0, \sigma^2_{c_t,}) \tag{1}$$

ΔI_t is the commodity market returns, the state dependent mean and variance is given by μ_{ct} and $\sigma^2_{c_t,}$ The model considers two market conditions (C_t), bull (1) and bear (2) market condition $\Delta SENT$ is the primary explanatory variable which is the investor sentiment index. ε_{c_t} is the volatility associated with state-dependent mean.

Market conditions are assumed to follow a first-order Markov process, governed by a constant transition probability matrix. Accordingly, the probabilities of transitioning between bull and bear market regimes are defined as:

$$Prob = \begin{bmatrix} Prob(C_t = 1 / C_{t-1} = 1) & Prob(C_t = 2 / C_{t-1} = 1) \\ Prob(C_t = 2 / C_{t-1} = 2) & Prob(C_t = 1 / C_{t-1} = 2) \end{bmatrix} = \begin{bmatrix} Prob_{11} & Prob_{21} \\ Prob_{22} & Prob_{12} \end{bmatrix} \tag{2}$$

Where $Prob_{11}$ is the probability that the commodity market return is at a bullish state and will not move, $Prob_{21}$ is the probability that the returns are at bullish state and will move to a bearish state. $Prob_{12}$ is the probability that the returns are at a bear regime and will not moveis the probability that the returns are at a bearish regime and it will move to a bullish state (Brooks, 2019).

4.2. Preliminary and Diagnostic Tests

The study begins by applying the Brock, Dechert, and Scheinkman (BDS) test to assess the presence of nonlinearity in the relationship between the dependent and independent variables. Following this, the Variance Inflation Factor (VIF) test is employed to detect potential multicollinearity among the independent and control variables. To evaluate the stationarity of the data, the study conducts the Augmented Dickey-Fuller (ADF) unit root test, the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) stationarity test, and the ADF break point unit root test, which accounts for potential structural breaks. Once the preliminary tests confirm the presence of nonlinearity, absence of multicollinearity, and stationarity in levels—both with and without structural breaks—the Markov regime-switching model is estimated. The robustness of the estimated model is then evaluated using the Breusch-Godfrey LM test and the Durbin-Watson statistic, both of which test for the presence of autocorrelation in the residuals.

4.3. Empirical Results

4.3.1. Preliminary test

Table 2 provides the preliminary results of the commodity market and the market-wide investor sentiment index. In Panel A, the mean figures associated with the two commodity market proxies demonstrate positive figures, suggesting that on average the returns are positive. However, it is worthy to note that the average return of gold is higher than the average return of oil. Moreover, one would expect the higher average return to have higher risk, but it is seen that the volatility of the oil returns is higher than the gold returns. These findings are not surprising, as gold provides safe heaven properties during unfavourable economic conditions, therefore, it should contain a higher average return and lower volatility. Moreover, the ongoing Russian-Ukraine war has impacted the global oil industry by increasing the volatility of oil which in turn caused heighten prices levels (Moodley et al., 2025b). These findings are further supported by the minimum and maximum values, as the oil returns contain the highest minimum and maximum values as compared to gold returns, which indicate there exists higher deviations from the mean which suggests heightening volatility. The kurtosis of gold and oil returns are negative, this suggest that majority of the returns lie to left of the mean.

In Panel B, the preliminary tests are presented. It is evident that the BDS test statistic is significant at all levels of significance, suggesting that the null hypothesis of linearity can be rejected in favour of the alternative hypothesis that gold, oil and sentiment index express nonlinearity. On this basis, a nonlinear model will be best suited to examine the effect of investor sentiment on commodity market returns, thus the study implements the Markov regime-switching model. The inclusion of the sentiment index is further supported by the VIF test stat as it provides no evidence of multicollinearity. This finding was predicted as there exist no other independent variables, so one would expect no multicollinearity, which further increases the robustness of the estimation. The ADF test demonstrates that all three variables are stationery in levels, as

Table 2: Preliminary results

Variable	Gold	Oil	SENT
	Panel A: Descriptive statistics		
Mean	0.5487	0.1010	−3.76E-2
Median	0.6711	1.4562	−0.1180
Maximum	12.7911	63.3269	4.6239
Minimum	−19.6561	−78.1866	−3.4905
Std. Dev.	4.9095	11.8663	1.8943
Skewness	−0.2815	−0.9571	0.2031
Kurtosis	3.9245	15.1652	1.9804
Jarque-Bera	9.9104	82.7560	11.8442
Probability	0.0070	0.0000	0.0027
Observations	203	203	203
	Panel B: Preliminary tests		
BDS	0.0146***	0.0220***	0.1440***
VIF	-	-	1.0000
ADF	15.9094***	−11.5535***	−3.7508***
KPSS	0.1642	0.0445	0.0904
ADF-Break Point	−16.6569***	−12.2379***	−20.7143***

the test statistic is more negative than the associated critical values, thereby allowing for the rejection of the null hypothesis that the variables contain a unit root. This was further collaborated by the KPSS test, as the test statistic is much lower than the critical values therefore, we fail to reject the null hypothesis that the variables are stationery. The ADF-break point test confirms the variables are stationery in the presence of structural breaks as the null hypothesis of the variables containing a unit root in the presence of structural breaks is rejected. One then can conclude that gold returns, oil return and investor sentiment index is stationery in levels and in the presence of structural breaks, thereby permitting the estimation of the Markov regime-switching model.

4.3.2. Transition probabilities and expected duration results

Table 3 provides the transition probabilities and expected duration of the associated commodity market variables. It is evident that the probability of the gold returns staying in a bull regime (0.9932) is higher than the probability of staying in a bear regime (0.9899). These findings suggest that the gold returns remain longer in a bull regime than a bear regime. This is confirmed by the expected duration as the gold returns stayed in a bull regime for 147.5495 months and a bear regime for 99.2725 months. Similarly, the probability of the oil returns remaining in bull regime is 0.9836 whereas in a bear regime it is 0.6800. Moreover, the expected duration of the oil returns staying in a bull regime is 60.9332 months whereas in a bear regime it is 3.1254 months. Again, the bull market condition is dominate among the oil returns. The concluding findings suggest that the bull market condition is persistent among the commodity market returns, suggesting that the returns are increasing overtime.

4.3.3. Smooth transition probability results

Figure 1 bellow provides the smooth transition probabilities associated with the gold and oil returns. It can be visualised from Figure 1a that the gold returns were bearish between 2007 and 2013. These dates coincide with the 2007/2008 GFC, suggesting that the returns of gold were decreasing during financial market uncertainty. These findings do not come as a shock as many markets including the commodity market was negatively affected by the GFC, which resulted in the crash of the global financial market. It is interesting to note that from period 2014 to 2023 the gold returns were bullish, suggesting that it was increasing overtime despite the COVID-19 pandemic causing negative effects to majority of markets. The resilience of gold to the COVID-19 pandemic portrays the characteristics of safe heaven assets, which assists in mitigating portfolio risk during financial market uncertainty. Moreover, it is seen that the gold returns stayed longer in a bull regime than a bear regime as supported by the findings in Section 4.4.2.

If one looks at Figure 1b, it is seen that there only existed two significant periods of a bearish condition in the oil returns, 2008 and 2020. These dates coincide with the 2007/2008 GFC and the COVID-19 pandemic, implying that the oil returns were decreasing over these time periods. Similarly, the findings do not come as a shock as it is general knowledge that these two financial market events had negative effects on asset market returns. It is also worthy to note that there existed small bearish periods in the oil returns, 2014, 2018 and 2021. These dates coincide with the Russian-Ukraine war which had a negative effect on oil prices throughout because Ukraine is the net supplier of oil. The findings of Section 4.4.2 suggesting that the oil returns are bullish, is further supported by Figure 1b as there exist more bullish periods than bearish periods.

4.3.4. Markov regime-switching results

Table 4 provides the results associated with the Markov regime-switching model. In Panel A, the returns of gold and oil is positive and significant in a bull regime. This implies that the returns are increasing in a bull regime. Similarly, the oil returns in a bear regime are negative and significant. Accordingly, in the bear regime, oil returns are decreasing. These findings are in line with theory as in a bull regime, returns are positive and increasing but in a bear regime, returns are negative and decreasing (Davies, 2013). It is worthy to note that the gold returns are positive and significant in a bear regime. These findings contradict theoretical observations as in a bear regime, returns must be negative as they decrease overtime. However, the findings demonstrate the safe heaven characteristics of gold as during financial market uncertainty (bear regime) the returns are positive, suggesting that gold can be used to mitigate risk during volatile market conditions. The findings are further supported by the error variance as it is higher in a bear regime than a bull regime, indicating the bear regime is more volatile.

The return of gold is negatively significantly affected by investor sentiment in a bull regime, but oil returns is positively significantly

Table 3: Transition probabilities and expected duration results

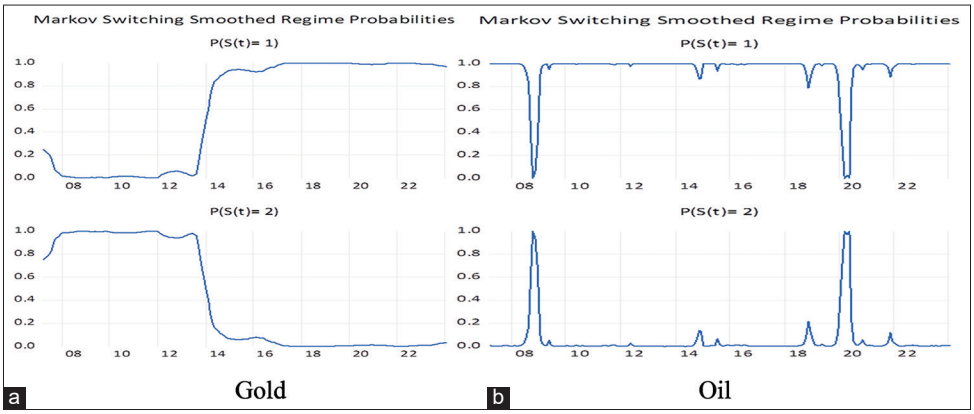
Gold		
Transition probabilities	Bull regime (P1)	Bear regime (P2)
Bull regime (P1)	0.9932	0.0068
Bear regime (P2)	0.0101	0.9899
Expected duration (T)	147.5495	99.2725
Oil		
Transition probabilities	Bull regime (P1)	Bear regime (P2)
Bull regime (P1)	0.9836	0.0164
Bear regime (P2)	0.3110	0.6800
Expected duration (T)	60.9332	3.1254

Authors' own estimation (2024)

Table 4: Markov regime-switching results

Variable	Gold		Oil	
	Coeff.	Z-stat.	Coeff.	Z-stat.
Panel A: Bull regime				
C	0.3908***	3.0555	0.7683***	3.4085
ΔSENT	−0.1741***	−3.1073	0.1731*	1.9948
σ	1.3483***	9.0202	2.1708***	6.3020
Panel B: Bear regime				
C	0.7425*	1.9514	−1.7974***	−3.5298
ΔSENT	0.1073***	3.3617	−1.7793***	−3.7791
σ	1.8037***	9.8836	3.4725***	3.8691
Panel C: Diagnostic tests				
LM-stat	2.8001		1.3884	
P-value	0.2466		0.3455	
DW-stat	2.2333		2.0517	

Figure 1: (a and b) Smooth transition probabilities of the commodity market. Authors' own estimation (2024)



affected by investor sentiment in the same regime. In a bear regime, investor sentiment has a positive significant effect on gold returns but in the same regime investor sentiment has a negative significant effect on oil returns. These findings indicate that investor sentiment has a time varying and regime-specific effect on commodity market returns, such that market conditions dictate the observed effect.

The robustness of the Markov regime-switching model is considered in Panel C. The Breusch–Godfrey LM test statistic is insignificant at all levels of significance. The study fails to reject the null hypothesis that there is no autocorrelation in the residuals of the model. The Durbin–Watson test further corroborates the findings as the test statistic is 2, which suggests there exists no autocorrelation in the residuals of the model and further increases the robustness of the model.

The results of the Markov regime-switching model suggest that the effect of investor sentiment on commodity market returns are regime dependent. These findings are consistent with the AMH which asserts that investors' perception of risk is dependent on the state of the market which in turn cause investor sentiment to vary under different market conditions. The significant alternating effect of investor sentiment on commodity market prices under different market conditions can be attributed to behavioural biases which dictates investors behaviour and appetite for risk (Lo, 2004). It is worthy to note that of the significant relationship that exists, investor sentiment has a more pronounced effect on commodity market returns in the bear market condition. Consequently, even though the effects of investor sentiment alternate with market conditions, the effect of investor sentiment are greater during volatile periods. Moreover, the results suggest that commodity market returns can be significantly explain by investor sentiment in the market which coincides with the AMH.

Collectively, the results of the paper indicate that investor sentiment has a significant effect on the commodity market returns in a bullish and bearish market condition. Together, these results suggest that investor sentiment does not influence commodity market returns uniformly as the response vary with the type of risk (investor sentiment), the direction of the change in risk (increase or decrease in investor sentiment) and the type of market condition (bull or bear regimes).

5. CONCLUSION AND IMPLICATIONS

At the onset of this study the objective was to examine the effect of investor sentiment on South African commodity market returns under bull and bear market conditions. To this extent, the study developed a novel market-wide investor sentiment index for the South African financial market, using the principal component analysis and selected oil and gold securities from the South African commodity asset market. The first research question was answered as the findings of the Markov regime-switching model reveal that investor sentiment is an important determinant of South African oil and gold returns, such that the effect is said to alternate with the state of the financial market. More specifically, in a bull market condition, investor sentiment has a negative (positive) effect on gold (oil) returns, whereas in a bear market condition, gold (oil) returns are positively (negatively) influenced by investor sentiment. Furthermore, the second research question was answered as it was found that gold and oil returns stayed longer in a bullish market, suggesting that the returns are positive and increase more frequently across the sample period.

The findings have key implications to investors and policy makers. Firstly, investors must take note that investor sentiment has a significant effect on commodity market returns, where the effect is dictated by the market condition (bull or bear conditions) and the type of sentiment in the market, (positive or negative). Accordingly, when investors develop appropriate risk management strategies, they must consider such information before determining which commodity market securities, oil or gold should be included in their portfolio. Investors asset selection strategy must be coherent with the findings of the study as it will have a key influence on investors portfolio's such that if the market is in a bull (bear) condition and investors consider gold (oil) in their portfolio it will cause a decrease in their portfolio returns. Furthermore, investors must take note that during financial market uncertainty, gold is the only security from the South African commodity market that attributes safe heaven properties, as such they should include the security in their portfolio to mitigate volatility caused by financial market uncertainty and to ensure appropriate diversification properties.

Secondly, policy makers must acknowledge that enhanced investor participation in the South African financial market, specifically

the commodity market, causes sentiment induced markets and changing market conditions. That being, the sentiment induced markets adversely affect commodity market returns causing the returns to deviate from their equilibrium level. This ultimately, causes financial market anomalies such as bull and bear market conditions which negatively influence financial stability of the commodity market and creates unnecessary volatility. To this extent, South African policy makers must revisit financial market policies to ensure there is a balance between market participation and market stability. This can be done, by controlling the amount of investor participation in the form of noise traders in the market, which will directly limit alternating market conditions and miss-pricing. Similarly, the JSE authorities must develop a market wide investor sentiment index to assist in understanding the levels of sentiment in the market. This can be done by using the current index of the study as its novelty is attained to its ability to capture foreign market sentiment, which has never been done before by other scholars. This will assist both investors and policy makers in monitoring the level of sentiment in the market so that appropriate asset selection and policy manipulation can be done to safeguard investors portfolio returns and financial market stability.

Despite the novel implications, the current study is not without limitations. That being, the study focuses on commodity market securities that are commonly traded, namely, gold and oil returns. However, there exist additional commodity market returns that can be examined for future studies, these include agriculture commodities as well as companies listed in the commodity market. Similarly, the analysis is restricted to the South African financial market, future studies can extend the analysis to other African emerging market to determine if the effect sentiment has on commodity market returns are uniform across African emerging markets. Moreover, the current study limits the sentiment index to seven key proxies, future studies can enhance the number of proxies to capture additional sentiment in the market.

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