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OVERREACTION AND UNDERREACTION DURING THE COVID-19 PANDEMIC IN THE SOUTH AFRICAN STOCK MARKET AND ITS IMPLICATIONS

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Abstract

The aim of this study was to investigate overreaction and underreaction from the six main sectors in the Johannesburg stock exchange due to the significant impact of Covid-19 on economic activities and financial markets globally. Using a Threshold GARCH model, the findings revealed the presence of overreaction mostly in the healthcare, industrial and telecom sector. However, very few stocks in the banking and tech portrayed overreaction while none of the stocks in the consumer goods sector revealed the presence of overreaction or underreaction because the coefficient of the leverage term was statistically insignificant. From these findings, there is a high risk of investing in healthcare, industrial and telecom stocks, which is not compensated by additional returns. Investors can minimize risk in this sectors by adding healthcare, industrial and telecom stocks in a well- diversified portfolio and assigning a risk coefficient to their pricing. This study adds to the body of knowledge on market anomalies by looking at overreaction and underreaction during the covid-19 pandemic, which is an important concept in behavioral finance. This study is significant to market participants that are willing to trade on the Johannesburg stock exchange as it provides valuable insights on behavioral pattern and anomalies.

Keywords: Overreaction, Underreaction, Covid-19 Pandemic, Threshold GARCH Model, Leverage Coefficient

1. Introduction

Modern research in finance started in the 1950's and was predominantly dominated by the assumption that investors are rational and they make rational decisions (Elton and Gruber, 1997). This idea was supported by the efficient market hypothesis (EMH) which proposes that stock prices reflect all available information in the market (Kelikume *et al.* 2020). That is to say, the prevailing market price reflects the stock price fundamental value. Also, the market price of a security should be the present value of discounted cash flows. The key assumption of the EMH theory is that investors are on aggregate rational and carefully analyze their investments (Woo *et al.* 2020). However, evidence from the different episodes in the market such as the Covid-19 pandemic have proven otherwise where the classical models do not mimic what happens in the real world and the actual way in which the markets function. The Covid-19 pandemic has had serious economic repercussions and some financial markets are still facing their biggest

challenges since the 2008 financial crisis. The pandemic has caused a rapid decline in economic activities while interest rates are steadily increasing (Shang *et al.* 2021). Credit margins have widened significantly because of fear, which may have caused a vicious cycle. It is perceived that the pandemic may have probably caused a fundamental change in financial markets due to the dramatic increase in volatility although the financial systems have responded well.

Considering the above mentioned challenges currently prevailing in financial markets, the basic assumption of market efficiency is challenged by the concept of behavioral finance which attempts to explain market conditions that cannot be explained by traditional finance. An understanding of psychological and cognitive biases, which underpins behavioral finance will assist investors to maximize investments and minimize trading errors. Investors may not have all the information or may not understand the information even when presented with it, which may trigger market anomalies causing investors to overreact or underreact to new information. According to Lin and Rassenti (2010), overreaction is the tendency to over-extrapolate from new information, that is, a disproportionate reaction from small information in which investors see patterns rather than randomness. In this case, if there is new information about a stock which performed really well, investors may be quick to think that the future returns will also be good. Conversely, underreaction is as a result of rejecting any information that contradicts the investor's belief and accepting what confirms the investor's view (Lin and Rassenti, 2010). This is also known as confirmation bias, which may be well present in stock markets. It is widely accepted that there is a positive relationship between expected return and risk implying the greater the risk the more returns are expected (Gitman and Zutter, 2012; Reilly and Brown, 2003). However, the presence of underreaction and overreaction defies this principle and the payoffs do not appear to compensate for risks. This is to say the returns are not correlated with the exposures of the known risk factors. This idea is also supported by Chandra (2016), who contends that any new information may significantly alter the equilibrium price and information cascades may cause market participants to overreact or underreact. Debondt and Thaler (1985) also suggest that overreaction and underreaction are caused by information asymmetry. The pandemic may have caused a fundamental change in some asset prices due to overreaction and underreaction behavioral biases in investors. The Dow Jones dropped by more than 2% during by the 31 January 2020 because of Covid-19 fears wiping out all the gains for the month. However, the United States (US) stock markets later quickly recovered to all-time highs in the following month, signaling the presence of overreaction and underreaction in market securities.

The aim of this study is to empirically investigate overreaction and underreaction for listed stocks in the Johannesburg stock exchange (JSE) in six major sectors in South Africa. The motivation of this study stems from the effect of the Covid-19 pandemic on financial markets. This quest has led to the idea of empirically exploring whether the pricing of stocks listed on the JSE follow their fundamental values or are affected by behavioral biases and anomalies during the pandemic. Also, if underreaction and overreaction biases are present, these stocks will not be appropriately priced and this will cause a change in the market price which is not proportionate to the significance of the episode. Exploring overreaction and underreaction will provide valuable insight to investors and will guide them not to use their emotions to sell after a bad performance and buy after good performance. Also, this study will be of significant importance to investment practitioners who will be able to select appropriate stocks for diversified portfolios. It is also worth noting that empirically analyzing overreaction and underreaction in financial securities is not a punitive-based approach but rather an incentive-based approach which is aimed at maintaining a sustainable market price. As such, it is worth noting that investments should be based on fundamental values and not on sentiments. By becoming aware of these behavioral biases, investors will avoid the principle of unconventionally being wrong to making the right decisions. Therefore, the research questions to be analyzed reads as follows:

- In order to investigate overreaction, does the volatility of selected stock returns follow an asymmetric pattern where the coefficient of the leverage term is significantly greater than zero?

- In order to investigate underreaction, does the volatility of selected stock returns follow an asymmetric pattern where the coefficient of the leverage term is significantly less than zero?

To achieve the aim, this study was divided into literature, methodology, data results and analysis as well as the conclusion section shown highlighted below.

2. Literature review

The Covid-19 pandemic has had several complexities in most financial markets because of the difficulty in absorbing volatility shocks (Baek *et al.* 2020). The reaction of financial markets to the pandemic has been on average remarkably and in some instances unparalleled. Market Sentiments indicators were at all-time lows comparable to the 2008 financial crisis although some gains have been made. This is evident in the rise in unemployment during the pandemic and a global contraction that is between 3 to 6% (Felsenthal, 2021). Some financial markets are still experiencing a rise in corporate borrowing driven by wider credit margins and more investors are more pruned to sell-offs today than the financial crisis (Mateev *et al.* 2021). Considering that there is more information filtering today than in the past, we might have expected stock market reactions to be rather spread out than in terms of volatility than in the past. However, some financial markets experienced the largest jump in prices during the Covid-19 pandemic for the past 11 years (Mazur *et al.* 2021). This was certainly not the case of the Spanish flu episode where there was a much milder stock market response than we saw recently. It may be possible that the Covid-19 pandemic may have caused a disconnect between asset prices and financial market pricing (Rashid and Pitterle, 2021). This is similar but opposite to the boom and burst price valuation in tech stocks during the dot com bubble. In reaction to the market drawbacks during the Covid-19 pandemic, central banks have reacted with aggressive monetary stimulus (Fischer, 2021). Central banks have introduced many policies to help capital markets through distress as well as increase in government spending. When Pfizer and BioNTech announced promising results from the late stage of the Covid-19 vaccine, the overall market rallied in relief but not every of the market saw gains. Microscopic look at most financial markets revealed rotation out of the tech stocks because of the stay at home policy into certain industries that are expected to rebound as the economy recover. On the downside, many big tech stocks such as Zoom, Netflix and Amazon fell on the vaccine announcement (Ponciano, 2020). Since the pandemic began, tech companies have benefitted from the stay at home policy, which buoyed the overall market. The top 10 tech stocks in the S&P 500 had an increase of more than 5% during the pandemic while 90% of stocks from other sectors had decreased by more than 10%, which may be attributed to value investing. With the global phasing out of restriction, we might experience a rotation from tech stocks to other sectors in the market. One sector that could possible benefit sustainably in the long run are travel and leisure stocks because of promising return to normal vacation and travels. Also, stocks in the corporate real estate may see an increase in stock prices due to the return back to work. Increase and decrease in share price should be proportionate to the valuation to avoid price risk. Pfizer and BioNTech stocks increased significantly from the announcement of the vaccine, which may be purely due to overreaction from investors. This may also imply that investors may be overreacting or underreacting to certain stocks in financial markets.

From the above literature, it may be suggested that the Covid-19 pandemic may have caused investors to overreact or underreact due to adverse selection, which presents some form of behavioral anomalies in the market. Therefore, we expect to see significant coefficient patterns of returns estimates.

Table 1 summarizes a review of prior research of overreaction and underreaction during the Covid-19 pandemic.

Table 1. Summary of prior literature

Study	Model	Period	Country	Findings
Kaluge and Kinesti (2021)	Cumulative abnormal return	December 2019 – April 2021	Indonesia	Evidence of overreaction during the Covid-19 pandemic
Scherf <i>et al.</i> (2022)	Event study approach	January 22 to May 20, 2020	42 different countries	A pattern of underreaction and overreaction during the lockdown restrictions. Relaxing the restrictions had a positive effect on the markets
Jin <i>et al.</i> (2022)	Quantile regression model	Different start dates for different countries till December 17, 2020	United States (US), India, Australia, Germany, Japan, and United Kingdom (UK)	The US and Indian market showed signs of overreaction and underreaction during the pandemic while Australia, Germany, Japan, and UK overreact to new information during the same time frame

3. Methodology

This study used the Threshold GARCH model (TGARCH) to investigate overreaction and underreaction in the Banking, Industrial, Healthcare, Consumer goods, Telecommunication and Tech sector. This model is very useful in estimating asymmetries relating to shocks in financial markets (Lim and Sek, 2013). A TGARCH model is comparable to the regular GARCH in terms of logic and mathematical elaboration but allows for asymmetric responses for conditional volatility to lag squared residuals and abnormal returns depending on lag residuals (Lim and Sek, 2013). If the value is negative, the TGARCH model allows the residual to be translated with a differential coefficient meaning there is persistence of immediate variance based on market shocks signaling overreaction or underreaction (Fang, 2013). The persistence of immediate variance is captured by a multiplicative variable in the model, which also investigates the statistical significance. This method was also used in the study of Fang (2013) to investigate overreaction and underreaction. A TGARCH model is as follows:

$$h_t = \mu + \beta_1 h_{t-1} + \alpha_1 \mu_{t-1}^2 + \gamma_1 \mu_{t-1}^2 D_{t-1} + \Omega \quad (1)$$

where D_{t-1} is a dummy variable, β = the coefficient of the GARCH term, α = The coefficient of the ARCH term of RESID (-1)², γ = The coefficient of the leverage effect (Indicating the presence of overreaction and underreaction).

A purposive sampling was used to select the largest five firms from each of the sectors mentioned above based on market capitalization. Considering that impact of Covid-19, the sampling period was from 2/01/2020 to 2/01/2022.

4. Results

Table 2 highlights a summary of the analyzed data, which provides some useful information about the behavior of the selected stocks. The results from the TGARCH model are present. From Table 2, it can be observed that the coefficient of the asymmetric term or leverage effect for some of the selected securities are positive and statistically significant. More specifically,

- Two out of the five largest stocks in the banking sector were positive and significant.
- Four out of the five largest stocks in the healthcare sector were positive and significant.
- Four out of the five largest stocks in the industrial sector were positive and significant.
- Two out of the five largest stocks in the tech sector were positive and significant.
- All the five largest stocks in the telecom sector were positive and significant.

Table 2. Summary of TGARCH results

Sector	Security name	Security	Coefficient of the GARCH term	Coefficient of the ARCH term	Coefficient of the leverage effect
Banks	FirstRand Limited	FSR.JO <i>p-value</i>	0.0003 (0.700)	0.8675 (0.000)*	0.1063 (0.030)*
	Standard Bank Group Limited	SBK.JO <i>p-value</i>	0.0002 (0.822)	0.8781 (0.000)*	0.0786 (0.062)
	Absa Bank Limited	ABSP.JO <i>p-value</i>	0.0005 (0.326)	0.6658 (0.000)*	-0.0124 (0.884)
	Capitec Bank Holdings Limited	CPI.JO <i>p-value</i>	0.0016 (0.040)*	0.7503 (0.000)*	0.2941 (0.000)*
	Nedbank Group Limited	NED.JO <i>p-value</i>	0.0000 (0.939)	0.7313 (0.000)*	-0.0051 (0.941)
	Aspen Pharmacare Holdings Limited	APN.JO <i>p-value</i>	0.0013 (0.185)	0.8326 (0.00)*	0.1593 (0.003)*
	Mediclinic International plc	MEI.JO <i>p-value</i>	-0.0001 (0.965)	0.8864 (0.000)*	0.1383 (0.000)*
Healthcare	Life Healthcare Group Holdings	LHC.JO <i>p-value</i>	0.0014 (0.126)	0.8564 (0.000)*	-0.1057 (0.080)
	Netcare Limited	NTC.JO <i>p-value</i>	0.0003 (0.710)	0.8248 (0.000)*	0.1421 (0.012)*
	Adcock Ingram Holdings Limited	AIP.JO <i>p-value</i>	-0.0002 (0.779)	0.7996 (0.000)*	0.1341 (0.046)*
	Bidvest Group Limited	BVT.JO <i>p-value</i>	0.0001 (0.850)	0.8851 (0.000)*	0.1167 (0.007)*
Industrial	Textainer Group Holdings Limited	TXT.JO <i>p-value</i>	0.003 (0.035)*	0.6156 (0.001)*	-0.0728 (0.402)
	Barloworld Limited	BAW.JO <i>p-value</i>	0.0015 (0.229)	0.9871 (0.000)*	0.0236 (0.010)*
	Super Group Limited	SPG.JO <i>p-value</i>	0.0007 (0.488)	0.938 (0.000)*	0.1068 (0.000)*
	Imperial Logistics Limited	IPL.JO <i>p-value</i>	0.0034 (0.000)*	0.9328 (0.000)*	0.1322 (0.000)*
	Prosus N.V.	PRX.JO <i>p-value</i>	0.0004 (0.632)	0.7112 (0.000)*	0.0297 (0.662)
Tech	Naspers Limited	NPN.JO <i>p-value</i>	0.0004 (0.622)	0.7271 (0.000)*	0.0271 (0.719)
	Datatec Limited	DTC.JO <i>p-value</i>	0.0005 (0.648)	0.7524 (0.000)*	0.3133 (0.000)*
	Capital Appreciation Ltd	CTA.JO <i>p-value</i>	0.0016 (0.205)	0.8985 (0.000)*	0.0418 (0.334)
	Alviva Holdings Limited	AVV.JO <i>p-value</i>	0.0006 (0.542)	0.5205 (0.000)*	0.5333 (0.000)*
	Shoprite Holdings Limited	SHP.JO <i>p-value</i>	0.0011 (0.227)	0.8359 (0.000)*	0.0562 (0.268)
Consumer services	Pepkor Holdings Limited	PPH.JO <i>p-value</i>	0.001 (0.334)	0.8871 (0.000)*	0.0704 (0.087)
	Clicks Group Limited	CLS.JO <i>p-value</i>	0.0012 (0.129)	0.9147 (0.000)*	0.0987 (0.068)
	Mr Price Group Limited	MRP.JO <i>p-value</i>	-0.0001 (0.920)	0.7853 (0.000)*	0.0896 (0.115)
	MultiChoice Group Limited	MCG.JO <i>p-value</i>	-0.0004 (0.582)	0.6149 (0.000)*	-0.0176 (0.846)

Table 2. Continued

Sector	Security name	Security	Coefficient of the GARCH term	Coefficient of the ARCH term	Coefficient of the leverage effect
Telecom	MTN mobile network	MTN.JO	0.0019 <i>p-value</i> (0.121)	0.8816 (0.000)*	0.1609 (0.000)*
	Vodacom Group Limited	VOD.JO	0.0001 <i>p-value</i> (0.802)	0.8044 (0.000)*	0.1582 (0.013)*
	Telkom SA SOC Limited	TKG.JO	0.0014 <i>p-value</i> (0.244)	0.9592 (0.000)*	0.0628 (0.000)*
	Blue Label Telecoms Ltd	BLUE.JO	0.0013 <i>p-value</i> (0.281)	0.9696 (0.000)*	0.0436 (0.003)*
	Huge Group Limited	HUG.JO	-0.0006 <i>p-value</i> (0.625)	0.8186 (0.000)*	0.1491 (0.002)*

Note: * significant at 5%.

The coefficient of the leverage effect for stocks in the consumer service sector were mostly positive but insignificant indicating the absence overreaction or underreaction. Conversely, the positive and significant leverage coefficient in the banking, healthcare, industrial, tech and telecom sectors confirm the presence of asymmetry and behavioral anomalies. In essence, these anomalies reveal the presence of overreaction in the stocks under consideration. From the leverage coefficients in Table 2, investors tend to overreact to bad news more than good news.

Bad events have a larger effect on the volatility of the stocks than good news confirming the propositions by Lin and Rassenti (2010); Razvan *et al.* (2012); Fang (2013) which state that investors tend to react more to bad news than good news. Applying the findings of this study to the above proposition means that adverse new information to the market has strong impact on stocks returns than favorable news. Market participants need to be cognisant of these facts and factor in some form of risk measure in their pricing especially in the telecom, healthcare and industrial stocks listed on the JSE where overreaction is evident. These findings are in tandem with the findings of Kaluge and Kinesti (2021); Scherf *et al.* (2022); Jin *et al.* (2022), who also detected the presence of overreaction during the Covid-19 pandemic. The presence of this overreaction might be because of fear and greed, which are the most common behavioral biases present.

5. Conclusion

The purpose of this study was to investigate the presence of overreaction and underreaction in selected stocks listed on the JSE. A paucity of research on overreaction and underreaction during the Covid-19 pandemic in South Africa prompted the study. From the findings, the returns of the selected stocks followed an asymmetric pattern where the coefficient of the leverage term was positive and statistically significant in most cases except in the consumer goods sector. This result is not surprising considering the manner in which investors take decisions about prospects based on uncertainty associated with the different outcomes. The presence of these asymmetries creates supply and demand imbalance, which may distort market efficiencies. The risk of investing in healthcare, industrial and telecom stocks are not only from the uncompensated risk from price volatility, but also the skewness of the price distribution. The implications of this study is that a risk coefficient should be assigned to the market price of securities in the healthcare, industrial and telecom in order to mitigate some of the volatility risk. Also, market participants and investors should establish and trade on the fundamental values of these stocks rather than trading on their emotions to limit behavioral biases.

Future research can also test if the abnormal returns or losses are directly linked to overreaction and underreaction biases. Also, future research can also use multiple models to test for overreaction and underreaction so as to have a robust finding.

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