The effect of exchange rate and inflation on the stock market returns of the top mining companies in South Africa

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Declaration

I, Murehwa Mangere declare that the research work reported in this dissertation is my own, except where otherwise indicated and acknowledged. It is submitted for the degree of Master of Management in Finance and Investment as the University of the Witwatersrand. This thesis has not, either in whole or in part, been submitted for a degree or diploma to any other universities.

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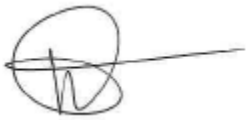

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Abstract

This research study examines the impact of nominal Rand/USD exchange rate and inflation on the nominal stock returns of top mining companies in South Africa that are listed on the Johannesburg Stock Exchange (JSE). The selected mining companies for this study form part of the FTSE/JSE Precious Metals and Mining Index. The relevant data was collected from Bloomberg over a ten-year period (2010 to 2020). The Johansen cointegration analysis was applied to model the long run relationship between inflation, exchange rate and stock market prices for JSE Precious Metals and Mining Index. The study outcome revealed that, in the long run, there is a negative and significant relationship between inflation and the stock market returns. Exchange rate has a negative, though insignificant, impact on the stock market returns for FTSE/JSE Precious Metals and Mining Index in the long run. The outcomes of this study pose important implications, from both a policy and practical perspective. Based on the findings, it is recommended that from a policy perspective, the inflation policy must minimise and stabilise inflation fluctuations. This will result in investor confidence and more investments can be made to revitalise the precious metals mining sector. Furthermore, the findings suggest that exchange rate should be considered at valuation to hedge against currency risk and diversify investments.

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List of Abbreviations

ADF	:	Augmented Dickey-Fuller
AIC	:	Akaike Information Criterion
APT	:	Arbitrage Pricing Theory
CPI	:	Consumer Price Index
KPPS	:	The Kwiatkowski–Phillips–Schmidt–Shin
JSE	:	Johannesburg Stock Exchange
PGMs	:	Platinum Group Metals
SIC	:	Schwarz information criterion
VAR	:	Vector Autoregressive
VECM	:	Error Correcting Model
US	:	United States

CHAPTER 1: INTRODUCTION

This chapter outlines the background (section 1.1) and research problem (section 1.2). Section 1.3 and 1.4 describes the scope and significance of this research. Finally, section 1.5 includes an outline of the objectives of this research.

1.1 BACKGROUND

Macroeconomic factors, which have a large impact on stock returns, are typically monitored and made public as fresh information (Osamwonyi and Evbayiro-Osagie, 2012). For the most part, investors use the publicly available data on macroeconomic variables to guide their investment choices. From a South African perspective, mining industry investments are common because the nation has an abundance of different mineral resources, including gold, platinum group metals, diamonds, iron ore, and coal. Therefore, for individual investors, portfolio managers, finance managers of the companies under study, and decision-makers in government policy, knowing and explaining the impact of macroeconomic variables on the stock market returns of mining companies is a crucial component.

Although there are many macroeconomic factors that influence stock returns, this analysis concentrates on inflation and nominal exchange rate. Numerous aspects of the South African economy are impacted by inflation, including investments, employment rates, government policy, and consumer spending. As a result, this has an effect on the nation's general inhabitants, particularly the poor. In South Africa, 16.3 million people live in extreme poverty, according to a report by Galal (2021). As defined by the World Bank, extreme poverty alludes to a poverty threshold of 1.90 U.S. dollars a day. The importance of the exchange rate in South Africa, meantime, comes from the fact that it serves as a conduit between domestic companies and international markets, both for the exchange of goods and services and financial trade.

Therefore, it is with the above background that the study investigates the impact of exchange rate and inflation on driving future stock market returns of the selected mining companies. Such knowledge is relevant and useful predictive information for the future stock market returns performance for the companies. This in turn can increase the investment potential of the South African economy, specifically the mining sector.

The mining sector is an important industry for the South African economy and the mining companies under study fall within the resources sector on the Johannesburg Stock Exchange (JSE). The mining sector represents more than a quarter of the market capitalisation of the JSE (Hackland, 2015).

The list of leading South African mining companies is dominated by companies that are in the gold and platinum group metals (PGMs) commodity sector, signifying that precious metals are a bedrock for the South African economy. Therefore, this study focused on understanding the effect of exchange rate and inflation on the stock returns of the FTSE/JSE Precious Metals and Mining Index.

1.2 RESEARCH PROBLEM

The relationship between stock prices and macroeconomic indicators is of interest to portfolio managers, company managers, and decision-makers in the government because stock market prices are typically assumed to have a strong association with these variables. There is a wealth of theoretical and empirical research emphasizing how exchange rates and inflation affect stock returns. Some notable studies into this area were carried out by Chen et al. (1986), Jacob and Kattookaran (2017), Mlambo et al. (2013), Molele (2019) Aliyu (2011), Suharyanto and Zaki (2021), Kwofie and Ansah (2018), Khan and Khan (2018), Kuwornu (2012), Ali et al. (2014) and Eita (2012). However, the studies modelling the effect of nominal exchange rate (Rand/USD) and inflation on the FTSE/JSE Precious Metals and Mining Index stock returns is sparse.

In South Africa, inflation has been rising, particularly after the Covid-19 outbreak, and the Rand is a very volatile currency compared to the US Dollar. Due to this, potential investors on the JSE stock market and shareholders alike are paying more attention to these two macroeconomic variables and how they affect stock returns.

1.3 SCOPE OF RESEARCH

The study focused on the effect of nominal exchange rate and inflation on the nominal stock market returns of the FTSE/JSE Precious Metals and Mining Index.

1.4 IMPORTANCE OF RESEARCH

The results from this study have a potential to assist portfolio managers in the portfolio diversification decisions and risk hedging strategies. Furthermore, it may also inform

policy makers in both government and private sectors to have awareness on the impact of nominal exchange rate and inflation on the mining industry in South Africa.

Also, the mining companies under study can use the results from this study in selecting exchange rate risk management strategies that encourages growth and increase shareholder value.

1.5 RESEARCH OBJECTIVES

The objective of the study is to examine the effect of nominal exchange rate and inflation on nominal stock market returns of top mining companies. Specifically, the study examines if exchange rate and inflation have a significant effect and influence on the stock market returns of the companies under study. The research objectives are summarised as follows;

(i) Determine the effect of nominal exchange rate on the stock market returns of the top mining companies in South Africa (FTSE/JSE Precious Metals and Mining Index),

(ii) Determine the effect of inflation on the stock market returns of the top mining companies in South Africa (FTSE/JSE Precious Metals and Mining Index).

CHAPTER 2: LITERATURE REVIEW

This chapter focusses on discussing the theories and studies that have been carried out to ascertain the interaction between inflation, exchange rate and the stock market prices. A detailed view of the risk concept and the following theories is presented; (1) The efficient market hypothesis, (2) the Present Value Model and (3) the Arbitrage Pricing Theory. The empirical studies showing the relationship between stock prices and the macroeconomic variables under study, namely exchange rate and inflation will also be presented.

2.1 RISK AND ASSET PRICING THEORIES

Every investor wants to earn a return in the form of dividends and capital growth. The returns investors get from stock market investments are known as stock market returns. These returns are influenced by a number of variables that fall into two categories: systematic risks and unsystematic risks. This study concentrated on systematic risks, with a particular emphasis on macroeconomic factors, in this case, inflation and nominal exchange rate.

Since stock market returns often follow a random walk, it is challenging to forecast future returns on investments (Reddy and Narayan, 2016). The relationship between stock market returns and various macroeconomic variables have been studied in-depth in the past. There are various financial theories that allude to the fact that macroeconomic variables may influence stock market returns. The models that were reviewed in this study and to support this notion are (1) the Efficient Market Hypothesis, (2) the Present Value Model and (3) the Arbitrage Pricing Theory.

2.1.1 Efficient Market Hypothesis

It remains a fact that the Efficient Market Hypothesis, as described by the efficient market theory, has application to modern finance. According to this hypothesis, a market whose stock prices reflect fundamental information about companies qualifies as an efficient stock market (Novickyte and Degutis, 2014). A condensed definition offered by Eakins and Mishkin (2012), states that an efficient market is one in which asset prices accurately reflect all knowledge about that specific asset price. The following conditions must be met for a market to be considered efficient: (a) all publicly available information has already been

included into stock market prices; and (b) investors cannot obtain a risk-weighted excess return (Novickyte and Degutis, 2014).

As can be seen from the background information, stock market returns are influenced by the market's ability to receive a steady flow of information and by how effectively and efficiently those returns are allocated. As a result, there are three types of market efficiency: weak, semi-strong, and strong (Novickyte and Degutis, 2014). For weak stock market efficiency, the current stock price includes all relevant data regarding stock price changes during the previous period. In contrast, for semi-strong efficient markets, the stock prices reflect both the most recent information that is currently available to the public and information about historical prices. Meanwhile, for strong efficient markets, the current stock market prices incorporate all possible information (both public and that which is not public).

2.1.2 Simple Present Value Model

The Present Value Model connects stock market returns to anticipated cash flows in the future. This model requires two key steps as follows (1) the forecasting of the future cash flows, and (2) the estimation of discounted factors (the risk-free rate plus a risk premium). The fundamental study of a company, which includes models of forecasts of future cash flows and their uncertainty, is the basis for the forecast of future cashflows. Only macroeconomic factors can determine the intrinsic discount factor.

A brief outline of the simple present value model of stock market price formation is discussed to demonstrate how macroeconomic variables can determine the stock market prices. The formulation of a simplified present value model is demonstrated below:

$$P_t = \frac{E_t[d_{t+1}]}{1 + E_t r} + \frac{E_t[P_{t+1}]}{1 + E_t r} \qquad (1)$$

Where E_t denotes the expectations operator conditional upon on all information available at time t, P_t is the fair (real) price of the stock at time t, $E_t[d_{t+1}]$ is the expected annual (real) dividend per share at the end of the first year, , $E_t[P_{t+1}]$ is the expected (real) price of the share at the end of the first year and finally $E_t r$ is the expected (constant) market determined (real) discount rate or cost of capital. It can be derived that:

$$E_t P_{t+i} = \frac{E_t[d_{t+i+1}]}{1 + E_t r} + \frac{E_t[P_{t+i+1}]}{1 + E_t r} \qquad (2)$$

For i = 1, 2 …, N-1, by substituting (2) into (1) and repeatedly substituting for the future expected price term we get the following equation:

$$P_t = \sum_{i=1}^{N} \frac{E_t[d_{t+1}]}{[1 + E_t r]^i} + \frac{E_t[P_N]}{[1 + E_t r]^N} \qquad (3)$$

As $N \rightarrow \infty$, (3) becomes:

$$P_t = \sum_{i=1}^{\infty} \frac{E_t[d_{t+1}]}{[1 + E_t r]^i} \qquad (4)$$

As a result, the expected stream of dividend payments and the market discount rate affect the share price. Hence any macroeconomic factor that is anticipated to affect predicted future dividends and/or the discount rate may have a significant impact on the overall price of stocks.

The Arbitrage Pricing Theory (APT), which was largely established by Ross (1976), makes the assumption that risk and stock market returns are positively correlated. This concept is predicated on the idea that some systematic factors have a long-term impact on stock market performance. Additionally, non-systematic factors that may have their risk diversified may have an impact on stock market results.

The Law of One Price, which states that similar securities must be priced the same regardless of how they are packaged, because of the drive by the forces of supply and demand, is the foundation of the Arbitrage Pricing Theory. Therefore, it presupposes that arbitrage profits are eliminated. Stock market gains are said to be driven by two factors: expected returns and unexpected returns. Because the unexpected part is linked to the economic environment, this then supports the notion that macroeconomic factors are the primary source of risk for stock market returns. Ross (1976) contends that the expected returns on the assets are roughly linearly proportional to the factor loadings, assuming equilibrium prices do not present arbitrage possibilities over static portfolios of the assets.

The Arbitrage Pricing Model can be represented by the following equation;

$$R_i = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \cdots + \beta_x X_x + \varepsilon \qquad (5)$$

Where, R_i is the expected stock market return on security i; β is the coefficient of the macroeconomic variables, X is the systematic risk and ε is the unsystematic risk (error term).

Macroeconomic variables in the Arbitrage Pricing Model can be chosen freely, and this supports the notion that this model is an explanatory rather than an empirical model.

These defined financial theories, highlight that, in part, the stock market returns are determined by macroeconomic variables. Hence it is important to understand the effect of these macroeconomic variables on stock market returns.

2.2 MACROECONOMIC FACTORS

Various studies looking at the effect of macroeconomic variables on the stock market returns have been presented in literature.

Chen, Roll, and Ross (1986) conducted studies that demonstrated how changes in macroeconomic conditions increase risks, which in turn have an impact on stock market returns. Industrial production shifts in risk premium, and twists in the yield curve are the macroeconomic factors that Chen et al. (1986) identified as having a substantial impact on or in explaining the predicted stock market returns. In the meantime, the effect of inflation on stock market gains was not very strong.

Dladla and Malikane (2019) derived a linear model that was based on the dividend discount theory that could be used to explain variations in stock market returns. The model considered the output gap, inflation rate and the real effective exchange rate through the Taylor rule. The model incorporates; (1) inflation rate as having negative effects on stock returns through the interest rate, (2) output gap having a negative impact on stock market returns and (3) exchange rate having a negative correlation with stock prices.

Jacob and Kattookaran (2017), conducted a study to understand the impact of exchange rate on the stock market of India. The investigations revealed a negative correlation between exchange rate impact and stock return. This simply indicated that higher import prices caused by the local currency's depreciation had a detrimental impact on a company's financial performance. As a result, the company's stock returns will decline. The authors of these studies concluded that maintaining exchange rate stability was crucial for fostering economic confidence.

Mlambo et al. (2013), assessed the effect of currency volatility on the Johannesburg Stock Exchange. The correlation between exchange rate volatility and stock market performance was established using the Generalized Autoregressive Conditional Heteroskedascity (1.1) (GARCH) model. The authors established that there is a very weak relationship between currency volatility and the stock market returns.

Molele (2019) looked on the impact of macroeconomic factors on the stock market return volatility of the oil and gas industry on the JSE. The Brent crude oil prices, the currency rate (R/$), the broad money supply, and the gold price were the macroeconomic factors taken into account in the studies. The research technique included the use of the GARCH-GED model to account for volatility. The author came to the conclusion that changes in oil prices and the overall money supply had a considerable and favorable impact on the returns on the oil and gas stock market. Exchange rates and the price of gold, meantime, had a negative and considerable impact on the stock market returns of the examined sector.

Aliyu (2011) used the generalized autoregressive conditional heteroskedasticity (GARCH) model to examine the effects of inflation on stock market returns and volatility for Nigeria and Ghana. The findings demonstrated that the two countries' stock markets' returns and volatility are both significantly influenced by the inflation rate. This eventually led to the conclusion that, should policies to control inflation be put into place in the two nations, stock market returns and investor confidence would improve.

In a different study, Suharyanto and Zaki (2021) looked at the impact of inflation, interest rates, and exchange rates on stock market returns for Indonesian food and beverage companies. They discovered that inflation has a significant negative impact on stock returns, while interest rates have no impact and the exchange rate has a significant negative impact.

Ghana's stock market returns were examined by Kwofie and Ansah (2018) in relation to the impact of inflation and exchange rates. Because it was based on an emerging market economy, this study is pertinent. The authors discovered a significant long-run link between inflation and market returns on the Ghana Stock Exchange. Additionally, they pointed out that there is no discernible short-run connection between inflation and stock market return. The research also showed a substantial long- and short-run association between exchange rate and returns on the Ghana Stock Exchange market.

Khan and Khan (2018) checked the short- and long-term cointegration of macroeconomic variables on stock prices of Karachi Stock Exchange using the ARDL approach of bound testing. The authors discovered that the money supply, exchange rate, and interest rate had a considerable long-term impact on the stock values of the Karachi Stock Exchange. This suggests that the Pakistani central bank should exercise caution while adjusting the money supply in the market because an excessive rise could have a negative impact on investments and the stock market.

The Johansen multivariate co-integration approach is used by Kuwornu (2012) to examine how macroeconomic factors affect returns on the Ghanaian stock market. The study's specific macroeconomic factors included the consumer price index (which tracks inflation), the price of crude oil, the currency rate, and the yield on 91-day Treasury bills (monitoring interest rate). The author deducts that there is co-integration between the four macroeconomic variables and stock returns in Ghana indicating long run equilibrium relationship.

In an endeavour to address the absence of research on the relationship between macroeconomic variables and industrial shares in developing countries, Banda et al. (2019) examined the impact of macroeconomic variables on industrial shares listed on the Johannesburg Stock Exchange. To reach their conclusions, the authors used a multivariate framework that included the normality test, correlation analysis, Augmented Dickey Fuller (ADF) unit root tests, the Johansen cointegration test, the Vector error correction model (VECM), and Granger causality tests. The results revealed that inflation has a significant positive relationship with stock market prices. Furthermore, interest rates and stock market prices had a negative relationship. In the same order, exchange rates had a positive effect on the stock market returns, while GDP and stock market returns where not related in any way.

In a comparison of Pakistan and India, Ali et al. (2014) looked into the effects of currency rates on stock market prices. For the investigation, the authors employed autoregressive techniques involving Dicky Fuller and Johansen co-integration tests. According to the findings, there was no long-term correlation between exchange rates and stock market prices for both countries' stock markets.

In order to examine the connection between inflation and stock market returns at the Johannesburg Stock Exchange (JSE) in South Africa, Eita (2012) used the Granger causality test. The authors revealed that there is a positive relationship between stock

market returns and inflation. In addition to these results, it was discovered that interest rates and stock market returns have a negative association.

2.2.1 Inflation

The pace of price growth over a specific time period in an economy is known as inflation (Morris and Morris, 1999). The Consumer Price Index (CPI) gauges the overall level of prices in an economy and serves as a proxy for inflation (measures the changes in the purchasing power of the currency). The cost of a predetermined basket of consumer goods, including food, healthcare, and transportation, is measured over time to determine the CPI.

The general view which is support by various academic studies suggest that a high expected inflation predicts low stock returns (Boyd and Smith, 1999). The main reason why the high inflation is related with negative stock market returns movements is because it increases borrowing costs, the cost of inputs such as labour and fuel, and reduces standards of living.

In general, the stock market anticipates a certain level of inflation during specific times and modifies the projected returns against the anticipated inflation. The component that worries investors the most is when inflation suddenly increases by a larger amount. Higher inflation will negatively impact company profitability in the future, which will diminish stock returns. Therefore, financial market stability tends to be promoted by consistently low and stable inflation.

The impacts of inflation on stocks were explored by Sharpe (2000), who came to the conclusion that there is a negative correlation between stock prices and anticipated inflation. These results are in contrast to those of Alagidede and Panagiotidis (2010), who found that the link between stock market returns and inflation was not only positive but even exceeded unity in the case of South Africa after studying six African markets.

2.2.2 Exchange Rate

In this study, the effect of the South African rand/US dollar (ZAR/USD) exchange rate on the stock market prices of the top mining companies in South Africa, specifically the FTSE/JSE Precious Metals and Mining Index, was investigated. This exchange rate may be defined as the price of a unit South African Rand in terms of the US dollar.

Exchange rate is predicted to have an impact on stock market values in a variety of ways. According to Ajayi and Mougoue (1996), a depreciating currency causes a decline in stock

market prices because of an expectation of inflation by the market. Equation 2 below illustrates this notion from a theoretical perspective.

$$e_t = \frac{e_t P_t^*}{P_t} \qquad (6)$$

Where, e is the real exchange rate, ε is the nominal exchange rate (domestic-currency price of one unit of foreign currency), P_t is the domestic-currency price of a basket of goods in the domestic country and P_t^* is the foreign-currency price of a basket of goods in the foreign country.

A higher nominal exchange rate in the short run is consistent with a decrease in the price ratio $\frac{P_t^*}{P}$ towards a long run equilibrium level, where the real exchange rate equals unity. A lower $\frac{P_t^*}{P}$ ratio implies relatively higher domestic prices. Thus, a decline in the nominal exchange rate breeds expectations of future inflation. The stock market views inflation as bad news because it tends to restrain consumer spending, which lowers stock market prices.

According to the second approach on how exchange rates affect stock market values, international investors will be reluctant to hold assets in currencies that depreciate because doing so would reduce their return on investment, and as a result, they will sell the stocks. The share prices fall because of this activity.

According to a contrasting perspective, importers will experience greater costs as a result of a weaker domestic currency and reduced earnings, which will result in lower stock market prices.

On the contrary, for large exporters, a depreciation in the exchange rate will have a beneficial influence on the income stream, which will raise stock market values. The South African rand/US dollar exchange rate (ZAR/USD) has historically been very volatile (Munyama and Tondani, 2005). In a separate study, Maveé, Perrelli, and Schimmelpfennig (2016) looked into the drivers of volatility in the South African rand/US dollar (ZAR/USD) exchange rate since the start of the global financial crisis. According to the authors, the recent pressures on the South African Rand against major currencies have caused investors to be concerned about the future growth prospects of the nation's economy.

It is with this background that most mining companies have an interest in exchange rate movements due to its potential impact on the profitability of the business. If the Rand is

stronger against the US dollar, then it encourages imports and adversely affects both exports and any international asset values measured in Rands.

The opposite is true for a weaker Rand; it adversely affects imports, assists exports, and increases any international asset values measured in Rands. It must be noted that most of the mining companies have their costs predominantly in Rands (there is less imports) while their revenue depends highly on the export of the minerals. Therefore, the mining companies prefer an economy where the South African Rand is substantially weaker against the US dollar. This may conflict with a broader expectation of the economy because a weaker Rand causes inflation, increase international capital outflows, and reduce foreign investments.

The debate of the effect of exchange rate on various key indicators in the economy has been wide and extensive and has led to the fundamental question on how it impacts on the stock market returns of mining companies. In a study by Abdalla and Murinde (1997), where they investigated the exchange rate and stock price interactions in emerging financial markets in India, Korea, Pakistan and the Philippines, the authors found out that there is a positive correlation between exchange rates and stock prices in all the countries under study (apart from Philippine). This outcome led to policy recommendations that the respective governments should be careful in their implementation of exchange rate policies since they affect the stock markets returns.

Yaya and Shittu (2010), studied the impact of exchange rate (Naira/US Dollar) on conditional stock market volatility in Nigeria and the results showed that there is a significant relationship between exchange rate and conditional stock market volatility in Nigeria. Again, this points to a specific policy direction when it comes to exchange rates.

2.3 RESOURCE SECTOR

A stock exchange provides a controlled setting for the trading of financial products like shares. A stock market serves as a marketplace where firm ownership can be bought or traded. Shares are traded on the Johannesburg Stock Exchange (JSE) in South Africa. The JSE is Africa's first and oldest stock market platform.

Due to the importance of precious metals mining on the South African economy, investors have an increased interest in monitoring the stock market returns of this sector. As a result, indices to track the stock market returns of the mining sector have been set up on the JSE, and this includes the FTSE/JSE Precious Metals and Mining Index. The FTSE/JSE Precious Metals and Mining Index comprises of companies operating in the mining industry and is a good indicator of stock market returns in the precious metals industry.

The South African economy hinges a lot on mining. Of significance is that South Africa has more than 80% of the world's platinum reserves, making it the largest producer of platinum group metals (PGMs). Previously, gold has been a corner stone of the mining industry, but gold production has declined over the years. Gold predominantly is used as an avenue to store value, while PGMs are primarily industrial metals that are driven by consumption and increased advances in industrial technologies. The primary use for the PGMs metals is in emissions reduction, particularly in catalytic converters in vehicles. This aspect is very critical to the growth of this industry as the green economies are now a global imperative in a bid to fight aspects such as global warming.

Besides the supply and demand aspects of the precious metals industry, there are various factors that can impact on the stock market returns of this sector. Some of the factors include, but not limited to, exchange rate, labour market pressures, productivity, increase in cost base, inconsistent supply of electricity and other policy related factors.

The purpose of this study is confined to ascertaining the effects of only nominal exchange rate and inflation on the stock market returns of the FTSE/JSE Precious Metals and Mining Index.

2.3.1 FTSE/JSE Precious Metals and Mining Index

The FTSE/JSE Precious Metals and Mining Index comprises of companies operating in the mining industry whose focus is on precious metals mining and processing i.e., gold and platinum group metals (PGMs). The list and description of the companies that make up the FTSE/JSE Precious Metals and Mining Index is as follows;

i. Harmony Gold Mining Company Limited: This company mines and explores for gold, and it conducts operations in Papua New Guinea and South Africa.

ii. Impala Platinum Holdings Limited (also known as Implats): This corporation serves as a holding company for a collection of businesses that run platinum mines to produce platinum group metals (PGMs) such nickel, palladium, rhodium, and platinum.

iii. Northam Platinum Holdings Limited: Palladium, platinum, and rhodium metals are explored, mined, and produced by this holding corporation.

iv. Anglo American Platinum Limited: Palladium, rhodium, iridium, ruthenium, osmium, nickel, copper, and cobalt are among the platinum group metals that are mined and produced by the enterprises in this holding company.

v. Royal Bafokeng Platinum Limited: This company explores, mines and produces platinum group metals (PGMs).

vi. AngloGold Ashanti Limited explores and mines gold internationally and has operations in South Africa.

vii. Sibanye Stillwater Limited extracts mineral properties and is the second-biggest primary producer of palladium, third-largest primary producer of gold, and largest primary producer of platinum in the world.

viii. DRDGOLD Limited: this is an entity that produces gold from underground mines and surface re-treatment operations (re-processing of gold dumps) in South Africa.

ix. Pan African Resources PLC: The company produces gold from underground operations and from surface tailings.

x. Gold Fields Ltd: This is one of the largest producers of gold. It has operations in South Africa, Australia, Ghana and Peru.

2.4 RESEARCH HYPOTHESIS

2.4.1 Inflation (Hypothesis 1)

The literature review section has outlined existing studies that provide evidence that inflation may result in stock market returns to move. High inflation is related with negative stock market returns movements because it increases borrowing costs, the cost of inputs such as labour and fuel. The fact that inflation raises precious metals mining companies' bottom line costs, and considering that commodity prices are market driven, it then means that inflation decreases the mining companies' future cash flows. When there is a rising inflation, monetary tightening (interest rate increase) usually takes place. According to Kuwornu (2012), raising the interest rate leads to an increase in the discount rate that is part of the stock valuation formula.

It is from this background that it is hypothesized that there is a negative relationship between inflation and the stock market returns of the index under review (FTSE/JSE Precious Metals and Mining Index).

2.4.2 Exchange Rate (Hypothesis 2)

Literature review has revealed that an increase in the Rand-USD exchange rate (a depreciation of the Rand) will be viewed as favourable by the mining industry (increased revenue because of a higher exchange rate), leading to increased production. Hence there will be an increase in exports and subsequent profits (in Rand terms) of the companies. This will ultimately result in higher stock market value. In summary, the devaluation of the domestic currency has a positive relationship with the stock returns.

Thus, it is hypothesized that the Rand/USD exchange rate is positively related to the stock returns of the mining companies under review.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter outlines the research methodology and design adopted by this research to achieve the aims and objectives stated in section 1.5 of Chapter 1. Research methodology defines the principles underpinning the approach used to conduct the research. A description of the research design is outlined in this chapter, data sources are stated, as well as the empirical and data analysis process that was followed. Section 3.1 sets out the methodology used in the study, the stages by which the methodology was implemented and section 3.2 details the empirical framework.

3.2 RESEARCH DESIGN

This study adopts a quantitative, descriptive research approach. Quantitative research design uses structured tools to generate numerical data and uses descriptive and inferential statistics to interpret, organise and represent data (Sekaran and Bougie, 2009). This study uses time series data, which includes inflation, exchange rates, and stock market returns from January 2010 to December 2020.

3.2.1 Model specification

The data involves three variables observed at equally spaced points in time (monthly). Therefore, the data constitute a time series data. It is suggested that the relationship to be estimated takes the following general equation:

$$SP_t = f(CPI_t, Ex_t) + \varepsilon_t \quad (7)$$

Where SP is the stock market returns for the FTSE/JSE Precious Metals and Mining Index (dependant variable), CPI is the inflation and Ex is the nominal exchange rate. A simplified model was then applied in the estimation of the relationship between the stock market returns and the macroeconomic variables selected (inflation and exchange rate) and is specified in equation 8 below. A natural log transformation of the model is performed to reduce multi-collinearity and to make the equation linear. If all variables are in log form, the coefficients can then be interpreted as their long run elasticities. The elasticities measure the degree of responsiveness of stock market returns to changes in the level of inflation and exchange rate.

$$SP_{it} = \beta_0 + \beta_{1t} CPI_t + \beta_{2t} Ex_t + \varepsilon_t \quad (8)$$

β_0 is the intercept of the regression and is the constant term representing risk free rate, β_1, β_2 are the coefficients of the variables (they represent the slope coefficient that captures the sensitivity of the stock returns to both inflation and exchange rate levels) and ε_t is the error term.

The signs of the coefficients of the variables can be anticipated based on the empirical and theoretical literature highlighted in Chapter 2. Additionally, according to the Fed model, earnings yield of stock market is equal to 10-year Treasury bond yield (Estrada, 2007). In a study by Campbell and Vuolteenaho (2004), it was established that inflation impacts on bond yields. The Fed model infers that the stock yields are negatively correlated with inflation i.e., a decline in inflation results in a drop in stock market returns. In a different study by Jorion (1990), it was established that the exchange rate risk is priced for individual stocks with positive correlation coefficients. These correlation coefficients were between 0.05 and 0.10, depending on the level of a company's operation in both local and international markets.

Therefore, it is expected that the signs for the coefficients can be depicted as follows; $\beta_1<0$ and $\beta_2>0$. To satisfy the objective of the study, which is to examine whether exchange rate and inflation affects stock market prices, the time series characteristics of the variables in equation 8 were investigated to determine their levels of integration or presence of unit root (stationarity). The level of integration of these macro-economic variables is considered by applying the augmented Dickey-Fuller (ADF) test.

If the ADF unit-root test reveal that the variables reject the null hypothesis for their first differences, then we shall test for the cointegration of the variables. If two variables are non-stationary and the series have cointegrating relationship among them, then the dynamic function can be represented as an error correction mechanism (Engle and Granger, 1987).

3.3 DESCRIPTION OF VARIABLES

The variables selected are based on relevance to the South African precious metals mining environment. However, this study makes no claim that the variables selected are exhaustive when coming to the effect of macroeconomic variables on nominal stock market returns. Two independent variables and one dependent variable are going to be considered in this study. The two independent variables are inflation (using CPI as a proxy) and nominal exchange rate (Rand/USD). The dependent variable is the nominal stock market returns of top South African companies as indicated by the FTSE/JSE Precious Metals and Mining Index. The nominal value has been adopted in this study as it reflects the current value, without taking aspects such as inflation or other macroeconomic factors into account. All data are secondary data and were obtained from Bloomberg.

3.4 DATA COLLECTION

The data that was used in this study is deemed secondary data as it has already been collected for some other purposes and is available to the public.

The data for inflation (CPI), exchange rate (Rand/USD) and the stock market returns for the FTSE/JSE Precious Metals and Mining Index were collected from Bloomberg. The data consists of monthly data, collected for the period from January 2010 to December 2020. Data is chosen on a monthly basis because the effect of the chosen macroeconomic variables on stock market returns is captured efficiently in a shorter period rather than quarterly and annually.

3.5 ESTIMATION TECHNIQUE

The objective of the study is to examine the effect of exchange rate and inflation on the stock market returns of top mining companies in South Africa. Eviews statistical model was used to analyse the secondary data that was collected and convert it to useful information that can answer the research questions asked.

The empirical design adopted in this study employed the normality test, correlation analysis, Augmented Dickey Fuller (ADF) unit root tests, the Johansen cointegration test, and the Vector error correction model (VECM). The methods are briefly described below to illustrate how they will assist to analyse the effect of the selected macroeconomic indicators and the stock market returns.

3.5.1 Stationarity Tests

A stationery series can be defined as one with a constant mean, constant variance and constant autocovariances for each given lag (Brooks, 2019). A non-stationary series can lead to spurious regressions. This results in regressions that produces a high R^2 even though there is no meaningful relation between the variables (Brooks, 2019). Various methods can be used to test for unit roots and include the following common tests: Durbin-Watson (DW) test, Dickey-Fuller test (1979) (DF), Augmented Dickey-Fuller (1981) (ADF) test and Philip-Perron (1988) (PP) test.

In this study, to test for a unit root, the Augmented Dickey Fuller (ADF) Test is used. The basis for the ADF is to include enough lagged terms so that the error term is serially uncorrelated. However, to test for sensitivity of results and conclusions, the Philip-Perron (1988) (PP) test is also applied. When compared with the Augmented Dickey-Fuller test, the Phillips-Perron test makes correction to the test statistics and is robust to the unspecified autocorrelation and heteroscedasticity in the errors.

The null and alternative hypothesis are as follows:

H_0: $\rho = 1$ (unit root – variable is not stationery)

H_1: $\rho = 0$ (no unit root – variable is stationery)

It must be noted that before running the ADF test, a time series of the variable must be plotted to check if there is a trend.

If stationarity has been established, the specific optimum lag length is determined by the Vector Autoregression (VAR) lad order selection method. The Akaike Information Criteria (AIC) will be the chosen criteria for this study.

3.5.2 Cointegration

A spurious regression is a result of the use of non-stationary time series in a regression model (Shretha and Bhatta, 2018). A spurious regression will highlight the existence of a relationship between two variables, which in fact are uncorrelated. Engle and Granger (1987) formulated the initial cointegration test method to determine the relationships when you have nonstationary variables. In an endeavour to improve the cointegration test, Johansen (1988), further formulated a cointegration test that is enhanced and is better than that proposed by Engle and Granger.

Cointegration analysis (Johansen, 1991) is carried out on a time series to preserve its long run information. Cointegration requires the variables to be integrated to the same order and therefore the Augmented Dickey-Fuller (ADF) is used, with the Phillips-Peron tests being used to test for sensitivity of the results. Once the order of integration of each variable is determined, the next step is to calculate the optimal lag length for the Vector Auto Regression (VAR) as all results in the VAR model depend on the right model specification.

CHAPTER 4: EMPIRICAL ANALYSIS

4.1 INTRODUCTION

This chapter outlines the outcomes of the tests conducted in the study. First, it presents the unit root test (test for stationarity) and the optimal lag selection. The Johansen cointegration method is then discussed to establish the effect of the macroeconomic indicators, inflation, and exchange rate, on stock market returns. After cointegration has been detected between the series, a vector error correction model (VECM) applied to evaluate the short run properties of the cointegrated series. The chapter ends with a presentation of the impulse response functions.

4.2 TEST FOR STATIONARITY (UNIT ROOT TEST)

The research study utilises market data that is expected to be non-stationary in nature. When working with time series data, it's crucial to check if the data series contains a unit root. The issue of false regression between unrelated variables is caused by non-stationarity. Therefore, we must check for unit root and confirm that we are working with stationary data.

It must be noted that before running the ADF test, a time series of the variable is plotted to check if there is a trend. If stationarity has been established, the specific optimum lag length is determined by the Vector Autoregression (VAR) lad order selection method. The Akaike Information Criteria (AIC) was the chosen criteria for this study.

To test for cointegration, the series must be stationery. Subsequently, a unit root test was carried out at series level and then at series' first difference. The results of the analysis are displayed in Table 1 and 2 below, both for ADF test and PP test respectively.

Table 1: Augmented Dickey Fuller Results at series LEVEL

Variable			Intercept		Trend & Intercept		None	
			t-Statistic	Prob*	t-Statistic	Prob*	t-Statistic	Prob*
SP	Augumented Dickey-Fuller test statistic		-0.95	0.77	-1.11	0.92	0.63	0.85
	Test critical values	1% level	-3.48		-4.03		-2.58	
		5% level	-2.88		-3.44		-1.94	
		10% level	-2.56		-3.15		-1.62	
CPI	Augumented Dickey-Fuller test statistic		0.81	0.99	-0.06	0.99	-1.97	0.99
	Test critical values	1% level	-3.83		-4.53		-2.69	
		5% level	-3.03		-3.67		-1.96	
		10% level	-2.66		-3.28		-1.61	
E*x*	Augumented Dickey-Fuller test statistic		-1.14	0.7	-2.15	0.512	1.14	0.93
	Test critical values	1% level	-3.48		-4.03		-2.58	
		5% level	-2.88		-3.44		-1.94	
		10% level	-2.58		-3.15		-1.62	

The results in table 1 are the ADF at series level. This study is based on a significant level of 5%. As we already know, the null hypothesis is that the series has a unit root. The results shows that the probability values are all bigger than 0.05, and hence this suggest that we cannot reject the null hypothesis of a unit root for all the variables. Therefore, the series of all the variables have a unit root in their levels.

The above results were further confirmed using the Philip-Perron (PP) test at series level and the results are displayed in Table 2 below.

Table 2: Philip-Perron (PP) Test Results at series LEVEL

Variable			Intercept		Trend & Intercept		None	
			t-Statistic	Prob*	t-Statistic	Prob*	t-Statistic	Prob*
SP	Augumented Dickey-Fuller test statistic		-0.89	0.79	-0.99	0.94	0.68	0.86
	Test critical values	1% level	-3.48		-4.03		-2.58	
		5% level	-2.88		-3.44		-1.94	
		10% level	-2.56		-3.15		-1.62	
CPI	Augumented Dickey-Fuller test statistic		-8.05	0.00	-7.99	0.00	-4.44	0.00
	Test critical values	1% level	-3.49		-4.05		-2.59	
		5% level	-2.89		-3.45		-1.94	
		10% level	-2.58		-3.15		-1.61	
E*x*	Augumented Dickey-Fuller test statistic		-1.09	0.72	-2.15	0.51	1.31	0.95
	Test critical values	1% level	-3.48		-4.03		-2.58	
		5% level	-2.88		-3.44		-1.94	
		10% level	-2.58		-3.15		-1.61	

The PP test confirmed the ADF test results at series level. The results shows that the probability values are all bigger than 0.05, and therefore suggesting that we cannot reject the null hypothesis of a unit root for all the variables, that is, the series of all the variables have a unit root at series level.

Therefore, it can be concluded that the series of all variables are non-stationery.

The solution to non-stationary series is to difference the series and resume with testing for stationarity. The stationarity of the time series, using the ADF test where the null hypothesis is that the series delivers a unit theme and is therefore non-stationary. The Phillips Perron test for testing stationarity was also applied to confirm the ADF test results.

The results in Table 3 below shows the ADF test at series' first difference with intercept, trend and intercept plus none respectively.

Table 3: Augmented Dickey Fuller Test Results at series' FIRST DIFFERENCE

Variable		Intercept		Trend & Intercept		None	
		t-Statistic	Prob*	t-Statistic	Prob*	t-Statistic	Prob*
SP	Augmented Dickey-Fuller test statistic	-12.64	0.00	-12.81	0.00	-12.66	0.00
	Test critical values 1% level	-3.48		-4.03		-2.58	
	5% level	-2.88		-3.45		-1.94	
	10% level	-2.58		-3.15		-1.62	
CPI	Augmented Dickey-Fuller test statistic	-3.78	0.01	-17.42	0.00	-13.49	0.00
	Test critical values 1% level	-3.83		-4.67		-2.59	
	5% level	-3.03		-3.73		-1.94	
	10% level	-2.66		-3.31		-1.61	
E*x*	Augmented Dickey-Fuller test statistic	-12.55	0.00	-12.53	0.00	-12.39	0.00
	Test critical values 1% level	-3.48		-4.03		-2.58	
	5% level	-2.88		-3.45		-1.94	
	10% level	-2.56		-3.15		-1.62	

Table 4 below shows the PP test results at series' first difference with intercept, trend and intercept plus none respectively.

Table 4: Phillips Perron Test Results at series' FIRST DIFFERENCE

Variable		Intercept		Trend & Intercept		None	
		t-Statistic	Prob*	t-Statistic	Prob*	t-Statistic	Prob*
SP	Augmented Dickey-Fuller test statistic	-12.61	0.00	-12.95	0.00	-12.62	0.00
	Test critical values 1% level	-3.48		-4.03		-2.59	
	5% level	-2.88		-3.45		-1.94	
	10% level	-2.58		-3.15		-1.62	
CPI	Augmented Dickey-Fuller test statistic	-19.8	0.00	-19.92	0.00	-20.01	0.00
	Test critical values 1% level	-3.51		-4.07		-2.59	
	5% level	-2.89		-3.46		-1.94	
	10% level	-2.58		-3.16		-1.61	
E*x*	Augmented Dickey-Fuller test statistic	-12.6	0.00	-12.59	0.00	-12.37	0.00
	Test critical values 1% level	-3.48		-4.03		-2.58	
	5% level	-2.88		-3.45		-1.94	
	10% level	-2.56		-3.15		-1.62	

The generalised decision criterion is that the null hypothesis is rejected when the probability is less than 5% otherwise accepted. The results of both the ADF test and PP test in Table 3 and 4 above, show that the probabilities for all variables at first difference are less than 5% hence we reject the null hypothesis of presence of unit root i.e., there is no unit root in the data set under review. Therefore, it can be concluded that the series of all the variables are stationery in first differences i.e., integrated of the same order I (1).

4.3 OPTIMAL LAG SELECTION

Table 5 below shows information criteria by rank and Model. The optimal lags is selected according to the Aikake Information Criteria (AIC).

Table 5: Information criteria by rank (lag selection order criteria)

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or	No Intercept	Intercept	Intercept	Intercept	Intercept
No. of CEs	No Trend	No Trend	No Trend	Trend	Trend
Akaike Information Criteria by Rank (rows) and Model (columns)					
0	-3.46	-3.46	-3.41	-3.41	-3.34
1	-3.79	-3.79*	-3.76	-3.74	-3.70
2	-3.69	-3.75	-3.75	-3.71	-3.69
3	-3.55	-3.62	-3.62	-3.61	-3.61
Schwarz Criteria by Rank (rows) and Model (columns)					
0	-3.20	-3.20	-3.07	-3.07	-2.92
1	-3.37*	-3.34	-3.26	-3.21	-3.11
2	-3.10	-3.11	-3.07	-2.98	-2.93
3	-2.79	-2.78	-2.78	-2.68	-2.68

*Indicates lag order selected by the criterion.

4.4 COINTEGRATION TEST

A time series is subjected to cointegration analysis (Johansen, 1991) to preserve its long run information. The Augmented Dickey-Fuller (ADF) test is used since cointegration requires that the variables be integrated in the same order, and the Phillips-Peron test is used to assess the results' sensitivity. The previous results from the unit root test established that all the variables being considered are stationery at the same level of I(1), hence the next step is to carry out a Johansen cointegration test using the first differences of the series. Like the unit root analysis, the AIC lag selection criterion to determine the number of lags was applied.

The outcomes of the Johansen cointegration test as displayed in Table 6 below shows that the trace value and the max eigenvalue are greater than the critical value, which means that we reject the null hypothesis and accept that there is cointegration. The results also reveal that for both the trace test and max-eigenvalue test there is 1 cointegrating equation at the 0.05 level. The three variables, inflation (denoted by Consumer Price Index), exchange rate - South African Rand/US dollar and stock market returns for FTSE/JSE Precious Metals and Mining Index are cointegrated. These variables have a long run association i.e., they move together in the long run.

Table 6: Johansen Cointegration Test Results

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.388551	56.51462	35.19275	0.0001
At most 1	0.116057	13.22538	20.26184	0.3461
At most 2	0.026567	2.369512	9.164546	0.7036

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.388551	43.28924	22.29962	0
At most 1	0.116057	10.85587	15.8921	0.2627
At most 2	0.026567	2.369512	9.164546	0.7036

Note that * denotes rejection of the hypothesis at 0.05 level.

Presented in Table 7 below is the normalised cointegration equation.

Table 7: Normalised Cointegration Equation for the FTSE/JSE Precious Metals and Mining Index

SP	**CPI**	**E*x***	**c**
1	-1.45*	-0.15*	9.36*
Standard Error	-0.21	-0.41	-1.01
t-value	6.90	0.37	-9.27

**Shows the value of the coefficients.*

The coefficient signs have been reversed in the normalised cointegrating equation of the Johansen model which is representing the long run. The normalised equation will be written as follows after inputting the coefficients;

$$SP_t = 9.36 - 1.45CPI_t - 0.15Ex_t + \varepsilon_{it} \quad (11)$$

Inflation has a negative and significant impact on the stock returns for FTSE/JSE Precious Metals and Mining Index in the long run. An increase in inflation will lead to a decrease in the stock returns for the FTSE/JSE Precious Metals and Mining Index.

Also, the exchange rate (USDZAR) has a negative, though insignificant impact on the stock returns for FTSE/JSE Precious Metals and Mining Index in the long run. A 1% increase in exchange rate (depreciation) will lead to a 0.15% decline in stock market prices.

4.5 VECTOR ERROR CORRECTION MODEL (VECM)

A long-term equilibrium relationship exists when cointegration has been detected between a series and hence a vector error correction model (VECM) can be used to evaluate the short run properties of the cointegrated series. To identify the size of the short-term effect of exchange rate and inflation on stock returns for FTSE/JSE Precious Metals and Mining Index, the VECM model was used. The Johansen cointegration test confirmed that the three variables under study are all cointegrated and have a long run association. Therefore, we can analyse the short run dynamics using the Vector Error Correction Model (VECM). Table 8 below shows the VECM cointegration equation.

Table 8: VECM Cointegration equation

Error correction	D(LSP)
Coint Eqn 1	-0.015
	(-0.008)
	[-1.73]
D(LSP (-1))	-0.022
	(-0.107)
	[-0.208]
D(CPI (-1))	0.022
	(-0.01)
	[2.13]
D(E*x* (-1))	-0.020
	(-0.189)
	[-0.106]
C	-0.002
	(-0.07)
	[-0.249]

The numbers in parenthesis () are the standard deviations and the ones in brackets [] are the *t*-values. Error correction coefficient gives the speed of adjustments within which the model will restore its equilibrium following any disturbances.

Interpreting the adjustment coefficient; the previous periods deviation from long run equilibrium is corrected in the current period as an adjustment speed of 1.5%. A percentage change in inflation (CPI) is associated with a 0.022% decrease in stock market price in the short run. For the exchange rate coefficient, a percentage change in exchange rate is

associated with a 0.020% decrease in stock market price in the short run. All the coefficients have a negative sign as was expected.

4.5.1 Residual diagnostics

Autocorrelation test

Null hypothesis: no serial correlation at lag h

Table 9: Autocorrelation test

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	5.75	9	0.76	0.64	(9, 190.0)	0.76

The probability values are higher than the 5% level, so there is no serial correlation in the model.

Heteroskedasticity test

Table 10: Heteroskedasticity test

Chi-sq	**Df**	**Prob.**
46.76	48	0.52

The results in Table 10 reflects a joint test. The probability value is 52%, and so the model is not heteroskedastic.

4.6 IMPULSE RESPONSES

Impulse response functions allow us to trace out the time path (current and future values) of the variables in our model to a one unit increase in the current value of one of the VAR errors. To identify the impulse responses, a restriction is applied in the main matrix. The results presented in Figure 1, 2 and 3 below reflect response to Cholesky One S.D. (d.f. adjusted) innovations/shocks.

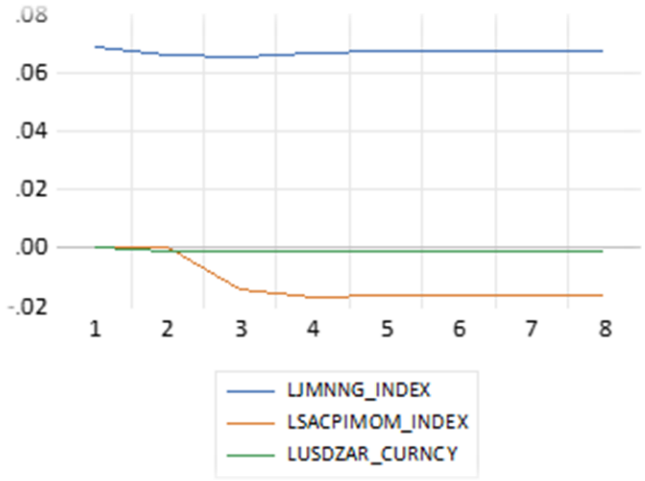

Figure 1: Impulse response functions – response of SP to innovations (shocks)

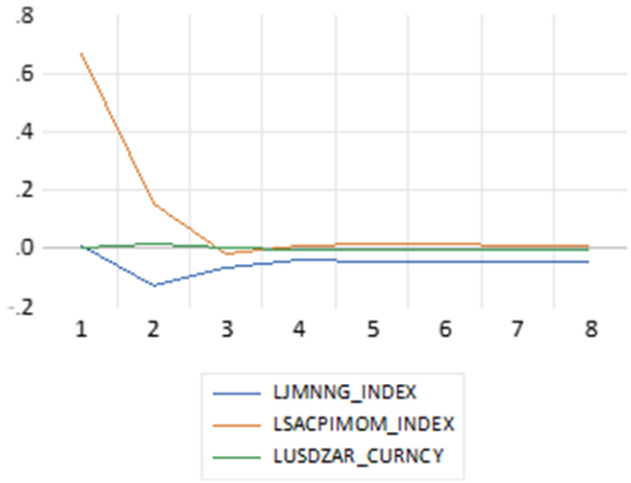

Figure 2: Impulse response functions – response of CPI to innovations (shocks)

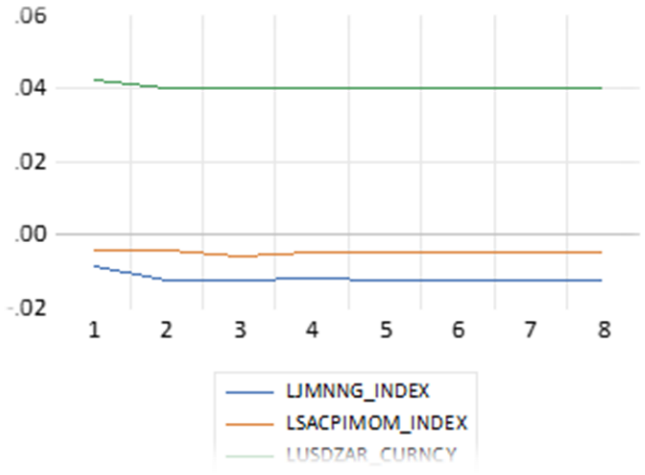

Figure 3: Impulse response functions – response of E*x* to innovations (shocks)

A brief explanation on some of the shocks is as follows: The graph that shows response of stock market prices to inflation (Figure 1) suggests that the unexpected increase in general price levels tends to provide a negative response to stock prices in the first 4 years and then levels off thereafter. In Figure 2, both stock market prices and exchange rate are expected to fall during an inflationary shock. This is more apparent for stock market prices than it is for exchange rate. Figure 3 (The graph that shows response of exchange rate to both inflation and stock prices) shows a slight decline in exchange rate in the first two years and levels off thereafter.

4.7 DISCUSSION OF RESULTS

4.7.1 Inflation

The initial hypothesis for inflation was that there is a negative relationship between inflation and the stock returns of the index under review (FTSE/JSE Precious Metals and Mining Index). The result of the analysis confirms that inflation has a negative and significant impact on the stock returns for FTSE/JSE Precious Metals and Mining Index in the long run. A 1% increase in inflation leads to a 0.45% decrease in the stock market returns in the long run.

The above result can be explained by the fact that inflation raises production costs resulting in lower revenue and profits and an increase in inflation increases the discount rate resulting in lower equity prices (Tripathi and Kumar, 2015). Therefore, the expectation that inflation results in a decrease in a company's future cashflows was validated by this study.

The findings are supported by other studies, such as Jaffe and Mandelker (1976) who found a negative relationship between stock market returns and inflation over short periods. Previous studies by Firer and Mcleod (1999) and Boyd Levine and Smith (2001) also found a negative relationship between inflation and stock market returns.

However, it must be noted that there are other studies that found the relationship to be contrary to the findings of this study. For example, Eita (2012) identified a positive relationship between overall JSE returns and inflation. It must be highlighted that the JSE overall index includes companies that are driven by consumer consumption, and it follows that during times of higher inflation, prices of consumer goods are increased, and this enhances company profits.

4.7.2 Exchange rate

The Rand/USD exchange rate was initially hypothesized that the Rand/USD exchange rate is positively related to the stock returns of the mining companies under review. This follows that a depreciation of the Rand is viewed as favourable by the mining industry, leading to increased production hence there will be a rise in exports and profits. This will subsequently result in higher stock market value. However, the results of the study are to the contrary. The study showed that exchange rate has a negative, though insignificant, impact on the stock returns for FTSE/JSE Precious Metals and Mining Index in the long run. A 1% increase in exchange rate (depreciation) will lead to a 0.15% decline in stock market prices.

The outcome of this study is consistent with the studies by Ajayi and Mougoue (1996) who found out that local currency depreciation had a negative effect on stock prices in the eight developed countries that were under consideration in the study. Furthermore, Abugri (2008) also found that the stock returns in Brazil and Mexico responded negatively to exchange rate depreciation. Putra and Robiyanto (2019), studied the effect of commodity price changes and USD/IDR exchange rate on the stock returns of mining companies in Indonesia and found out that exchange rate has a significant negative impact on companies under review.

A valid explanation on the decrease in the stock returns of the FTSE/JSE Precious Metals and Mining Index with a depreciation of the Rand against the $USD is that the depreciation of the Rand can cause a significant number of economic activities to be disturbed resulting in value loss in stock returns. Currency depreciation has negative impacts on the economy, for example, it makes imports more expensive, it drives foreign direct investments away from South Africa and it subsequently results in a rise in inflation. All these disturbances support the outcome that the stock market returns decrease with a depreciation of the Rand.

CHAPTER 5: CONCLUSIONS

This section of the report concludes the study by summarising the findings and subsequently advance recommendations for consideration.

The FTSE/JSE Precious Metals and Mining Index is critical to the financial markets in the South African context due to the abundance of mineral resources in the country. The objective of the study was to examine the effect of nominal exchange rate and inflation on the stock market returns of the FTSE/JSE Precious Metals and Mining Index. Monthly data from 2010 to 2020 was used for the study.

The study confirmed that there is a negative and significant relationship between inflation and the stock returns of the FTSE/JSE Precious Metals and Mining Index. A 1% increase in inflation will lead to a 0.45% decrease in the stock market returns in the long run.

The study also showed that exchange rate has a negative, though insignificant, impact on the stock returns for FTSE/JSE Precious Metals and Mining Index in the long run. A 1% increase in exchange rate (depreciation) will lead to a 0.15% decline in stock market prices.

The impulse response functions revealed that stock market prices are expected to fall during an inflationary shock. Meanwhile, the response of stock market prices to inflation suggests that an unexpected increase in general price levels tends to provide a negative response to stock prices in the first 4 years and then levels off thereafter.

The outcome of this study has important implications, from both a policy and practical perspective. Based on the findings that inflation has a negative relationship with stock returns of the FTSE/JSE Precious Metals and Mining Index, the study recommends that from a policy perspective, the inflation policy by the government must minimise and stabilise inflation fluctuations. This will ultimately result in investor confidence and more investments can be made to revitalise the precious metals mining sector. The findings will also assist the investors to understand the behaviour of the stock returns of the FTSE/JSE Precious Metals and Mining Index in the event of eminent inflation fluctuations. For example, if the economic environment is highly inflationary, an investor must approach this environment with caution, perhaps disinvest to ensure that their investments preserve value.

In addition, the study showed that the exchange rate (ZAR/$USD) has a negative and significant impact on the stock returns for FTSE/JSE Precious Metals and Mining Index in the long run. This finding suggest that it is imperative that investors monitor the exchange rate because an increase in exchange rate (depreciation of the Rand) will lead to a decrease in the stock returns. Furthermore, the exchange rate should be considered at valuation to hedge against currency risk and diversify investments.

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