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DEPARTMENT OF ECONOMICS

AN INVESTIGATION OF FOREIGN DIRECT INVESTMENT'S EFFECT ON THE MINING SECTOR OUTPUT IN ZIMBABWE FROM 1990 TO 2022.

BY

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DEDICATION

This investigation is dedicated towards my parents Mr. P and Mrs. T Mahlupeko as a way to thank them for their help with my studies, their prayers, support, and love throughout the entirety regarding my educational journey. Also, I'd want to express gratitude my sister Melinda and brother Tawananyasha for their assistance, patience, and support during my academic career.

MAY YOU ALL BE BLESSED ABUNDANTLY.

ABSTRACT

The investigation applied data from the World Data, Trade Economics, Zimbabwe National Statistics Agency (ZIMSTAT), World Bank, in addition to International Monetary Fund to assess the impact of labor, inflation, capital, merchant bank loans, as well as corruption on the mining sector output. The investigation pursued towards discovering the effect appertaining to Foreign Direct Investment (FDI) within mining sector output with yearly time series facts. According to investigation's findings, FDI positively impacts the mining industry, which is consistent with theory. The investigation additionally showed that even though inflation was not a noteworthy factor in influencing production within mining sector, labor, capital, and merchant bank loans all had favorable bearing. Additionally, the output of the mining sector is positively correlated with corruption. The investigation comes to a conclusion with suggestions for the appropriate stakeholders and decision-makers on the problem of implementing strategy procedures towards increasing local economy's appeal aimed at investment within mining sector.

ACKNOWLEDGEMENT

I want to sincerely thank the Almighty God, my parents, my supervisor, as well as my classmates who supported me in effective completion of my study. I want to start by thanking the heavenly father for his unwavering love and generosity, which have helped me make progress in my academic career up until this moment. His holy name deserves all praise, adoration, and devotion. I also want to convey my sincere gratitude to my supervisor, Dr. Damiyano, who gave me the guidance I required to do my assignment. I wouldn't have known where I was headed without him. I intend also to direct my appreciation towards economics department lecturers for offering their help.

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ZMS Zimbabwe Mining Sector

ADF Augmented Dickey Fuller

BLUE Best Linear Unbiased Estimator

CoMZ Chamber of Mines of Zimbabwe

FDI Foreign Direct Investment

FPI Foreign Portfolio Investment

GDP Gross Domestic Product

MBL Merchant Bank Loan

MNCs Multi-National Company

MNEs Multi- National Enterprises

OLS Ordinary Least Squares

RBZ Reserve Bank of Zimbabwe

UNCTAD United National Conference on Trade and Development

USD United State Dollar

ZIA Zimbabwe Investment Authority

ZIMSTATS Zimbabwe National Statistics Agency

CHAPTER I

1.0 Introduction

African countries have tried to create policies that promote FDI inflows. Due to the economic, political, and social diversity among these emerging nations, the growth consequences of FDI vary from one country to another. Zimbabwe, like other emerging nations in Africa, has benefited from FDI for its growth and continues to work to draw this crucial resource movement. undoubtedly Zimbabwe had severe domestic investment shortages to finance essential inputs in the many growth-promoting economic sectors, including the mining industry, throughout the previous decades. On the notion that FDI has been of crucial help to the economy. Such suggests one accepting foreign investment together with finance allows Zimbabwe to invest within both human and physical capital simultaneously taking advantage of possibilities well known would not otherwise be available for growth as according to the Gochero and Boopen (2020).

Gold, copper, nickel, and other mineral resource reserves are only a few of the abundant mineral deposits in Zimbabwe. Zimbabwe hasn't prospered, despite being endowed with mineral resources and receiving significant sums of foreign direct investment (Mlambo 2016). The country Zimbabwe is low-income nation based on socioeconomic indicators. (World Bank 2017). As a consequence, Zimbabwe's economic performance is occasionally referred to as a conundrum by virtue statistics prohibit to actual economic activity in the nation. The government has taken many steps to encourage private investment in the mining sector respecting an increase within the output. The investigation determination is to accord with the data from 1990 to 2022. Employment, economic growth, and development are anticipated to improve in nations that draw foreign direct investment. (UNCTAD, 2016). In this chapter, there will be the background of the study, statement of the problem, research objectives, research questions and the significance of the study. These will be explained as below;

1.1 Background of the study

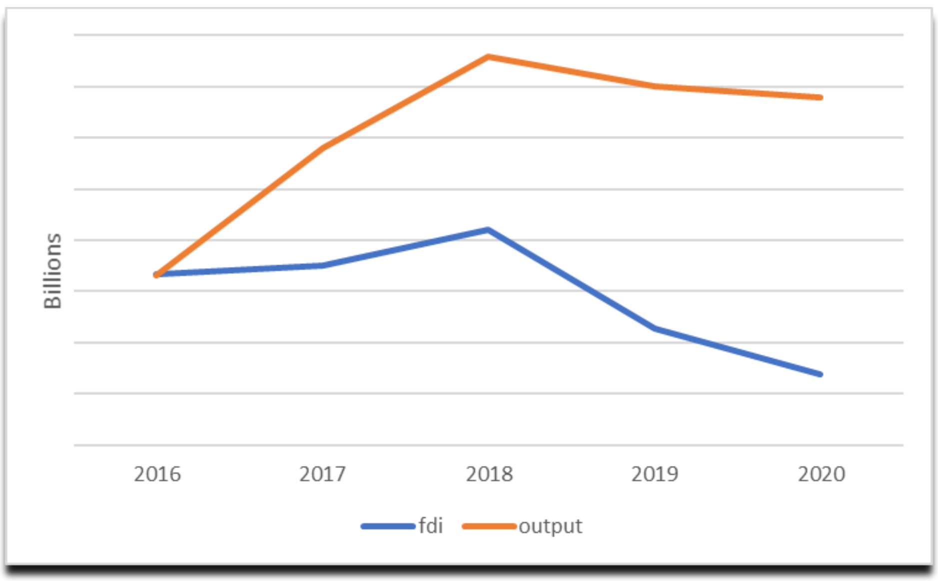
Discussions about international development continue to center on the issue of foreign direct investment (FDI). Target 10.7 of Sustainable Development Goal (SDG) 10 recognizes that foreign direct investment (FDI) into Africa and other emerging and least developed countries can significantly lower inequality within and across countries (United Nations, 2015). Developmental countries gain from FDI in the transfer of production technology, skills, increased productivity, company creation for local businesses, and creation of better-remunerating jobs (World Bank, 2017). (UNCTAD, 2018) asserts FDI is a critical spring of private outward supporting for emerging states. It upsurges the sum of investment designed and investable funds. More specifically, FDI helping hand the private sector-led progress, successfully combating poverty by boosting the economy and productivity of the host nation (OECD, 2019).

African governments are trying, but FDI into the region is still declining. Africa received $59 billion in foreign direct investment (FDI) in 2016, down from $61 billion in 2015, with regional and national differences, according to the World Investment Report 2017 (UNCTAD). In Africa, many developing nations set 2015 as the time limit for achieving the Millennium Development Goals (MDGs). However, majority of emerging nations in Sub-Saharan Africa failed to meet this deadline, leaving them in desperate need of high levels of foreign investment in order to return to their previous economic status. Most of these emerging nations are seen to be falling behind because they lack the means to fund continuing funds, that is a major hindrance near economic progress (United Nations, MDGs Report 2015).

Zimbabwe's FDI climbed by 10.4% from 2020 to $0.17 billion in 2021, according to the UNTACD. Investment from abroad to Zimbabwe fell by 39.74% in 2020 to $0.15 billion, from 2019. FDI into Zimbabwe decreased by 65.24% in 2019 to $0.25 billion, from 2018. FDI into Zimbabwe totaled $0.72 billion in 2018, an increase of 133.69% over the previous year. When compared to the years prior to the crisis (USD 745 million in 2018), FDI inflows were just USD 166 million in 2021. The overall stock of FDI rose to USD 6 billion in the same year.

Most individuals believe that FDI, which includes direct collection of investing in addition to cross-border bank loaning, is more efficient and trustworthy than other types of capital flows as stated by Lipsey (2020). FDI remains a more dependable cause of capital inflow aimed at developing nations since it is less vulnerable to setbacks than portfolio investment. For these reasons, it is thought that FDI makes a significant contribution to host nation growth.

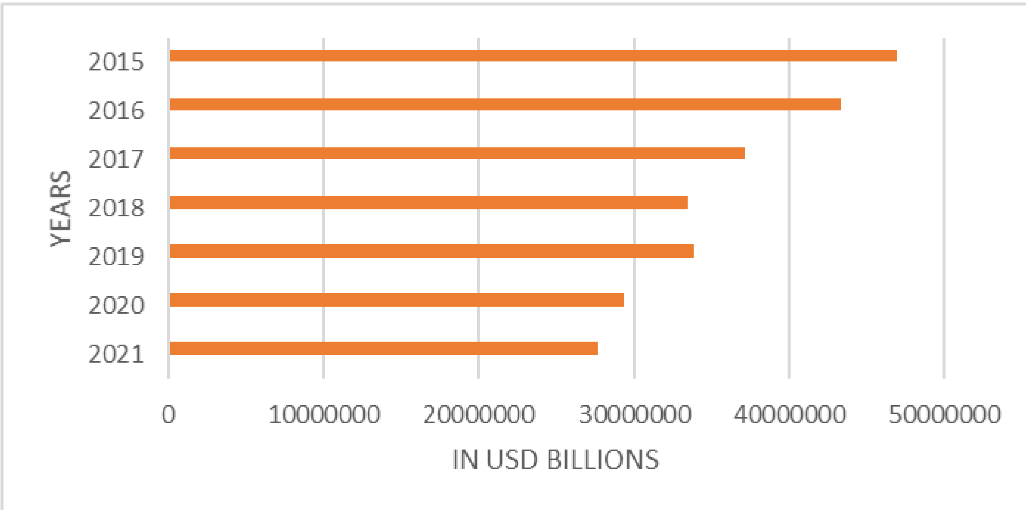
Figure 1:Fforeign direct investment into Zimbabwe



Source: Trading Economics (2022)

From figure 1 it can be noticed that the FDI into Zimbabwe was highest in 2018 so is the mining output mainly due to the campaign that Zimbabwe is open for business and many business legal acts amendments were. In 2020, there was a fall in FDI, and the aforementioned remains probable such this trend drive continue in 2021. The mining out was increasing as the mining was increasing and decreased as it decreased. In 2016 the FDI into was 1.67 USD billion while the output was only 1.65 USD billion. the highest was in both the FDI and the mining output was recorded in 2018 and the decreased in the following years due to Covid 19 so does the mining output.

Figure 2 Global Foreign Direct Investment

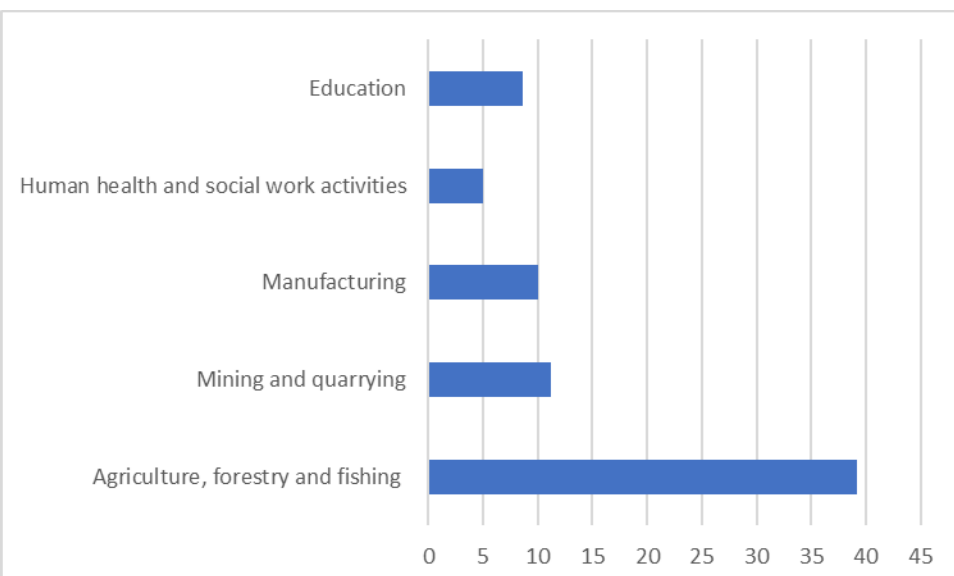


SOURCE: UCTAD (2022)

From the figure 2 it can be noticed that the global FDI has been on a decreasing rate due to the effect of Covid 19 especially from 2019. Global FDI flows, which were $1.54 trillion in 2019, fell by up to 40% in 2020. As a consequence, FDI went under $1 trillion for its debut since 2005. In 2021, FDI will drop by an additional 5 to 10%. Global FDI inflows were about $300 billion greater than the $1.2 trillion low point of the 2020 projection in 2009, when it was made. International foreign direct funds rose sharply in 2021, but the regaining was incredibly uneven, as claimed by UNCTAD's Investment Trends Monitor. International FDI movements demonstrated a robust comeback in 2021, surpassing their pre-COVID-19 level and growing to a projected $1.65 trillion from $929 billion in 2020, an increase of 77%. According to the report, advanced nations had the biggest growth, with three times the extremely low level in 2020, FDI is anticipated to reach $777 billion in 2021. A 60% drop from 2015's $2 trillion to less than $900 billion is projected for the level of global FDI flows in 2021. After reaching an exceptionally low level in 2020, worldwide foreign direct investment (FDI) movements increased by 64% to $1.58 trillion in 2021. A 60% drop from 2015's $2 trillion to less than $900 billion is projected for the level of global FDI flows in 2021. From a very low level in 2020 to $1.58 trillion in 2021, global FDI flows surged by 64%.

According to Herald (2023), Zimbabwe's state-run mining industry is on track to meet the government's goal of transporting minerals worth 12 billion US dollars by 2023. According to Reuters 2022, the mining industry in Zimbabwe was expected to have slower growth in 2023 as a result of growing prices and persistent power outages. According to a newswire that cited a report by the country's Chamber of Mines, the sector will increase by 7% in 2019 rather than the 8% predicted for 2022. Mineral productivity growth prospects for 2023 are mostly likely to be less favorable than those observed in 2022. As specified by the Chamber Of Mines Of Zimbabwe, major threats to the prognosis for 2023 include a weak power supply, excessive expenses, a lack of foreign currency, an unstable tax system, and a lack of capital. According to the newswire, as of 2022, Zimbabwe has generous reserves of platinum collection metals, gold, chrome, coal, diamonds, and lithium, and its mining industry backs roughly 11% of the country's GDP and greater than 60% of its export income.

Figure 3: Percent Distribution of Currently Employed by Industry



Source: Zimbabwe Statistics Agency(2022)

Between 2021 and 2022, mining businesses added over 30 000 jobs as the industry continued to draw in new investors and expand its operations as a result of the targeted policies. In 2018, mineral exports totaled more than $5,4 billion. more than doubling the US$2,7 billion realized in 2017. The largest mining businesses in Zimbabwe are represented by the Chamber of Mines of Zimbabwe, which anticipates a 4,000 increase in employment this year. By the end of 2022, there were 106 151 direct employees working in the mining industry.

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Against a target prediction of US$8 billion, the mining sector's exports in 2022 reached US$5,4 billion. The sector has shown a 100% upsurge of mineral exports compared to the base year, 2017, when it generated US$2,7 billion in yearly income, the Ministry of Mines and Mining Development stated. By the end of this 2022, Zimbabwe hopes to have a mining industry worth US$12 billion, with lithium, platinum, gold, and other important minerals serving as the growth's pillars. About 9% of the gross domestic product was contributed by the mining industry in 2017, and that percentage increased to over 13% in 2022.

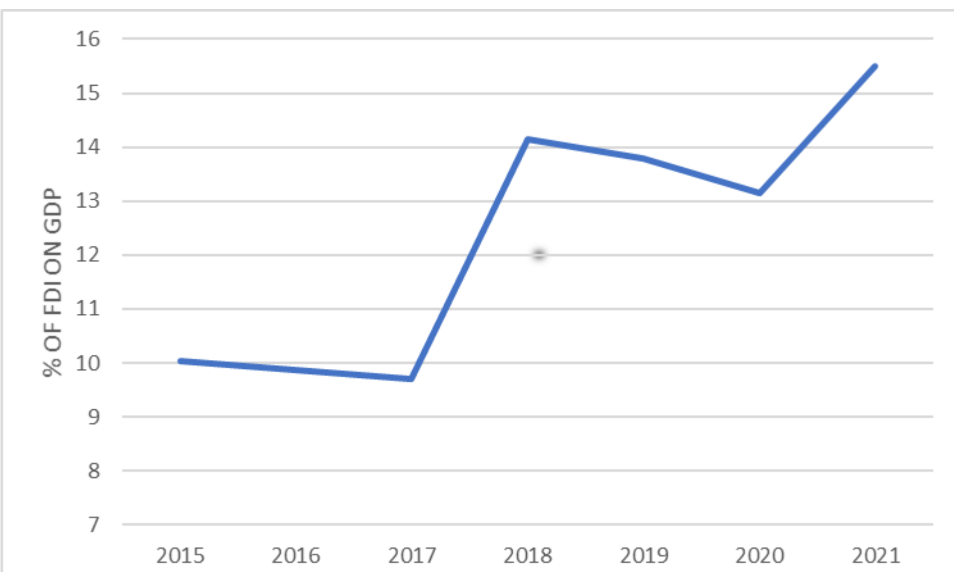
Table 4.1 GDP by Sector In Zimbabwe

Zimbabwe's Top 5 Contributors to GDP 2019 to 2021 (%)	2019	2020	2021
Wholesale & Retail	19.7	19.7	19.2
Mining & Quarrying	12.0	13.1	12.8
Agriculture	9.8	11.1	12.0
Manufacturing	14.2	12.6	11.7
Financial & Insurance Services	6.5	7.9	7.5

Source: Zimstats (2022)

According to the data in the table above, the sector's input to GDP is growing at a steady proportion than that of other parts of the economy like agriculture. According to Mlambo (2015), the Reserve Bank of Zimbabwe's strict foreign currency surrender requirements, greater government regulator over the industry, then an absence of transparency on the royalty and levy regime have all hampered the performance of the mining sector.

Figure 5: Percentage of the FDI on GDP of Zimbabwe



Source: Trading Economics (2023)

From figure 5 it shows that throughout 2016 and 2020, investment represented an average of 9.1% of GDP. While the investment made by the private sector averaged 3.7% of GDP throughout that time, public sector investment accounted for 5.5% of GDP on average. The highest percentage of investment in GDP was 10.1% in the year 2018. The percentage of investments in GDP that was greatest, at 10.1%, was in 2018. This came after the government pursued a fiscal expansion that increased the share of public investment in GDP to 6.9%. Local funding, however, as a proportion of GDP, is still below MEC target of 30%.

Foreign direct investment made up 24% of the GDP and 60% of the government budget at the time of independence in 1980 (ZIA 2013). (UNCTAD 2013) reports that FDI into Zimbabwe surged by 36% in 2014, from $400 million to $545 million, mostly as a result of investments in the mining, infrastructure, and services industries. In the initially half of the year 2013, ZIA permitted investment developments value US$971.3 million, majority were in the manufacturing industry. Considering the impact of unfavorable external sector developments on domestic economic activity, the monetary policy (2013) said that economic growth is anticipated to have decreased from 4,5% realized in 2011 to 3,1% realized in 2012. The mining, services, manufacturing, and investment sectors were expected to lead the economy's future growth of 3,2% in 2014. ZIA (2015) presented a summary of the nation's sector-specific FDI distribution. 2014 saw investments in the manufacturing sector with 26 projects amounting US$721,9 million, with the mining industry had 16 projects receiving US$155,8 million. In the time span under consideration, Zimbabwe got US$712,5 million in FDI from eight projects, which resulted in the creation of 4065 employment. Zimbabwe also received US$258,5 million in joint investments from 59 projects, which have the potential to generate 3079 jobs (ZIA 2015).

In the opinion of (Karombo, 2016) the MS in Zimbabwe has remained overwhelmed through a worsening crisis for more than ten years. The segment's decline came to be caused by political faction-fights, takeovers by quasi-state organizations, and accusations of dishonesty and sneak-in in the diamond also gold sector. The sector's initial decline was based on deteriorating production competences then investor caution attributed by the country's deteriorating economic environment.

UNCTAD (2017) contends such within extractive sector, mainly the mining sector and agriculture, the opportunity for optimistic effect stays constrained. According to the UNCTAD World Investment Report (2001), there are less opportunities for positive effect in the extractive sector, especially in the mining and agricultural industries. Manufacturing and service sectors typically gain more from FDI spillovers like labor training, technological transfer, or managerial know-how (Findlay, 1978). Because of this, these sectors receive the majority of FDI. Not every sector of the economy can relate the advantages of FDI to the break of the economy in the same way (Malikane, 2017). As a result, the confident impact FDI would have on an economy is limited by such weak ties. The capacity of primary goods after mines smuggle themselves overseas without developing much concerning the rest of the economy is said to be the cause of the low links between FDI in the extractive sector and constructive economic progress (Hirschman 1958). This implies that foreign investors may participate in extractive activities and harm the economy as a whole without the right legislation and operation specifications.

According to Zimstat CIP (2019), all mineral output has significantly decreased from its highest levels. Similar patterns were observed in the output of all other minerals, with gold making a fall as the tons increased from 27 tons in 1999 to 3.6 tons in 2008. In this sense, Zimbabwe missed a good chance to benefit from the long-lasting, sustained global commodities price boom between 2003 and 2008. The recent collapse of other mining firms also had an impact on production growth in the industry since some people lost their employment. According to Zimstats figures, one of the industries most impacted by business closures was the mining industry.

Further to the mining industry's poor performance, other industries like manufacturing also contribute negatively to the nation's export earnings. The 2015 stoppage of EPO issuance hindered exploratory efforts, which had the impact of delaying upcoming mineral regaining. The result of this interruption will have a significant effect against mining sector's forthcoming. All economic sectors saw decreased output as a result of ill-conceived policies, which led to widespread talent exodus, power shortages, and a lack of foreign currency to pay for equipment and raw supplies. As of July 2008, the official rate of inflation had reached a record high of 0,00000031%.

1.2 Problem Statement

The mining industry has been unable to make a substantial contribution to economic growth despite being endowed with natural resources and getting considerable sums of foreign straight funds. Over time, the sectors' aggregate performance has decreased. As a consequence of the sector's importance to the nation's GDP, employment, and export earnings, this tendency not only jeopardizes the sector's viability and sustainability but also the economy as a whole. Hence, determining the effect of FDI on mining performance is the primary driving force behind this study.

1.3 Research Objectives

The purpose regarding the investigation is to evaluate the effect concerning FDI on Zimbabwe's mining industry.

1.3.1 Precise Objectives

1. Determine a link amid FDI then the productivity of the mining industry.
2. To determine how capital affects the mining industry's performance.
3. Assess strategies that promotes FDI into the mining sector.

1.4 Questions of the Research

1. Does FDI impact Zimbabwe's mining industry performance?
2. Does Zimbabwe's mining industry performance depend on number of individuals occupied within such sector?
3. How does capital impact the production of the mining sector?
4. What is the effect of corruption on the mining output?

1.5 Hypothesis

Due to the fact that might be difficult to conclude that the FDI into the mining sector can possibly affect the mining output. It can sometimes have negative impacts such as exploitation of workers and repatriation of profits to mother country without developing the local community. The verdicts of investigation emphasize the need to examine following hypotheses before doing this investigation:

H_O: FDI inflows and Zimbabwe's mining industry performance are positively correlated.

H_1 : FDI inflows and Zimbabwe’s mining industry performance are negatively correlated.

1.6 Significance of the study

The sector and other mining industry stakeholders are expected to gain from this research. The drive of present study intends look at the effect of FDI on mining performance from 200 to 2022. Cross country regression analysis is used to discover the connection among FDI in addition to economic performance.

The study's findings will benefit not just this industry but also a few other FDI-receiving industries in Zimbabwe. This so in the sense that if the impact is positive then the other sectors will form an setting expressively favorable towards receiving FDI. From this study is can be noted that there are other factors that might affect the output of the mining segment or other segments of the economy which can help in decision making for improving output of the sectors of the economy. The findings subject to the subject matter piece of information that might help Zimbabwe attract foreign direct investment. Also, the government will bound to be in a improved position to choose between measures that favor domestic investment and those that support foreign direct investment. This research can also help formulate policies that have objectives that will enhance the mining output positively.

1.7 Assumptions

This study is predicated on several presumptions:

- The information gathered for study is correct, comprehensive, pertinent, and trustworthy.
- E-views 7 econometrics set gives more practical and accurate situation the study tries to explore.
- The investigation prediction ample time and funding to complete all required tasks.

1.8 Delimitations

Mining performance is a wide subject that may be assessed in a variety of ways. Nevertheless, this study will use yearly data constructed on the period series figures for the study phase to concentrate concerning influence of FDI on mining production in Zimbabwe from 2000 to 2022. The estimating process motivation stays conducted by means of the OLS econometrics approach. Then the geographic delimitation remains that the research focuses only on the mining output of Zimbabwe rather than other countries or regions. The study only emphases on the influence of FDI on the mining sector rather than examining its impact across all sectors of the economy.

1.9 Limitations

Due to circumstances beyond of the researcher's control, the research is significantly hampered by the lack of readily available trustworthy, sufficient, and insightful data. Since this study depends on time series data, gathering and collecting relevant data for it was difficult and time-consuming because the data came from several sources and was gathered for purposes unrelated to those of this research. Zimbabwe figures remains to have patchy exposure, which might undermine the validity of the study's findings.

The scholar employed secondary statistics gathered from reputable sources, such as the Trade Economics, World Data, Chamber of Mines of Zimbabwe (CoMZ), and Zimbabwe National Statistics Agency (ZIMSTATS), United Nations Conference on Trade and Development (UNCTAD), the World Bank, Reserve Bank of Zimbabwe (RBZ) towards overawed the issue. The information is trustworthy as a result, and the researcher was able to draw insightful inferences from the data.

1.10 Definition of key Terms

Foreign direct investment - Sudha (2015) FDI is "trans-border capital formed in one firm in other side country by residents of one economy accompanied by such intension of beginning a long-lasting awareness in the investee economy." Investments made by foreign companies in local businesses are referred to as this is another definition of FDI. Foreign direct investment (FDI) is now universally recognized by way of playing one significant role within advancing managerial capabilities, capabilities, and technology. Additional investments help to provide much-needed job opportunities in addition to the investments that can be done utilizing local resources. (FDI) remains a worldwide approach towards each country's economic transactions created through a corporation or else institution that existing in a different country. Investments in overseas companies should take the form of ownership or controlled ownership Al-Qaisi (2017).

Gross Domestic Product (GDP) – according to Callen (2018) GDP governs the monetary worth appertaining the useable final goods and services put together within one country over one specific period (like quarterly or yearly). It adds up entirely each production created surrounded within country's borders. GDP remains put together of goods and services assemble aimed at up for sale utilization also a positive nonmarket making, including defense or educational facilities obtainable through the government. A country's economic activity, including that of its enterprises, governments, and citizens, can be measured using its GDP Bloomberg (2023)

Economic growth - Investopedia (2023) Utilizing approximations like the GDP, economic expansion is regularly calculated as the escalation in the overall market price of afresh formed goods and facilities. It may also stand clear as the rise in productivity of goods then services per person over a predetermined time period Roser (2021).

1.11 The most important idea is to organize the entire study

The indicated section, the research topic, along with issue statement, and the main goals of the academic work were introduced. With such overall aim about determining the drive concerning the mining industry within Zimbabwe, this research attempts to address important concerns in the mining sector while assessing risks and benefits. The research focuses on a literature review in the second chapter, where the opinions of other writers are examined.

The investigation design, tools employed in the academic study, and the methodologies for statistics examination are highlighted in the next chapters provide explanation of the methodology used to conduct the study. Presenting data analysis, study findings, and conclusions in Chapter 4, Also, Chapter 5 makes suggestions for what the respective stakeholders should do to create policies that will support the company's growth as well as what the monetary authorities should do to limit the macroeconomic ills that the nation is currently confronting.

CHAPTER II

2.1 Introduction

The study's background, research questions, objectives, and problem description were all covered in the preceding chapter. The chapter will evaluate both published and unpublished research from writers all around the world as well as investigations conducted by other academics. Journals, books, and the internet will all be used as research sources for this project. This chapter examined theoretical and empirical research on overseas direct investment and mining production. The outcomes of similar research that has been done and may be compared to the current study are examined through empirical literature. A thorough literature study is crucial since it helps to avoid others' work being duplicated. The study consulted material from local, regional, and global archives.

2.2 Theoretical review

2.2.1 Capital Market Theory

This idea, which is occasionally stated per the "currency area theory," is regarded as unique one to explain FDI. It made the assumption that capital market flows directed towards the upsurge within foreign investment in overall based on one study of Aliber (1970). According to Nayak and Choudhury (2014), disparities in the currencies of the origin countries and host countries directly triggered FDI. In contrast to a powerful country currency, frailer currencies have a larger volume to lure foreign direct investment (FDI) in addition are improved to profit as of disparities in market capitalization charges. Aliber (1970) goes on to say that since portfolio investors don't take into account the fact that origin state MNCs are based in firm currency locations, they possibly will take currency at a lesser interest amount than companies situated in the host member state. Due to their ability to access cheap options for finance for their foreign associates also subsidiaries than domestic firms might, source state firms have an edge when taking out loans. This theory is applicable towards the investigation apparently that there have been policies in place in trying to lower the cost of borrowing so as to lure the FDI. In this sense capital market theory is relevant.

2.2.2 Location-based approach to FDI theories

Even though firm behavior (a microeconomic component) influences FDI location taking into account the reasons for its location, such as incase it is resource seeking, market-seeking, efficiency-seeking, in addition to seeking tactical assets, overall verdict is actually made on the foundation of economic characteristics, that remains one macroeconomic choice because it pills into account state-level features (Dunning, 1970). They claimed that such model accounted for this achievement concerning FDI between nations in terms of a state's nationwide riches, counting its grant of natural resources, the convenience of labor, the magnitude of the internal market, infrastructure, and government strategy concerning these national resources. According to Popovici et al, (2021), key determinants of FDI flows include gravity factors including size, degree of development, distance, shared language, and additional institutional characteristics like owner protection and the extent of trade. The aforementioned concept is related appertaining the investigation within the view that FDI is being directed into the mining sector due to the fact that there are abundant minerals that are raw materials for different manufacturing industries as there is plenty of labor available for the extraction of the minerals.

2.2.3 Institutional FDI Fitness theory

The concept of FDI fitness was introduced through Wilhems and Witter (1998) and emphasizes a nation's capacity to draw, accept, and hold on to FDI. The advantage in attracting FDI inflows is due to a country's capacity for adaptation, or for fitting to the interior and exterior prospects regarding the aforementioned investors. The theory itself makes an attempt to enlighten rationale FDI streams between nations are not evenly dispersed. Government, market, educational, and socio-cultural fitness are the four main pillars that support FDI fitness theory. The writers proclaim that education is essential in offering an advantageous environment for FDI meanwhile upskilled human capital improves Research and Development inventiveness in addition data to processing skills. Given that the necessities position on the numerous skills needed for the developments to be conducted, authentic literacy level rarely appears to substance abundant for FDI. Basic education is essential for attracting FDI. This theory is relevant to the sense in the mining sector there have institutional transformation taking place such as regulatory laws changing so that FDI can be attracted. This is so in the sense that the FDI is lured where institutional policies are favorable.

2.2.4 The Eclectic Theory

Based on the point of view of investing firms, Dunning (1993) goes on to describe three main types of FDI: market-seeking FDI, similarly recognized by way of horizontal FDI (the goal remains towards admittance besides ration resident and worldwide markets), in addition resource-seeking FDI, similarly as recognized as vertical or export-oriented FDI, in which firms capitalize overseas in the direction of acquiring foreign possessions: unprocessed resources, employment, and natural endowments (oil, gas, mineral ores). Similar FDI might entail establishing supply chains in the host nation. When a company arranges its operations near one benefit of economies regarding size then possibility through shared control regarding geographically isolated actions, this is known as efficiency-seeking FDI. This theory is essential for the study since it shows that there are reasons why business owners prefer to have foreign investment as compared to serving the foreign market. This is due to the fact that its easier and more profitable to invest in foreign land since there will be plenty raw materials. In this case it’s the minerals and processing the minerals resulting is high prices than just serve the market without investing in the in the source of the minerals first that is investing in the mining sector of Zimbabwe that is FDI inflows in the mining sector.

2.3 Empirical Review

Mungunzul and Chang (2019) demonstrated that increased mining output brought on by FDI might partake an indirect influence on economic progress by changing accumulation pertaining to manufacture factors then overall factor efficiency. Such unintended benefit be attributed to volume in addition to quality of government spending, more effective international trade of products and services, or the economic multiplier effects of spending money. Technology transfers and spillover effects in the mining sector are indirect effects of FDI. Mining-connected services have brought within international equipment suppliers and mining consulting services, which collectively have increased the mining production. FDI in mining has brought newest technology to Mongolia.

Policymakers must continue to implement various economic liberalization and market expansion policies in order to increase the attractiveness of Southern African countries to FDI inflow privy to mining sector. Because increased overseas direct funds and economic growing are positively correlated, Southern African governments should make an attempt to draw more strategic investments in the mining industry in order to persuade other foreign investors to increase their investments. This is based on the idea that overseas investors might interpret an increase in other people's investment decisions as a sign that the market is improving (Mitchell 2013).

Cheng and Kwan (2015) looked at factors influencing foreign direct investment (FDI) in the mining and quarrying, manufacturing, and construction sectors utilizing aggregate regression of 13 fields in China and nine fields in the provincial of Guangdong. The study was place between 1977 and 2002. It was discovered that market magnitude, infrastructure, strategy descriptions, labour remuneration, and politically aware instability were the main factors influencing investment in the mining sector. Additionally, according to Abel, and Roux (2020), FDI in the MS is influenced by GDP, remuneration, price increases, interest charges, and openness over the elongated duration. Gross Domestic Product has a positive coefficient, indicating an optimistic connection between FDI and GDP. The amount of FDI will rise as GDP changes in terms of units. Numerous empirical findings strongly show the positive correlation between GDP and growth since a country's output level reveals the size of its market and its level of success, that is regularly appreciated and required subsequently by means of distant direct investors. The conclusion that GDP growth rate and FDI are positively correlated is supported by a number of research (Muzurura 2019; Tapera 2016).

On the other hand, a study by Li and Liu (2015) uses panel statistics from 84 states to examine effect of FDI on mining output. The research discovered a substantial correlation among mining output and FDI. Furthermore, if FDI interacts with skilled labor, a stronger link is extracted. Due to the complimentary nature of FDI and skilled labor, more skilled labor provides superior absorptive potential which is accurate meant for developing states.

In a group of 47 developing nations, Alfaro (2015) discusses the issue of the connection among economic progress and sectorial FDI. According to the research, FDI in the mining industry has an optimistic, considerable influence on progress, although overall FDI has an equivocal impact against actual per capita GDP progress proportion. In the examination that emphases on the effects within sectorial foreign direct investment in twelve Asian economies, Wang (2013) comes to comparable results. The study concludes that aggregated FDI, and more especially, FDI in mining, has a stronger beneficial impact on growth.

An econometric model was employed by Graham and Wada (2015) to evaluate the effect of FDI on China's mining industry production. According to the study, FDI favorably impacted productivity advance in general. Particularly, it was discovered that overall issue productivity development did quicken in China's coastline region, where the majority of FDI was found to have occurred in comparison to other provinces of the country.

Temba (2015) looked into how FDI affected Tanzania's mining sector's export performance. He used ordinary least square methods to analyze the succeeding factors: exchange rate, domestic capital investment, global consumer demand, national GDP, and FDI. He discovered that these three factors were the primary influences on Tanzania's mining sector's export performance. The export success and investment from abroad variables, for example, show a long-term association according to co-integration analysis. It is expected that this relationship also affects the agriculture sector.

On the other hand, Kiong and Jomo (2015) investigated the effects of FDI on the Malaysian economy. In their study, the same finding was reached. Despite the fact such FDI possess beneficial power on mining output, the study issued a warning that if FDI had a negative impact on domestic saving rates, the overall impact of FDI might be constrained.

For the years 1970–2003, Krishnan and Chandran (2015) looked at the immediate and longstanding patterns of foreign direct investment (FDI) concluded increase of mining yield in Malaysia, an emerging nation. They employed the autoregressive distributed lag (ARDL) approach with a relatively recent co integration technique known as the "bounds test" in order to assess quick and extended run production elasticity regarding FDI. Both the quick- and continuing term estimates of FDI elasticity have been demonstrated to be statistically noteworthy. Over time, 1% increase in FDI results in a 0.115% rise within Malaysia's mining worth additional output. The model determines how FDI and technical advancement affect mining productivity. In light of the findings, additional recommendations are made for measures to boost Malaysia's mining industries' competitiveness in the world of fierce FDI competition, particularly among Asian economies like China and other members.

Chinese FDIs in Zambia's mining sector are significant, according to Granath and Larsson (2017), because China has the necessary cash for the industry's capital-intensive nature. As there is equipment to extract the minerals, the production of mining is growing. Chinese FDIs help Zambia's economy, society, and mining industry to flourish. Since there are many negative externalities, such as the exploitative treatment of the Zambian mining employees, the exhaustion of the minerals, and the returning of money to China without strengthening the Zambian community, the Chinese investors are the major targets for the opponents. This demonstrates that FDI in mining output is required even when it has negative effects.

According to a related study by Oxford Policy Management (2017), one of the primary economic drivers of the Democratic Republic of the Congo's economy antiquated FDI inflows into the country's mining industry. where the mining industry makes for about 12% of the GDP. 90% of all FDI and 75% of all exports of the nation are accounted for by investments in mining plants and equipment (Oxford Policy Management, 2017).

It is also suggested by Bucaj (2018), study, which included 47 nations in its example, that FDI influxes hooked on various economic segments had various results on economic growth. The primary sector's FDI inflows had a negative impact on growth mostly since agricultural and mining investment only possess little constructive spillover consequence within host economy This suggests that not all FDI can be beneficial for a nation. According to Bucaj (2018), the present research found a favorable connection between FDI in the mining industry and growth regardless of very recent and not extremely large amounts of FDI inflows. To help the economy keep benefiting and draw in more FDI, one policy recommendation is to make it easier to export finished good.

Gochero (2018) assessed the variables influencing FDI in the Zimbabwean MS between 2005 and 2014. Over 14 mineral resources, the panel regression approach with random effects was used in this study. The study was unable to prove a connection between mineral prices and production as factors influencing FDI into the industry. According to the study, strategies endorsing venture and recapitalization bounded by mining sector ought to be developed. The report suggested should have been an equal playground for domestic in addition foreign businesses. All of this demonstrates that FDI in the mining sector might not be successful if other macroeconomic policies are ineffective and there is political instability. Muzurura (2019) investigated the factors that influenced FDI within Zimbabwe allying 1980 to 2011. Time series data were used in this study's multivariate regression technique. According to such investigation, factors certain encouraged FDI where capital creation remains gross additionally fixed, trade openness, monetary steadiness, dishonesty, uncertainty, subpar supremacy, and inadequate government strategies. The government should make sure that there is commercial constancy along with an environment that is favorable for investment, as these factors encourage spending, export competitiveness, and fixed capital development.

2.4 Summary

It should be mentioned that there aren't many empirical researches on the effects of FDI on the output of the mining industry in Zimbabwe. There are other projects about the FDI and its impacts on other sectors of the economy or on the economy as whole. For example, Gochero and Boopen (2020) have written about foreign direct investment in Zimbabwe, as far as the author is concerned. The aforementioned empirical evidence assessment also reveals that the majority of research on mining and foreign direct investment has been conducted in developing nations as opposed to developed ones.

CHAPTER III

3.0 Introduction

The previous chapter examined together theoretical then empirical literature reviews. This chapter provides an explanation appertaining to methodology used to conduct the study and reach the study's goals, which were to identify the variables influencing mining productivity in Zimbabwe. This chapter focuses on the researcher's study methods and data analysis techniques. The chapter also covers the model's estimation processes, diagnostic tests, and the theoretical foundation upon which it was constructed.

3.1 Theoretical Model

The Cobb-Douglas production function formed in 1947 through Herzer Charles Cobb then Paul Douglas served as the foundation for the theoretical model. Output (Y), capital (K), labor (L), and total factor productivity (A) make up its main constituents, as indicated below:

$$Y = AK^{\beta}L^{\alpha} \text{ ....(I)}$$

where α and β stand as relative labor and capital output elasticity. The model also requires that total factor productivity (A) remains as function concerning labor productivity (PL) also capital productivity (PK), with these values being constants set by the technology in use. The equation shown below can be used to express this:

$$A = TFP = f(P_K, P_L) \text{....................................(II)}$$

3.2 Empirical model

A encapsulates one impact of total factor productivity (TFP) on output growth. The aforementioned presumable that variable **A** governs how the bearing of FDI within mining output works based on investigation Gochero (2018);

$\mathbf{A = f(FDI, MBL, INF, CORR)}$ **....................................(III)**

Where;
A refers to the total factor productivity.

FDI refers to foreign direct investment.

MBL refers to merchant bank loans.

INF which stands the yearly inflation.

CORR which is the corruption index in the economy

Φ denotes additional aspects such act on TFP nonetheless unspecified merging equation (**i**) and (**III**) getting:

$\mathbf{MO = \Phi, \beta_1}\, \boldsymbol{K},\ \mathbf{\beta_2}\, \boldsymbol{L}, \mathbf{\beta_3} \boldsymbol{FDI}, \mathbf{\beta_4\ MBL, \beta_6}\, \boldsymbol{INF}, \mathbf{\beta_6} \boldsymbol{CORR}$ ....(iv)

Where;

MO refers to MS output

K indicate Gross Capital Formation within MS

L refers amount of labour employed within MS

FDI refers foreign direct investment within MS

MBL indicate merchant bank loans concerning the MS

INF refers to yearly inflation in the economy.

CORR which is the yearly corruption index is the economy

and $\boldsymbol{\beta}_1$, $\boldsymbol{\beta}_2$, $\boldsymbol{\beta}_3$, $\boldsymbol{\beta}_4$, $\boldsymbol{\beta}_5$, $\boldsymbol{\beta}_6$ are scale parameters of the variables.

The procedure, however, presupposes a linear connection between variables; as a result, equation will remain linearized. Additionally, logarithms aid in lowering the variability of the factor's minimum and maximum values. The model's specification may then be as follows:

$\boldsymbol{LMO = C + \beta_1 L}\mathbf{K} + \boldsymbol{\beta_2 L}\mathbf{L} + \boldsymbol{\beta_3 L}\mathbf{FDI} + \boldsymbol{\beta_4 L}\mathbf{MBL} + \boldsymbol{\beta_5 LI}\mathbf{NF} + \boldsymbol{\beta_6 L}\mathbf{CORR} + \mu$ **..............(IV)**

Where:

***L*MO** is the mining output in natural logarithm

C is ***L*Φ**

***L*K** refers to MS capital (Domestic Investment) that is Gross Fixed Capital Formation in the natural logarithm.

***L*L** refers to labour employed within MS in natural logarithm**.**

***L*FDI** indicate foreign direct investment within MS in the natural logarithm.

***L*MB** indicate merchant bank loans regarding MS in natural logarithm of advances**.**

***L*INF** refers to inflation in the economy in the natural logarithms.

***L*CORR** which the yearly corruption in the country in the natural logarithm.

3.3 Defense of Variables within the Model

3.3.1 Mining Output (MO)

The variable output (MO) remain used to represent output level, such is regarded as primary resource for technological advancement and the development of human capital. Output (MO) stay as factual output of all the minerals in the mining industry produced annually. When choosing where to locate FDI, investors intent to consider into explanation such factor, particularly by way of a proportion of overall sector yield in order to gauge the magnitude regarding potential market. This is especially true for investors who want to increase market portion within host state. The Zimbabwe Mining Sector (ZMS) is thought to consist of all mining companies that take resources from the economy.

3.3.1 FDI

Even though other factors such as macroeconomic policy, inflation, merchant bank loans, cost of labor, mineral output itself, domestic capital formation, and corruption in the economy can also possess an influence on mining output FDI inflows within the sector . Foreign direct investment (FDI) stands as type regarding direct capital investment made by TNCS with the intention of fostering growth and entrepreneurship in another nation. Such investments are especially helpful in developing nations when directed toward sectors like mining. There is no earlier instance to discuss, such as Gochero and Boopen (2020) because FDI within mining sector drive such study on an annual basis then factor remains likewise regarded to be a dependent variable. FDI is calculated as a yearly allocation of millions of USD to the mining production.

3.3.2 Mining production labour (L)

Labor is another factor that can affect the MS sector output. The aforementioned is the figure regarding workers being hired within mining division. It can affect one sector by its upsurge or decrease the mining sector. In the mining industry, labor is measured in the tens of thousands of workers employed yearly. The overall mining production is directly impacted by this variable. Driscoll (2017) stated that mining production is crucial for the sector as it increases or decreases in the mining productivity.

3.3.3 Capital (K) (Domestic Investment) Gross Fixed Capital Formation

In mining output, capital is expressed as millions of USD per year. Alongside help regarding gross fixed capital formation, the aforementioned remains future replaced. This is the total net accumulation concerning fixed capital during the accounting interval. Since the amount of original capital and depreciation is fixed, variations in investment can explain a large portion of the stock of capital (K), such remains calculated utilizing perpetual inventory technique. It stays expected that capital investment and mining output are positively correlated. Gochero and Boopen (2020) reviewed that the domestic investment an affect the sectorial output especially the mining output. It can have a positive impact on the sector.

3.3.4 Merchant Bank Loans (MBL)

Yearly, merchant bank loans directed towards mining industry remain estimated in millions of US Dollars. Financial institutions known as merchant banks specialize in providing services like the acceptance of bills of exchange, hire purchase or instalment buying, financing for international trade, long-term loans, and portfolio management. The mining sector will become more productive as a result of MBL's assistance in purchasing improved production equipment. MBL is anticipated to have a favorable correlation with mining output. The function of bank credit in economic development, particularly the real sector development, is being acknowledged, according to Wood and Skiner (2018), because credits are received by different economic agents to help them pay for investment and operating expenses on real sector components

3.3.5 Inflation (INF)

The general increase in price level or decline in the purchasing power of money is known as inflation (INF). Consumer pricing index (CPI) being used in place of stand-in for inflation since inflation lowers returns on investment, such has detrimental result on foreign direct investment (Battellino, 2023). A low inflation environment had a favorable effect as the output of the sector will increase. The performance of the mining industry is expected to be negatively impacted by inflation because it affects people's willingness to work productively. This could potentially lower mining productivity. Inflation indicate general upsurge within price level. For the purposes of this study inflation. Domestic inflation may result in significant adverse consequences on the increase of sectoral productivity, according to Yang and Guo (2021).

3.3.6 CORR (CORRUPTION)

The Worldwide Governance Indicators, notably its dimension on corruption (CCI), which is published annually by the World Bank and provides a review of the level of corruption in various countries, is the most important indicator for evaluating corruption. Knudten and Kostadam(2017) asserts that it is difficult to reduce corruption in areas with difficult economic conditions. According to Pramugar at al (2020), corruption prevents economy from growing, even the output of diverse sectors within economy. Crawford and Botchwey (2017) asserts that corruption has a positive impact on growth because it avoids the bureaucratic system also encourages corrupt government employees to work more productively. With this, it will help to determine if the corruption hinders the mining output or otherwise.

3.3 Estimation, Analysis and Presentation method

The estimations will be performed using a computer program called E-views and the OLS method for the equation. This package stand utilized since it is simple to use and makes it simple to compute descriptive statistics. The Ordinary Least Squares approximation method remains employed within investigation. This criterion is justified because it satisfies the standard for determining how well an estimator fits the data. OLS remains optimal estimate concerning such investigation model since OLS estimators minimalize the sum of squared residuals formerly model practices linear connection amongst variables. The tables will display the data.

3.4 Diagnostic Tests

3.4.1 Stationarity tests

According to Gujarati (2019) data needs to be stable in order to estimate using the OLS estimator, besides empirical work employing time series data presupposes certain underlying time series is stationary. Although there may be little to no correlation between the variables, a very high R2 can be observed if the data are not steady since this will lead to erroneous regression. In this study, the Phillips-Peron test is utilized in conjunction with the Augmented Dickey Fuller Unit root test towards dictate order of integration concerning time series variable. The majority of time series variables are unstable, which frequently causes the issue of false regression, wherein we occasionally expect no relationship between two variables when regressing one on the other, despite the fact that the regression regarding single other variable reveals a noteworthy connection. First order differencing is employed to make a variable stationary if it is not at its original level. Uncertainty variable remains not stationary on first order differencing, second order differencing is done.

3.4.2 Heteroscedasticity test

In this case, disturbance term remains not constant since error term's variances are not equal. To produce accurate estimates, a heteroscedasticity test will also be run. The classical linear regression model makes the critical assumption that, depending by the chosen standards of the illustrative parameters, variance regarding each disturbance term is not equal. Such remains homoscedasticity, or equal (homo) spread (scedasticity), or variance, underlying assumption. Since OLS estimator would obsolete the best linear unbiased estimator (BLUE), homogeneity variance assumption would be relaxed, leading to inaccurate results when using the estimator. The Breusch-Pagan-Godfrey test indented to be utilized by the researcher towards considering existence concerning heteroscedasticity. Estimates are made under both the null hypothesis of heteroscedasticity besides alternate hypothesis of its absence.

3.4.3 Multicollinearity

This is when the explanatory variables have a linear connection. The independent variables are the only ones affected by the no perfect collinearity assumption. This suggests such descriptive variables drive change almost likewise, succeeding challenging towards determining the relative importance of apiece variable. Since most regressors are stochastic, there will inevitably be correlation and linkages between them, which makes multicollinearity an intrinsic property of most explanatory variables. Multicollinearity makes it difficult to calculate arithmetical standards regarding parameters once employing OLS estimator, necessitating the necessity to test for its presence. To check for multicollinearity, correlation matrices and modified R-squared (R2) will be utilized. Gujarati (2018) states that the correlation matrix's values might range between zero and one, nonetheless correlation between the descriptive variables require not to be greater than 0.8. The correlation matrix remains elected by the researcher to identify multicollinearity, then uncertainty the aforementioned shows correlations of 0.8 otherwise else greater between the variables, multicollinearity may exist (Hair et al, 2019)

3.4.4 Durbin Watson (DW) test

The postulation appertaining OLS analysis, according to Gujarati (2019), is that there shouldn't be any autocorrelation between subsequent variables that explain. The Durbin Watson (DW) test will be utilized in this investigation towards establishing whether there is autocorrelation. The ratio of the residual sum about squares (RSS) to the sum concerning squared differences in subsequent residuals is known as the Durbin-Watson test. The fact that the (DW) must be within the range of 0 and 4 and roughly equal 2 indicates there is no autocorrelation amongst descriptive factors. Furthermore, if DW in the model equals 2, it follows absence regarding first order autocorrelation, positive or negative. Additionally, positive serial correlation if DW is nearer to 0, and here stands perfect negative serial correlation doubtly DW is equal to 4. Evidence of negative serial association is stronger the closer the DW is near 4.

3.5 Model Specification Test

3.5.1 Normality Test

Using the Jacque-Bera (JB) test, normality was determined. When considering the confidence interval and significance test findings, to be precise, the normality assumption is crucial. The assumption of normalcy allows probabilities to be derived, and the F test and t test are also dependent on it. If $P > 0.1$ no evidence to reject $H0$, this means such parameters stays normally distributed.

3.5.2 Ramsey's (RESET) Test

Testing for model specification, overall model validity, and the importance of each coefficient are essential. As a result, we run into the issue of model specification bias if the model is poorly stated. The model misspecification was examined using the Ramsey Regression Specification Error Test (RESET). The significance of each variable and the significance of the entire model were also tested using P-value and F-test, respectively.

3.5.3 Coefficient of determination

The coefficient of determination stands such metric used towards checking regression equation's accuracy in fitting the data. The R2's proximity to 1 will determine how well the line fits. In sense, the variance in the data will be entirely described if the regression line yields a perfect fit (Gaynor & Kirkpatrick, 1994). R2 will be close to 1 if the independent variables accurately forecast changes in mining production.

3.5.4 F- Statistic

The calculated regression model's overall significance is measured by the F-statistic. The null hypothesis that genuine slope coefficients remain concurrently zero is tested via the F-value. We reject H0 undoubtedly calculated F-value remains more compared with crucial F-value determined by F table by percentage appertaining significance level; otherwise, do not discard it. Alternately, we may reject H0 if the observed F's p-value is sufficiently low. Thus, the critical value will be contrasted to the F-statistic after the test, then choice meant accepting or rejecting the null hypothesis appertaining factors account for fluctuations within mining output once the aforementioned exceeds critical value. The F-testing method can be broadly.

3.6 Data sources

The paper calculates a practical model utilizing secondary statistics on mining yield, foreign direct investment in the industry, the number of employees, gross capital formation, merchant bank advances, and inflation in the sector for the years 1990-2022. World Data, UNTACD World Bank, Trading Economics, Knoema, World Data Mining, RBZ, ILO, and IMF provided information on mining output, staff count, gross capital formation, merchant bank advances, inflation, and FDI. The selection of the data sources is predicated on the notion that World Data Mining, RBZ and the other sources named before offer statistics such remain precise, pertinent, besides trustworthy.

3.7 Reason aimed at the utilization of secondary data

This study employed secondary data for a number of reasons. The strategy was selected primarily because data from reliable and published sources, primarily already existed. Since the data is easily accessible, using and gathering it is less expensive Smith and Wattle (2022).

Regardless of the above explanation, the primary drawback of secondary figures remains open to multiple usages besides interpretations, might not be significant to the present investigation, may be obsolete then inappropriate about present determination, besides the aforementioned possibly drive correction of data errors. Additionally, some secondary data may not be specifically tailored to the needs of this project, necessitating its fine-tuning.

3.8 Summary

This chapter has discussed the study's methods. The estimating techniques that would be used in this research were outlined. In this economic investigation, OLS regression intend to be utilized. Such chapter similarly examined theoretical then empirical reviews, besides it is clear that both types of reviews concur in their conclusion such FDI has a beneficial impact on mining output. The estimation, presentation, also interpretation of results will all be covered during following chapter.

CHAPTER IV

DATA PRESENTATION AND ANALYSIS

4.0 Introduction

This section attempts toward provide thorough summary concerning investigation's conclusions. On the way to calculate the each of FDI on mining output within Zimbabwe (1990–2022), the statistical program E–views were employed. This chapter provides a thorough discussion of the data description, diagnostic tests, regression results, and model significance. Finally, it presents an economic interpretation of the results and summarizes the numbers analysis' discoveries.

Table 4.1 Descriptive Statistics

	*L*MO	*L*FDI	*L*CORR	*L*DCF	*L*INF	*L*L	*L*MBL
Mean	14.66654	0.840749	0.447548	2.830914	1.786149	3.908291	2.3843
Median	14.82549	0.580094	0.405465	2.907758	1.359866	3.921129	2.576124
Maximum	15.39969	3.432943	0.916291	4.440437	6.405139	3.930566	3.1667
Minimum	13.63632	0.017861	0	1.655884	-2.0334	3.847297	0.42211
Std. Dev.	0.441387	0.844108	0.308494	0.579315	1.963967	0.025069	0.684001
Skewness	-0.86488	1.667004	-0.186719	0.153253	0.593388	-1.21256	-1.479845

Kurtosis	2.849763	5.095212	1.945778	4.31363	2.922523	3.22499	4.979088
Jarque-Bera	4.019514	21.3201	1.719905	2.35028	1.944853	8.156245	16.37389
Probability	0.134021	0.000023	0.423182	0.308776	0.378164	0.016939	0.000278
Sum	469.3293	27.74472	14.76907	87.75833	58.94293	128.9736	73.91331
Sum Sq. Dev.	6.0395	22.80057	3.045395	10.06816	123.4294	0.020111	14.03572
Observations	32	33	33	31	33	33	31

The variables involved in the model are described statistically for 33 observations in Table 4 above. The table above displays the mean, median, maximum, minimum, and standard deviations for each factor. While the data were in logarithmic form, indicated by *L* behindhand the variables has been made available, descriptive statistics were generated. This took place in an effort to lessen the variability of the variable and data sets. We can see in the data that *L*INF has the greatest variability, with a standard deviation of 1.963967.

Four variables (*L*MO, *L*CORR, *L*L, and *L*MBL) are negatively skewed, whereas *L*FDI, *L*DCF, in addition *L*INF are positively skewed; yet, the other factors consume substantially lesser standard deviations, indicating high degree appertaining dependability in describing fluctuations within *L*MO.

Every one of the parameters are institute to be normally distributed via the Jarque-Bera test. At the 10% level of statistical significance, reject null hypothesis such parameters remain never normally distributed because probability of Jarque-Bera is over 0.10 aimed at altogether factors.

We can still carry out the regression and get the desired outcomes. Greene (2016) asserts that the regression model's inclusion of the presumption of normality is considered as an unneeded and unsuitable addition, and is therefore only used for practical reasons.

4.2 Diagnostic Tests

4.2.1 Heteroscedasticity

In fore instance, error term's variance happens not persistent that is never constant. The aforementioned could stay brought about by the utilization of inappropriate functional forms, the existence of outliers, or the omission of a significant variable from a model. Biased standard errors will be the outcome of heteroscedasticity. Standard errors that are biased will likewise produce biased inferences, such confer to incorrect hypothesis testing.

Table 5: Breusch-Pagan-Godfrey Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.764673	Prob. F(6,23)	0.6051
Obs*R-squared	4.989159	Prob. Chi-Square(6)	0.5452

With the purpose appertaining detecting presence of heteroskedasticity, Breusch-Pagan-Godfrey test remains utilized. As soon as the P-value is less than 0.1, the null hypothesis is repudiated. The P-value (0.6051) in the table above is bigger than 0.1, hence we are unable to uncover any data to support rejecting the null hypothesis. Therefore, it is clear that lacking of systematic connection amid squared residuals in addition to descriptive factors which means there is no heteroskedasticity.

4.2.2 Correlation Matrix

The coefficient of purpose amid illustrative factors is known as multicollinearity. The P-value essentially remain smaller relatively 0.80 so as to draw conclusion that multicollinearity is not present (Gujarati, 2019).

Table 6: Correlation Matrix

	*L*CORR	*L*DCF	*L*FDI	*L*INF	*L*L	*L*MBL
*L*CORR	1.000000					
*L*DCF	-0.091329	1.000000				
*L*FDI	-0.098320	0.412324	1.000000			
*L*INF	0.438841	-0.529500	-0.126396	1.000000		
*L*L	0.136873	-0.211333	-0.279214	0.066211	1.000000	-0.493683
*L*MBL	-0.173220	-0.173198	-0.252820	0.211818	-0.493683	1.000000

SOURCE: E-views 7

Since none of the explanatory variable coefficients in table 6 above are greater than 0.8, the estimated model is not multicollinear.

4.2.3 LM test aimed at autocorrelation

Table 7: Breusch-Godfrey Serial Correlation LM Test

Serial Correlation by Breusch and Godfrey A model is said to have autocorrelation, according to the LM Test, if the P-value is less than 0.1.

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	11.24282	Prob. F(2,21)	0.0005
Obs*R-squared	15.51246	Prob. Chi-Square(2)	0.0004

The aforementioned table shows a P-value of less than 0.1. Inferring that our variables are affected by autocorrelation, here is sign to "reject null hypothesis" that stand deprived autocorrelation between such terms. Estimated variances of the regression coefficients intended biased also inconsistent when there is co-elation, which makes hypothesis testing invalid. Making a variable that will have a two-period lag behind the dependent variable (***L***MO) will address the autocorrelation problem

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.530264	Prob. F(2,19)	0.2420
Obs*R-squared	3.884529	Prob. Chi-Square(2)	0.1434

P-value stands more than 0.1, hence unable to infer that null hypothesis has been rejected based on the aforementioned table when comparing it to the alternative. As a result, we may say that there isn't any autocorrelation.

4.2.4 Stationarity test

The Augmented Dickey-Fuller (ADF) statistic is used to determine if a variable is stationary when its absolute value is superior to the test statistic. This is because spurious regression can occur when a model remains regressed per variables such integrated regarding different levels. Presuming that ADF statistic is inflated compared to the crucial value appearing in 5%, we reject null hypothesis such series has a unit root then derive towards decision this is stationary.

Table 8: Unit root test (ADF test within levels)

VARIABLE	ADF	1% level	5% level	10% level	DECISION	
LMO	4.255923	-2.6443	-1.952473	-1.61021	NOT-STAIONARY	
LCORR	-0.89504	-2.63921	-1.951687	-1.61058	NOT-STATIONARY	
LDCF	-0.64521	-2.6443	-1.952473	-1.61021	NOT-STATIONARY	
LFDI	-1.64562	-2.64712	-1.95291	-1.61001	NOT-STATIONARY	
LINF	-1.57685	-2.63921	-1.951687	-1.61058	NOT-STATIONARY	
LL	-0.38251	-2.6443	-1.952473	-1.61021	NOT-STATIONARY	
LMBL	-0.60155	-2.6443	-1.952473	-1.61021	NOT-STATIONARY	

AT 5% LEVEL OF SIGNIFINCE

All of the variables are non-stationary, as can be seen from table 8 above. Due to this, the Unit Root Test in First Difference is performed, as illustrated below;

Table 9: Unit root test in first difference

VARIABLE	ADF	1% level	5% level	10% level	DECISION
LMO	-2.62405	-2.65015	-1.953381	-1.609798	STATIONARY
LCORR	-5.77355	-2.6443	-1.952473	-1.61021	STAIONARY
LDCF	-4.71076	-2.64712	-1.95291	-1.61001	STAIONARY
LFDI	-3.30076	-2.64712	-1.95291	-1.61001	STAIONARY
LINF	-6.2943	-2.64167	-1.952066	-1.6104	STAIONARY
LL	-1.06778	-2.64167	-1.952066	-1.6104	NOT STAIONARY
LMBL	-5.43388	-2.64712	-1.95291	-1.61001	STAIONARY

AT 5% LEVEL OF SIGNIFINCE

Table 9: Unit root test in second difference

VARIABLE	ADF	1% level	5% level	10% level	DECISION
L L	-4.10886	-2.6443	-1.95247	-1.61021	STAIONARY

AT 5% LEVEL OF SIGNIFINCE

In the first difference, stationarity from table 9 above was evaluated once more. All variables became stable after being tested for stationarity in the first difference, indicating such parameters stand integrated about order one 1(1). Subsequently variables got stationary by various values, even if the parameters are unrelated to one another the model is probable to have high R2 then a spuriously significant outcome. The non-stationary variable will need to be changed in order to solve this problem. However, since this is outside the purview of the researcher, the researcher will continue to estimate findings.

4.3 Estimation of Results

4.3.1 Regression Analysis

Table 10 below displays the regression outcomes obtained by means of the OLS technique and statistics program E-views;

Table 10: Econometric Results

Dependent Variable: ***L***MO

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-48.49501	3.483107	-13.92292	0.0000
LCORR	0.169493	0.062937	2.693047	0.0133
LDCF	-0.204792	0.099659	-2.054931	0.0520

***L*FDI**	0.055272	0.023029	2.400100	0.0253
***L*INF**	0.012410	0.026546	0.467506	0.6447
***L*L**	16.13777	0.882041	18.29594	0.0000
***L*MBL**	0.070337	0.040540	1.734979	0.0967

AT 5% LEVEL OF SIGNIFINCE

R Squared 0.960316

Adjusted R Squared 0.960316

F Statistic 88.73053

Durbin Watson Stat 1.764535

Prob(F-statistic) 0.000000

Econometric model utilized remains;

*L*MO= C+ β_1 *L*FDI+ β_2 *L*DCF + β_3 LL + β_4 *L*MBL+ β_5 *L*INF+ β_6 *L*CORR+ μ

This form of the equation is ultimately achieved by substituting coefficients into the model;

LMO= -48.49501+ 0.055272***L***FDI -0.204792***L***DCF + 16.13777***L***L + 0.070337***L***MBL + 0.012410***L***INF + 0.169493***L***CORR

4.4 Model specification test

The R Squared and Probability (F statistics) model specification tests altogether indicated such model is correctly described. The R^2 of 0.960316 revealed such model's variables account for almost 96% of the fluctuations in *L*MO, which is higher than the threshold value of 0.60 and indicates such model is statistically significant (Gujarati, 2019). The error term or external factors reason being 4% of the variability. The dependent variable, mining production, has an adjusted R2 of 0.960316, which indicates that the explanatory variables account for roughly 96%

of the variation, with the remaining 4% being explained by other variables, such as those that have an impact on the dependent factor *L*MO

The likelihood of the F-statistic being true is 0.000000, and the F-statistic is 88.73053. Given that it is smaller than 0.1 the P stat of 0.000000 further proves such model remains accurately defined.

4.5 Result Interpretation and Discussions

Foreign Direct Investment (***L***FDI)

The P-value about 0.0253 designates FDI be situated statistically significant at the 10% level of significance in illumination mining sector output. Based on the FDI coefficient (β_1=0.055272), an upsurge in FDI of 1% motivate outcome in an upsurge in mining output of around 0.05%. This suggests that we agree with the idea that increasing foreign direct investment in the mining industry will result in higher output. The production of mining will increase as FDI increases.

Gochero and Boopen (2020) assert that FDI in the mining industry consumes long-term, favorable impression on the nation's economic growth. A 1% rise in FDI in the mining industry is thought to have contributed to a 0.512% increase in the mining sector of Zimbabwe. Such a finding is consistent with Bucaj's (2018) research on the contribution of FDI inflows to Kosovo's mining sector to economic growth, which discovered that FDI in mining had a favorable impact. This is consistent with earlier that is 2010 research by Moose, who discovered a favorable, noteworthy influence of FDI on mining output. FDI is important at a 5% level of significance, according to study Moose (2010), which found 36 pieces of solid evidence. According to the regression analysis, an increase in FDI of 8.03% led to a 1% rise in mining output.

DOMESTIC CAPITAL FORMATION (***L***DCF)

The domestic capital has a P-value of 0.0520 in the table above, indicating such is statistically significant on 10% rank. The measure of ***L***DCF is (β_2 =-0.204792), which explains that a 1% growth in capital motivate effect in a 0.05% drop in mining production. Correlation between domestic capital formation and mining output is positive, as indicated by the domestic capital formation coefficient. A rise in domestic capital formation productivity translates into more output being produced per unit of capital as well as more minerals being extracted, which is mining output. The coefficient appertaining to ***L***DCF bear negative mark due to the diminishing marginal returns.

According to the outcomes of the regression model, capital, as measured by gross fixed capital formation, contributes positively to mining output. This suggests that, ceteris paribus, an upsurge of capital creation mains in the direction of surge in mining output as additionally. Additionally, rising capital creation growth rates correspond to rising production. This is corroborated by CoMZ (2016), which states that a lack of modernized equipment, machinery, and foreign exchange are all important hindrances to the mining industry's productivity in Zimbabwe. CoMZ (2016) also detailed the government's efforts to circumvent these restrictions, including the elimination of the need for foreign currency surrenders and the provision of investment funds and credit lines to reopen closed mines and boost capacity utilization in the sector.

Labor (***L***L)

It has been determined that the contribution of labor to the Zimbabwean mining industry's changes in output is negligible. At the 10% level of significance, Labor has P-value about 0, making it statistically significant. Since labor has a coefficient of β_3=16.13777, an increase in labor by 1% determine upshot in an intensification in mining output of 16.622%. This demonstrates that there is a beneficial relationship between mining output and labor. Increased manpower in the mining industry will result in higher mining output.

This is in relation to the study that was carried by Gochero (2018) that the variable was discovered to be statistically significant at 5% level and to have the anticipated positive sign. With a coefficient of 0.4636, it is clear that FDI inflows into the mining industry are both mineral-specific and comparatively elastic towards changes within levels of labor readily available to the industry. In the MS, FDI inflows will therefore grow by 46.36 percentage points for every unit percentage increase in labor.

Merchant Bank Loans (***L***MBL)

They are statistically insignificant on 10 % level revealed by means of the P-value based on 0.0967. A growth within ***L***MBL on 0.01 drive an intensification within mining division yield at 0.0967% roughly. Such incomes even if the sector has access to loans to buy advanced machinery for production of the sector will still decrease.

This implies that if the sector has the opportunity to obtain loans, they will have the funds to purchase cutting-edge production machinery, increasing the sector's output. According to the findings of the regression model, ***L***MBL also partake a beneficial bearing to mining output. It is important for illuminating changes in mining output. This suggests that a rise in loans provided to the industry causes a steady rise in mining output, other things being equal (Emmanual at al, 2022)

INFLATION (***L***INF)

Inflation taking place in mining division has P-value about (0.6447), something that displays such stands statistically insignificant in defining yield regarding the sector at 10%. A 1% upsurge in inflation drive result towards a reduction within mining productivity with almost 0.001% as shown by the coefficient (β_5 =0.012410) .The study shows that inflation may not be detrimental to the mining output as highly as the other factors

CORRUPTION (***L***CORR)

Corruption within the yield of mining division consume P-value about (0.0133), such displays statistically significant with defining production within the sector. A 1% intensification within corruption drive upshot toward lessening within mining yield on nearly 0.17%. Intensification in corruption motivate affect the mining sector negatively. As result the mining sector will be reduced.

According to research by Knutsen et al (2017), the mining industry is active, which is considerable at 1% for police corruption, and this is connected with higher bribe payments in the MS. This shows that mines indicate that there is an effect of corruption on mining. The research also showed that areas that have mines are highly having corruption of different forms.

4.6 Summary

This chapter's diagnostic tests and findings explanation reveal that the use of FDI, domestic capital, merchant bank loans, and foreign direct investment take one favorable influence on mining yield. Additionally, corruption has one detrimental bearing on mining output, while inflation has little bearing on differences in mining output between 1990 and 2022. The focus of the following chapter will be a summary, findings, and suggestions for improving mining productivity.

CHAPTER V

Summary, Conclusion and Recommendations

5.0 Introduction

This chapter confer primary outcomes after investigation while offering a thorough discussion regarding results in addition to recommendations for further research. Additionally, it makes some suggestions on how to improve the performance appertaining to foreign direct investment within Zimbabwe. The chapter first provides an overview of the investigation's results subsequently offers verdicts that take into account the investigation's aims, followed by providing suggestions and proposals for further research**.**

5.1 Summary

The investigation’s goal remained to ascertain how foreign direct investment affected Zimbabwe's mining industry's output. In order to evaluate the effect of foreign direct investment on the output of the mining sector within Zimbabwe, data from time series spanning years 1990 up to 2022 were employed. The primary goal of the first chapter, which aimed at identifying the connection between FDI and the mining industry, was to evaluate the influence of FDI on the performance of the mining sector. Due to the fact that a rise in FDI also results in an upsurge in output, the investigator discovered an encouraging association connecting FDI and mining division performance. One of the goals of the investigation was to assess and determine conclusion regarding labor also capital on performance within mining sector. According to research's findings, labor is important in explaining differences in mining output as it affects the mining output positively and also a positive association connection regarding capital and performance appertaining sector output.

Additionally, the other goal was to find out the effect of corruption on the mining sector output. From this investigation it was noted that that there is a positive association between the corruption and the mining sector. Mining sector output increases so does the corruption resulting in a compromised recorded mining sector output.

5.3 Conclusion

In this study, result concerning FDI on mining output within Zimbabwe stayed examined, and it was determined that there was enough evidence to support the claim that foreign direct investment may help Zimbabwe's mining industry thrive. Domestic capital, on the other hand, has been shown to be a policy variable such have a malignant outcome on sector's performance since it pulls in a different direction. Inflation turned proven to be insignificant or irrelevant in explaining discrepancies in production regarding mining sector in Zimbabwe. On contrary , corruption is crucial in influencing the rate of output growth in Zimbabwe's mining industry.

The mining sector's gross fixed capital formation shows a strong and favorable impact of capital expansion on output. This suggests that, ceteris paribus, a continuous rise within rate of gross fixed capital creation corresponds to a lasting upsurge within mining output. Additionally, rising growth rates in capital formation indicate rising levels of investment, which in turn indicates rising rates of mining sector output

5.4 Recommendation

According to the empirical research stated above, the investigation recommends following endorsements towards relevant stakeholders, including government and investors, to name a few, based on the findings;

- To make the domestic economy more appealing for investment in the mining sector, policy measures should be put in place.
- The government must make sure that FDI inflows serve its primary aims in order to effectively contribute to the sector's sustained development. This might be accomplished by deterring high-ranking officials from engaging in corruption and rent-seeking behavior through greater accountability and openness.

- Additionally, the government must lower interest rates to encourage domestic investment and guarantee adequate or higher levels of domestic capital growth.
- Stability in macroeconomic policy is also essential for determining foreign aid for development. The government should adopt policies that would encouraging the sector's exports, as export earnings also contributes to the expansion of the economy.
- The government and its officials should update anti-bribery & anti-corruption policies, watch out for bribery & corruption red flags.

5.5 Suggestions for further studies

The verdicts regarding present inquiry should not be seen as definitive, but rather as a catalyst for additional investigation into how foreign direct investment affects the production of the mining sector in Zimbabwe. It is advised that further research be done to determine the impact of FDI on the nation's various industries, including agriculture, manufacturing, and tourism, to name a few. Analyzing the variables that influence inflows of foreign direct investment is an intriguing subject for further study. Additional research can be carried out to identify elements not included by this study that have an impact on the output of the mining sector in Zimbabwe.

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APPENDICES

Appendix 1**: Raw Data used for the analysis**

YEAR	MINING OUTPUT (TONNES)	FDI (USD MILLION)	DOMESTIC CAPITAL FORMATION (UDS MILLIONS)	LABOUR (NO. OF WORKERS IN THOUSANDS)	MERCHANT BANK LOANS (MILLIONS)	INFLATION RATE % (AS COMPARED TO THE PREVIOUS YRAR)	CORPTION (1=low to 6=high)
1990	835945	2656473	1975060	95855	987643	1.35	1.5
1991	956122	2790485	2648757	100565	2432454	1.35	1
1992	1023244	1494989	2745350	101273	1753623	-13.14	1.5
1993	1167576	2795513	1945376	251586	946249	-3	2
1994	1265695	3464887	989503	356764	3547233	0.38	2
1995	1367572	3117700	1845765	470466	4234265	-2.76	1.5
1996	1563652	4574809	2364362	419590	3765542	15.23	1
1997	1753665	3509999	3983624	479720	967643	6.01	1
1998	1945345	4443098	1642760	575654	1353456	-0.97	1.5
1999	2024535	2353590	2364627	416001	859796	-28.02	1.5
2000	2437233	2310009	2768625	467636	3986666	13.43	1
2001	2400313	3799999	1046824	357756	3425354	4.48	1
2002	2512378	2586734	2363965	329674	2464745	-37.2	2
2003	2689879	3787309	1846724	365634	357385	-34.45	2
2004	2696432	1357758	2074370	200637	753242	-8.57	2
2005	2755467	1028757	1970467	206476	364623	113.57	2
2006	2798786	NA	1360372	236543	446257	-31.52	1.5
2007	2735656	NA	NA	266436	NA	32.97	1
2008	NA	NA	NA	NA	NA	NA	1
2009	2866358	977574	2156740	300624	4742378	NA	1
2010	2946254	1225666	2259412	324757	5426456	NA	1.5
2011	2954763	3443764	2453419	385653	356384	3.05	1.5
2012	2854787	3498635	1687007	375956	43567534	3.47	1.5
2013	2987691	3730563	1758183	383265	5637452	3.72	1.5
2014	2912345	4728684	1879216	356436	6845244	1.63	1.5

2015	3025765	3992563	2003427	329267	4762474	-0.21	1.5
2016	3065337	3430338	2026381	385766	6457964	-2.41	2
2017	3308842	3071878	3240458	549665	3416638	-1.56	2
2018	3829231	7178653	3345404	577056	1390321	0.91	2
2019	3512668	4955000	3117897	605254	4271965	10.61	2.5
2020	3389547	3657577	2848065	623635	47601108	557.21	2.5
2021	3956845	5366063	3738189	645376	10512411 6.8	98.55	2.5
2022	4875276	6973794	4869306	674764	57166420 5.3	193.4	2.5

Appendix 2**: Descriptive Statistics**

	LMO	***L***MBL	***L***L	***L***FDI	***L***INF	***L***DCF	***L***CORR
Mean	14.66654	0.793646	3.908291	0.840749	2.114570	1.018974	0.447548
Median	14.82549	0.946286	3.921129	0.580094	2.174523	1.067382	0.405465
Maximum	15.39969	1.152690	3.930566	3.432943	2.228659	1.490753	0.916291
Minimum	13.63632	-0.862489	3.847297	0.017861	1.536094	0.504335	0.000000
Std. Dev.	0.441387	0.474495	0.025069	0.844108	0.182978	0.216686	0.308494
Skewness	-0.864879	-2.648036	-1.212559	1.667004	-2.414209	-0.736300	-0.186719
Kurtosis	2.849763	9.525378	3.224990	5.095212	7.393471	4.001877	1.945778
Jarque-Bera	4.019514	91.22904	8.156245	21.32010	56.82160	4.097567	1.719905
Probability	0.134021	0.000000	0.016939	0.000023	0.000000	0.128892	0.423182
Sum	469.3293	24.60303	128.9736	27.74472	67.66625	31.58819	14.76907
Sum Sq. Dev.	6.039500	6.754363	0.020111	22.80057	1.037913	1.408587	3.045395
Observations	32	33	33	33	33	33	33

Appendix 3**: Heteroskedasticity Test: Breusch-Pagan-Godfrey**

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.044489	Prob. F(6,22)	0.4242
Obs*R-squared	6.429457	Prob. Chi-Square(6)	0.3768
Scaled explained SS	2.722062	Prob. Chi-Square(6)	0.8428

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/26/23 Time: 19:51
Sample: 2 31
Included observations: 29

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.234755	0.283287	-0.828683	0.4162
LMBL	0.003498	0.003292	1.062422	0.2996
LL	0.052378	0.071561	0.731935	0.4719
LINF	0.019518	0.015964	1.222680	0.2344
LFDI	-0.000719	0.001871	-0.384291	0.7045
LDCF	-0.006389	0.008143	-0.784556	0.4411
LCORR	-0.004130	0.005151	-0.801636	0.4313

R-squared	0.221705	Mean dependent var	0.005728
Adjusted R-squared	0.009443	S.D. dependent var	0.007071
S.E. of regression	0.007038	Akaike info criterion	-6.868560
Sum squared resid	0.001090	Schwarz criterion	-6.538523
Log likelihood	106.5941	Hannan-Quinn criter.	-6.765196
F-statistic	1.044489	Durbin-Watson stat	2.123941
Prob(F-statistic)	0.424177		

Appendix 4**: Breusch-Godfrey Serial Correlation LM Test:**

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	13.04969	Prob. F(2,20)	0.0002
Obs*R-squared	16.41848	Prob. Chi-Square(2)	0.0003

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 05/26/23 Time: 19:53
Sample: 2 31
Included observations: 29
Presample and interior missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LMBL	-0.024306	0.028673	-0.847684	0.4066
LL	-0.595238	0.624612	-0.952973	0.3520
LINF	0.214371	0.147324	1.455099	0.1612
LFDI	-0.043803	0.018284	-2.395705	0.0265
LDCF	0.023093	0.070146	0.329210	0.7454
LCORR	-0.035583	0.046979	-0.757418	0.4576
C	1.913970	2.463222	0.777019	0.4462
RESID(-1)	0.817937	0.204974	3.990434	0.0007
RESID(-2)	0.148978	0.217365	0.685381	0.5010

R-squared	0.566155	Mean dependent var	-5.14E-15
Adjusted R-squared	0.392616	S.D. dependent var	0.077025
S.E. of regression	0.060029	Akaike info criterion	-2.538850
Sum squared resid	0.072070	Schwarz criterion	-2.114517
Log likelihood	45.81332	Hannan-Quinn criter.	-2.405954
F-statistic	3.262422	Durbin-Watson stat	1.830148
Prob(F-statistic)	0.015170		

Appendix 5**: Correlation Matrix**

	LMO	***L***MBL	***L***L	***L***INF	***L***FDI	***L***DCF	***L***CORR
LMO	1.000000	-0.301711	0.963377	-0.223056	-0.333636	-0.381417	0.305020
LMBL	-0.301711	1.000000	-0.355228	-0.015109	-0.209329	-0.102665	-0.203137
LL	0.963377	-0.355228	1.000000	-0.146456	-0.385623	-0.294414	0.201125
LINF	-0.223056	-0.015109	-0.146456	1.000000	0.177252	0.591859	-0.397714
LFDI	-0.333636	-0.209329	-0.385623	0.177252	1.000000	0.381934	-0.150449
LDCF	-0.381417	-0.102665	-0.294414	0.591859	0.381934	1.000000	-0.212359
LCORR	0.305020	-0.203137	0.201125	-0.397714	-0.150449	-0.212359	1.000000

Unit root test (ADF test within levels)

Appendix 6**: LCORR has a unit root**

Null Hypothesis: LCORR has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.895041	0.3207
Test critical values:	1% level	-2.639210	
	5% level	-1.951687	
	10% level	-1.610579	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LCORR)
Method: Least Squares
Date: 05/26/23 Time: 19:58
Sample (adjusted): 2 33
Included observations: 32 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LCORR(-1)	-0.075826	0.084718	-0.895041	0.3777

R-squared	0.021224	Mean dependent var	0.015963
Adjusted R-squared	0.021224	S.D. dependent var	0.254251
S.E. of regression	0.251538	Akaike info criterion	0.108308
Sum squared resid	1.961417	Schwarz criterion	0.154113
Log likelihood	-0.732933	Hannan-Quinn criter.	0.123491
Durbin-Watson stat	1.643355		

Appendix 7: LDCF has a unit root

Null Hypothesis: LDCF has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.715345	0.3983
Test critical values:	1% level	-2.644302	

	5% level	-1.952473	
	10% level	-1.610211	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LDCF)
Method: Least Squares
Date: 05/26/23 Time: 19:59
Sample (adjusted): 2 31
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LDCF(-1)	-0.018179	0.025413	-0.715345	0.4801

R-squared	0.009085	Mean dependent var	-0.013280
Adjusted R-squared	0.009085	S.D. dependent var	0.147368
S.E. of regression	0.146697	Akaike info criterion	-0.968131
Sum squared resid	0.624080	Schwarz criterion	-0.921425
Log likelihood	15.52197	Hannan-Quinn criter.	-0.953189
Durbin-Watson stat	1.749128		

Appendix 8**: LFDI has a unit root**

Null Hypothesis: LFDI has a unit root
Exogenous: None
Lag Length: 3 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.645622	0.0934
Test critical values:	1% level	-2.647120	
	5% level	-1.952910	
	10% level	-1.610011	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LFDI)
Method: Least Squares

Date: 05/26/23 Time: 20:00
Sample (adjusted): 5 33
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LFDI(-1)	-0.231454	0.140648	-1.645622	0.1124
D(LFDI(-1))	-0.349080	0.199807	-1.747085	0.0929
D(LFDI(-2))	-0.108155	0.195043	-0.554520	0.5842
D(LFDI(-3))	0.178733	0.152092	1.175158	0.2510

R-squared	0.372066	Mean dependent var	-0.009873
Adjusted R-squared	0.296714	S.D. dependent var	0.867947
S.E. of regression	0.727879	Akaike info criterion	2.330077
Sum squared resid	13.24518	Schwarz criterion	2.518670
Log likelihood	-29.78612	Hannan-Quinn criter.	2.389142
Durbin-Watson stat	1.993075		

Appendix 9: **LINF has a unit root**

Null Hypothesis: LINF has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.320875	0.1684
Test critical values:	1% level	-2.644302	
	5% level	-1.952473	
	10% level	-1.610211	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LINF)
Method: Least Squares
Date: 05/26/23 Time: 20:01
Sample (adjusted): 4 33
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LINF(-1)	-0.012707	0.009620	-1.320875	0.1972

D(LINF(-1))	-0.357894	0.174703	-2.048584	0.0500

R-squared	0.131568	Mean dependent var	-0.021304
Adjusted R-squared	0.100552	S.D. dependent var	0.117742
S.E. of regression	0.111665	Akaike info criterion	-1.482284
Sum squared resid	0.349135	Schwarz criterion	-1.388871
Log likelihood	24.23426	Hannan-Quinn criter.	-1.452400
Durbin-Watson stat	1.762162		

Appendix 10**: LL has a unit root**

Null Hypothesis: LL has a unit root
Exogenous: None
Lag Length: 2 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.382509	0.5378
Test critical values:	1% level	-2.644302	
	5% level	-1.952473	
	10% level	-1.610211	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LL)
Method: Least Squares
Date: 05/26/23 Time: 20:01
Sample (adjusted): 4 33
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LL(-1)	-4.31E-05	0.000113	-0.382509	0.7051
D(LL(-1))	0.955279	0.247984	3.852184	0.0007
D(LL(-2))	-0.041749	0.248359	-0.168101	0.8678

R-squared	0.724842	Mean dependent var	0.002083
Adjusted R-squared	0.704460	S.D. dependent var	0.003449
S.E. of regression	0.001875	Akaike info criterion	-9.625767
Sum squared resid	9.49E-05	Schwarz criterion	-9.485648
Log likelihood	147.3865	Hannan-Quinn criter.	-9.580942
Durbin-Watson stat	1.627263		

Appendix 11**: LMBL has a unit root**

Null Hypothesis: LMBL has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.197799	0.2061
Test critical values:	1% level	-2.644302	
	5% level	-1.952473	
	10% level	-1.610211	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LMBL)
Method: Least Squares
Date: 05/26/23 Time: 20:02
Sample (adjusted): 2 31
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LMBL(-1)	-0.091136	0.076087	-1.197799	0.2407

R-squared	0.047102	Mean dependent var	-0.002450
Adjusted R-squared	0.047102	S.D. dependent var	0.391774
S.E. of regression	0.382436	Akaike info criterion	0.948252
Sum squared resid	4.241453	Schwarz criterion	0.994959
Log likelihood	-13.22378	Hannan-Quinn criter.	0.963194
Durbin-Watson stat	1.911910		

Appendix 12**: LMO has a unit root**

Null Hypothesis: LMO has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		4.255923	1.0000
Test critical values:	1% level	-2.644302	
	5% level	-1.952473	
	10% level	-1.610211	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LMO)
Method: Least Squares
Date: 05/26/23 Time: 20:03
Sample (adjusted): 2 33
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LMO(-1)	0.003853	0.000905	4.255923	0.0002

R-squared	-0.018313	Mean dependent var	0.057223
Adjusted R-squared	-0.018313	S.D. dependent var	0.071951
S.E. of regression	0.072607	Akaike info criterion	-2.374759
Sum squared resid	0.152879	Schwarz criterion	-2.328053
Log likelihood	36.62139	Hannan-Quinn criter.	-2.359817
Durbin-Watson stat	1.450452		

Unit root test in first difference

Appendix 13**:** D(LCORR) has a unit root
Null Hypothesis: D(LCORR) has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.773550	0.0000
Test critical values:	1% level	-2.644302	
	5% level	-1.952473	
	10% level	-1.610211	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LCORR,2)
Method: Least Squares
Date: 05/26/23 Time: 20:04
Sample (adjusted): 4 33
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

D(LCORR(-1))	-1.191657	0.206399	-5.773550	0.0000
D(LCORR(-1),2)	0.423580	0.150207	2.819973	0.0087

R-squared	0.554313	Mean dependent var	-0.013516
Adjusted R-squared	0.538395	S.D. dependent var	0.312148
S.E. of regression	0.212078	Akaike info criterion	-0.199386
Sum squared resid	1.259357	Schwarz criterion	-0.105972
Log likelihood	4.990783	Hannan-Quinn criter.	-0.169502
Durbin-Watson stat	2.140679		

Appendix 14**: D(LDCF) has a unit root**

Null Hypothesis: D(LDCF) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.716012	0.0000
Test critical values:	1% level	-2.647120	
	5% level	-1.952910	
	10% level	-1.610011	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LDCF,2)
Method: Least Squares
Date: 05/26/23 Time: 20:05
Sample (adjusted): 3 31
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LDCF(-1))	-0.880560	0.186717	-4.716012	0.0001

R-squared	0.442620	Mean dependent var	-0.002086
Adjusted R-squared	0.442620	S.D. dependent var	0.199247
S.E. of regression	0.148753	Akaike info criterion	-0.939180
Sum squared resid	0.619572	Schwarz criterion	-0.892032
Log likelihood	14.61811	Hannan-Quinn criter.	-0.924414
Durbin-Watson stat	1.967756		

Appendix 15**: D(LFDI) has a unit root**

Null Hypothesis: D(LFDI) has a unit root
Exogenous: None
Lag Length: 2 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.300757	0.0018
Test critical values:	1% level	-2.647120	
	5% level	-1.952910	
	10% level	-1.610011	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LFDI,2)
Method: Least Squares
Date: 05/26/23 Time: 20:06
Sample (adjusted): 5 33
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LFDI(-1))	-1.476177	0.447224	-3.300757	0.0028
D(LFDI(-1),2)	-0.000286	0.318079	-0.000899	0.9993
D(LFDI(-2),2)	-0.151919	0.156105	-0.973182	0.3394

R-squared	0.762783	Mean dependent var	0.023633
Adjusted R-squared	0.744535	S.D. dependent var	1.486654
S.E. of regression	0.751407	Akaike info criterion	2.363960
Sum squared resid	14.67994	Schwarz criterion	2.505404
Log likelihood	-31.27741	Hannan-Quinn criter.	2.408258
Durbin-Watson stat	2.027622		

Appendix 16**: D(LINF) has a unit root**

Null Hypothesis: D(LINF) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

	t-Statistic	Prob.*

Augmented Dickey-Fuller test statistic		-7.569815	0.0000
Test critical values:	1% level	-2.644302	
	5% level	-1.952473	
	10% level	-1.610211	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LINF,2)
Method: Least Squares
Date: 05/26/23 Time: 20:06
Sample (adjusted): 4 33
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINF(-1))	-1.328234	0.175465	-7.569815	0.0000

R-squared	0.663970	Mean dependent var	-0.000306
Adjusted R-squared	0.663970	S.D. dependent var	0.195090
S.E. of regression	0.113090	Akaike info criterion	-1.488504
Sum squared resid	0.370890	Schwarz criterion	-1.441797
Log likelihood	23.32756	Hannan-Quinn criter.	-1.473562
Durbin-Watson stat	1.763099		

Appendix 17**: D(LL) has a unit root**

Null Hypothesis: D(LL) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.067778	0.2518
Test critical values:	1% level	-2.641672	
	5% level	-1.952066	
	10% level	-1.610400	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LL,2)
Method: Least Squares
Date: 05/26/23 Time: 20:07

Sample (adjusted): 3 33
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LL(-1))	-0.090116	0.084395	-1.067778	0.2941

R-squared	0.014099	Mean dependent var	-0.000283
Adjusted R-squared	0.014099	S.D. dependent var	0.001881
S.E. of regression	0.001867	Akaike info criterion	-9.696760
Sum squared resid	0.000105	Schwarz criterion	-9.650502
Log likelihood	151.2998	Hannan-Quinn criter.	-9.681681
Durbin-Watson stat	1.435960		

Appendix 17**: D(LMBL) has a unit root**

Null Hypothesis: D(LMBL) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.279387	0.0000
Test critical values:	1% level	-2.647120	
	5% level	-1.952910	
	10% level	-1.610011	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LMBL,2)
Method: Least Squares
Date: 05/26/23 Time: 20:07
Sample (adjusted): 3 31
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LMBL(-1))	-0.998097	0.189056	-5.279387	0.0000

R-squared	0.498850	Mean dependent var	0.001469
Adjusted R-squared	0.498850	S.D. dependent var	0.563198
S.E. of regression	0.398699	Akaike info criterion	1.032653
Sum squared resid	4.450900	Schwarz criterion	1.079801
Log likelihood	-13.97347	Hannan-Quinn criter.	1.047419

Durbin-Watson stat	1.997817

Appendix 18**: D(LMO) has a unit root**

Null Hypothesis: D(LMO) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.624050	0.0107
Test critical values:	1% level	-2.650145	
	5% level	-1.953381	
	10% level	-1.609798	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LMO,2)
Method: Least Squares
Date: 05/26/23 Time: 20:08
Sample (adjusted): 3 33
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LMO(-1))	-0.460978	0.175674	-2.624050	0.0141

R-squared	0.203125	Mean dependent var	0.000861
Adjusted R-squared	0.203125	S.D. dependent var	0.088945
S.E. of regression	0.079399	Akaike info criterion	-2.193590
Sum squared resid	0.170215	Schwarz criterion	-2.146011
Log likelihood	31.71026	Hannan-Quinn criter.	-2.179045
Durbin-Watson stat	2.159149		

Unit root test in second difference

Appendix 19**: D(LL,2) has a unit root**

Null Hypothesis: D(LL,2) has a unit root
Exogenous: None

Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.108860	0.0002
Test critical values:	1% level	-2.644302	
	5% level	-1.952473	
	10% level	-1.610211	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LL,3)
Method: Least Squares
Date: 05/26/23 Time: 20:09
Sample (adjusted): 4 33
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LL(-1),2)	-0.990214	0.240995	-4.108860	0.0003

R-squared	0.355542	Mean dependent var	-0.000321
Adjusted R-squared	0.355542	S.D. dependent var	0.002330
S.E. of regression	0.001870	Akaike info criterion	-9.692719
Sum squared resid	0.000101	Schwarz criterion	-9.646013
Log likelihood	146.3908	Hannan-Quinn criter.	-9.677778
Durbin-Watson stat	1.589875		

Appendix 20**: LMO**
Dependent Variable: LMO
Method: Least Squares
Date: 05/26/23 Time: 20:10
Sample (adjusted): 2 31
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LDCF	-0.196961	0.100546	-1.958909	0.0629
LMBL	0.070819	0.040650	1.742190	0.0954
LL	16.15102	0.883569	18.27930	0.0000
LINF	0.062528	0.197104	0.317232	0.7541
LFDI	0.055086	0.023101	2.384558	0.0261
LCORR	0.166827	0.063606	2.622815	0.0155

C	-48.58108	3.497783	-13.88910	0.0000

R-squared	0.960105	Mean dependent var	14.65870
Adjusted R-squared	0.949224	S.D. dependent var	0.385628
S.E. of regression	0.086896	Akaike info criterion	-1.841714
Sum squared resid	0.166119	Schwarz criterion	-1.511677
Log likelihood	33.70485	Hannan-Quinn criter.	-1.738350
F-statistic	88.24013	Durbin-Watson stat	0.761047
Prob(F-statistic)	0.000000		

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