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AN ASSESSMENT OF THE IMPACT OF GOVENMENT EXPENDITURE AND FOREIGN DIRECT INVESTMENT ON MINING OUTPUT IN ZIMBABWE (1985-2017)

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DECLARATION

I Tariro M Bob declare this research project here in as my own effort and have not been copied or lifted from any source without the acknowledgment of the source. Acknowledgements for other scholars' and researchers' work have been accordingly made herein

Signed ……. **Date ……/……/……**

DEDICATION

I dedicate this dissertation to my parents Mr and Mrs Bob and my sisters as a way of appreciating their effort towards my education, for their love, encouragements, and support throughout my whole learning process. Also to my friends who were with me for almost 4 years and their support, tolerance and help throughout those entire years. I feel humbled for everything and to everyone.

ABSRACT

The main aim of this study is to empirically examine the impacts of foreign direct investment and government expenditure on mining output in Zimbabwe from the period 1985 to 2017. The research has been carried out since there has been a decline in mining output since late which is attributed to different government policies. To find out the relationship between foreign direct investment, government expenditure, and mining output OLS method was used and other explanatory variable like labour force, bank loans, capital employed, and inflation were also included. The study uses time series data which was collected from ZIMSTATS, WORLD BANK and UNCTAD, and the researcher uses Eview 7 software for data analysis. The results obtained from the analysis shows that foreign direct investment has a significant and positive contribution to mining. The finding from the study also shows that bank loans and capital employed has a significant and positive relationship with mining output. Inflation has a negative relationship with mining output while labour force employed and government expenditure in the mining sector does not have a significant relationship with mining output. The researcher goes on further to recommend the possible resolutions which can be done to improve the performance of the mining sector. These resolutions include increase government revenue and monetary policy which will reduce the interest rates leading to increased loans to the sector.

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ABREVIATIONS/ ACRONYMS

ADF	**Augmented Dickey Fuller**
GDP	**Gross Domestic Product**
CSO	**Central Statistics Office**
CoM	**Chamber of Mines**
GDP	**Gross Domestic Product**
GOZ	**Government of Zimbabwe**
IMF	**International Monetary Fund**
MOFED	**Ministry of Finance and Economic Development**
RBZ	**Reserve Bank of Zimbabwe**
OLS	**Ordinary Least Squares**
US	**United State Dollar**
UNCTAD	**United National Conference on Trade and Development**
ZIMSTATS	**Zimbabwe National Statistics Agency**

CHAPTER 1

INTRODUCTION

1.0 Introduction

Mining sector has been regarded as the second largest sector in Zimbabwe contributing to economic growth. The sector has large amounts of mineral deposits i.e. gold, copper, nickel and other mineral resource deposits to mention just a few. However, despite its mineral resource endowments and receiving large amounts of investment, Zimbabwe has failed to prosper (Mlambo 2011). Zimbabwe as a developing country aims at achieving economic growth through improved private investment and government investment. The country is classified as a low income country because its social indicators are consistent with low income countries states (World Bank 2013). For these reasons, the economic performance of Zimbabwe is sometimes described as a paradox because statistics do not match with economic activities in the country. The government has taken many steps to encourage private investment and to increase government investment in the mining sector so as to increase the output. The study will deal with the data from 1985 to 2017. This paper investigates empirically the influence of private investment and government investment in the period 1985 to 2017 in Zimbabwe. The countries that manage to attract Foreign Direct Investment are expected to improve employment, economic growth and development (UNCTAD, 2014).

This chapter will outline the background of the study, statement of the research problem, objectives of the study, research questions, statement of hypothesis, significance of the study, and justification of the study, scope of the study and limitations of the study, the assumptions at which the study is based on and the boundaries which govern the research.

1.1 Background of the study

The mining sector is second to agriculture as a pillar to anchor our economy both as an employer and foreign currency earner, with potential to contribute around a third of total export earnings and also increasing the GDP of the economy (Mapfumo et al, 2012). According to (Onowor et al, 2013), one of the most silent features of present days globalisation drive is conscious encouraged by the inflows of the foreign direct investment. According to the ZIA (2011) the mining production was stagnated over the entire period from 1980 to 2004 growing just at 0.32% annually. The sector, however, continued to

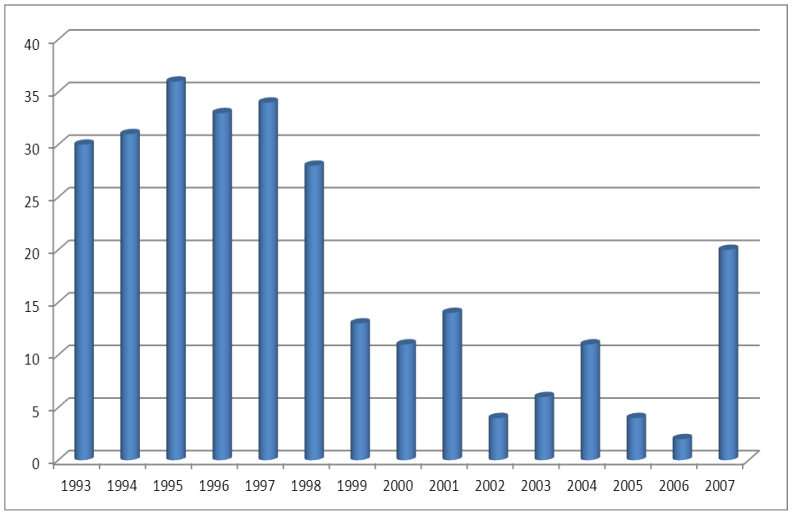
experience a decline in capacity utilisation and production volumes despite last year's generally buoyant mineral prices. In the case of gold, decline in output is notwithstanding firm prices recorded over the past three or four years, resulting in other countries' gold producers expanding operations and production

To cushion gold producers from the low international prices, the government announced a $55 million gold subsidy package in April 2001. The subsidy guarantees gold producers an effective price of $326 an ounce, $63 more than the world market price. While gold producers may escape the full consequences of the rising costs, total mineral production is likely to fall

In 2008 mining output declined by 33.3% this was due to the hyperinflation that occurred that year and hence this lead to the sector not performing well shortages. During this period the mining sector had a capacity utilisation which was below 30%. In 2009 the government introduced the use of multicurrency in an attempt to deal with challenges of liquidity and fall in growth rate in the mining sector. Private investment declined since 2000 until 2009 and consequently output declined during that period. This has shown the significance of investment as a determinant of increasing output.

Figure 1: Investment in the mining sector from 1993 -2007

Number of projects



Source: Zimbabwe Investment Authority 2011

Investment in the mining sector fell drastically as shown in the graph below from 1993 to 2007. The production of all minerals was below their peak levels. Gold production dropped

from 27 tons in 1999 to 3.6 tons in 2008, with similar trends in the output of all other minerals. By the end of 2008 nearly all of the country's mines were either closed or under care maintenance. In this regard, Zimbabwe lost a golden opportunity to take advantage of the lengthy sustained worldwide commodity price boom during 2003-2008. Despite these challenges, the sector is also expected to be the primary driver of growth in the near term and also to attract most foreign direct investment (FDI), assuming uncertainty over the controversial Indigenization Law and structural constraints, such as a lack of electricity, a shortage of skills, and limited access to domestic capital, are addressed.

According to Mangudhla (2016), after this crisis the government had to increase their expenditure towards mining sector since some of the mines had closed down and only the major mines were under maintenance. The government allocated 7% to the mining sector in 2009 so that mines will recover. In 2009 there was an improvement in the mining sector as there was an increase in GDP by 2% (according to RBZ 2010). In the previous years the sector had recorded persistent decline in growth rate during 2000 to 2008. currently, several losses have been exhibited in the mining sector which has culminated in a stagnant economic growth in the country. During its peak in 1986, the mining sector contributed 6 per cent to Zimbabwe's GDP (Matsika, 2010). However, from the period 1998 to 2009, mining did not play a significant role in the development of the country's economy due to the financial and operational costs and constraints as a result of the hyper-inflationary environment experienced in the country during this decade (Matsika, 2010).

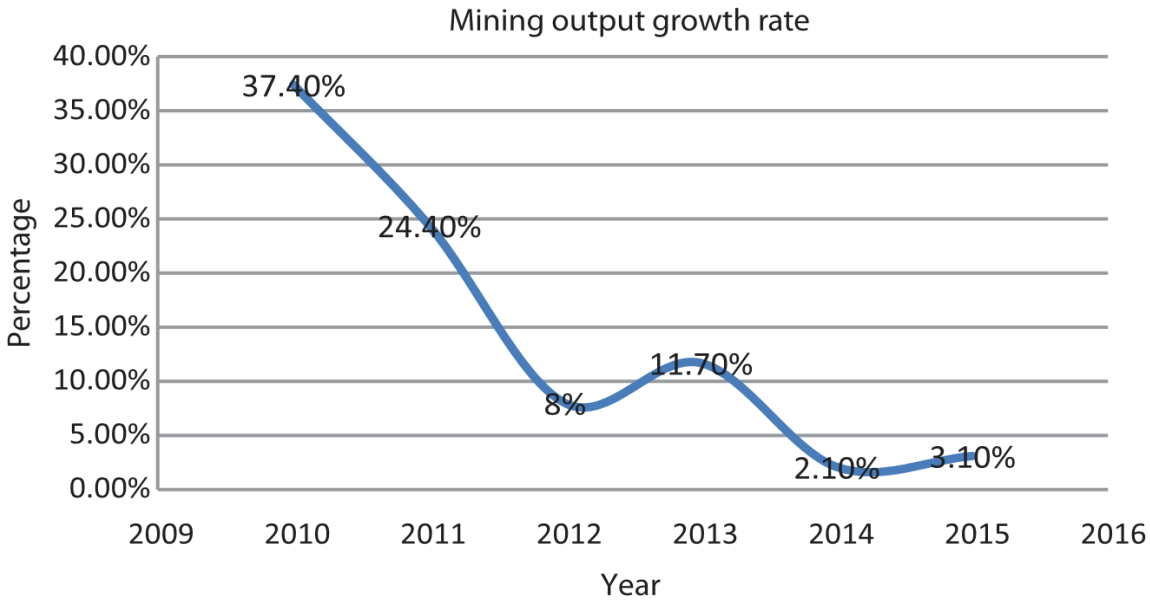
The mining sector was contributing significantly to the economic development, constituting about 15 per cent of gross domestic product (GDP), 53 per cent of foreign exchange earnings, between 8 and 12 per cent of government revenue and more than 500,000 formal jobs (Nyoni, 2015) On the contrary, the current contribution of mining to GDP has dropped.

There was investment of US$ 39.9 million in the mining sector in 2010 and hence this led to the decline in output by 13% 0f the GDP. Despite these investments mining output did not exhibit a larger increase RBZ (2012). In 2009 there was the discovery of the diamonds at Marange, Chiadzwa and this expanded the private and government sector investment through the mining sector and output increased to 37.40% in 2010.

According to the ZIA publication (2015) ,trend analysis on how Foreign direct investment supports the mining sector for the past years in 2011 there was investment of US$3.68 million , US$ 688 in 2012 , US$ 1597 in 2013 .In the year 2014 the mining sector received

US$159,9 million with 47 project. Zimbabwe's Foreign Direct Investment (FDI) has grown by 36% to $545 million in 2014 from $400 million in 2013 driven mainly an increase in investments in the mining, infrastructure, and the services sector, (UNCTAD 2013). Then in 2015 it was US$ 576.5 million. Although there was investment, output continued to decline as shown below

Figure 2: Mining Output Growth Rate



Source: RBZ,Ministry of Finance , ZIMSTATS

Figure 3 above shows how mining output growth has declined over the years between 2010 and 2015. In 2010, mining output was at 37.4 per cent and by 2015, drastically declined to 3.1 per cent. The figure above shows that there was a decline in the mining from 37.40% in 2010 to 3.10% in 2015. The mining sector accounts for about 2 per cent of national employment. The mining sector according to the Zimbabwe Independent (2014) has the potential to employ over 75,000 people. The sector has not yet reached its full potential to employ a large number of people. Formal employment in the mining industry accounted for 30,000 employees in 2009, 36,100 in 2010 and 42,100 in 2011 (Ministry of Finance and Economic Development, 2012)

According to RBZ (2012) the government launched empowerment funding facilities in

2011, in each and every sector and in the mining sector there was the Mining industry loan fund. This was meant to give financial assistance to the sector and also to ensure that those

mines that had closed down would be saved. The government wanted to increase output but output in that period declined by16.4% in 2016 and mining output had increased by 6,9% to the GDP.

Despite Government effort and private investment to the mining sector, the sector continued to experience a decline in the mining output (GDP). In addition, it is important to undertake an empirical study that assesses the relationship between mining output and government expenditure and foreign direct investment.

1.2 Problem statement

Despite mineral resource endowments and receiving large amounts of foreign and government investment, the mining sector has failed to significantly contribute to economic development. The mining sector was ranked the second among other sectors in Zimbabwe on receiving foreign direct investment by the Zimbabwe Investment Authority (ZIA). The sectors' overall performance has declined over the years. This trend does not only threaten the viability and sustainability of the sector but also the economy at large because the sector contributes to exports revenue, employment, GDP among others in the country. Therefore, the principal motivation behind this study is to find out the impact of investment on mining performance.

1.3 Objectives of the study

- To assess the contribution of private and government investment to mining in Zimbabwe.
- To evaluate the impact of labour on mining output in Zimbabwe
- To find the impact of capital on the performance of the mining sector

1.4 Research questions

- What is the contribution of private and government investment to mining output in Zimbabwe?
- Does the number of people employed affect mining output in Zimbabwe?
- How does capital affect mining sector output

1.5 Statement of hypothesis

The null hypothesis for the study is

Ho: $\beta_1 = 0$ that is, private and government investment is positively linked to mining output, While, the alternative hypothesis is

H_1: $\beta_1 \neq 0$ that is, private and government investment is not positively linked to mining output

1.6 Significance of the study

This research intends to benefit the sector and other players engaged in the mining business. This study intended to investigate the relationship between foreign and government investment on mining performance for the period of 1985-2017. Most studies undertaken so far to establish the relation between foreign investment and economic performance apply cross country regression analysis methodology. Also most researches of investment on performance were just general of foreign investment but, this study is looking at specified foreign and government investment that is to the mining sector. The results of this study will help policy makers at all government levels as well as commercial organizations on what could be done to attract foreign direct investment in Zimbabwe.

1.7 Justification of the study

There are supporting statements which propound that if investment is undertaken by the private sector and also provided by the government it is more efficient and productive, but that judgment has to be based on empirical evidence. What is surprising is that despite the importance of this relationship there is virtually little empirical evidence that can be called on to support or disprove the notion that investment leads to long-run growth in mining output . Consequently, the proposals favouring the private sector in this particular context appear to rest more on theory than on proven fact. The purpose of this thesis is to show the contribution of private and government investment to mining output in Zimbabwe so as to know whether investment is truly necessary. The relationship between private and government investment and mining output in the nation is discussed and its contribution will be uncovered. To achieve these, scholarly opinions and suggestions will be discussed and empirical analysis on investment will be carried out. What has been the contribution of investment on the mining output? Has the contribution been positive or not? Is the contribution increasing over time? This study attempts to answer these questions and more unmentioned questions. For the empirical analysis, data for mining output, private investment, public investment, in Zimbabwe as a whole will be used. Data source for the empirical works is ZIMSTAT (Zimbabwe National Statistics Agency). The thesis will concentrate on the period between 1986 and 2012 based on the available data.

1.8 Assumptions of the study

- The data used in the study is reliable and is not biased
- The method used for data collection by the source is feasible to the study
- The researcher will get enough cooperation from the respondents

1.9 Delimitation of the study

- The study covers Private and Government Investment in Zimbabwe with special reference to mining output. The period under study is from 1985-2017.
- The other data on determinants that affects mining output in Zimbabwe was used. For empirical analysis, data for mining output and private investment, government expenditure in Zimbabwe as a whole was used

1.10 Limitations

- Past statistical information may be rendered obsolete by the changes in the market to date moving from a Zimbabwean dollar economy to a United States of America dollarized economy.
- Some of the statistics may not reflect an accurate value of the Private and Government Investment and mining output due to the errors on data collection.
- Exchange of the figures noted in Zimbabwean Dollar terms into US Dollar terms proved to slightly alter the truthfulness of the statistics.
- Confidentiality of some information, especially other national statistics which are not supposed to be marshalled out to everyone and their respective formulas of calculating such values.

1.11 DEFINITION OF TERMS

Foreign direct investment –is defined as money invested by private companies or financial organisations rather than by the government. It is defined as the net inflows of investment to acquiring long lasting management interest in an enterprise operating in an economy other than that of the investor, or a long term participation by country A into country B.

Capital – is the machinery used by the sector in the production process. It is going to be substituted using gross fixed capital formation.

Labour – includes both physical and mental work undertaken for some monetary reward.

Gross Domestic Product – is the increase in total goods produced and services provided within the economy for a specific given period. GDP is also a measure of economic growth

Economic Growth – refers to the process by which they increase their per capita output, whether by increasing their stock of capital goods, improving production techniques, improving workers' skills or other means.

Government investment- is money that the government invests in an activity. It can be non infrastructure investment in which the government takes market activity and competes with the private sector of the economy, and infrastructure development in which government works in the establishment of infrastructure that is aimed at boosting investment

1.12 Summary and study outline

This chapter introduces the study, looking particularly at the background of the study, problem statement, research objectives, research questions, statement of problem and hypothesis. The next chapter will present the literature review both the theoretical and empirical literature. Chapter III explains the methodology which shall be used to test for the hypothesis and produce empirical results. Chapter IV presents data analysis, research findings, conclusions and Chapter V gives the recommendations

CHAPTER II

LITERATURE REVIEW

2.0 Introduction

This section covers the review of the study made by some researchers in the past. The review of the literature is not only cantered on Zimbabwe, but for some researches made on other developing economies and developed economies. The section looks at both the theoretical and empirical literature reviews. This section is aimed at offering a summary of important ongoing debates on the importance of private and government investment on output.

2.1Theoretical review

2.2Neoclassical Theory of Economic Growth

The neoclassical growth theory was developed by Frank Ramsey (1928) as a result of intensive research in the field of growth economies. The theory lays stress on capital accumulation and its related decision on savings as an important determinant of economic growth. The model considered two factor production functions with labour and capital as determinants of output and it also added exogenously determined factors which are technology to the production function. The production function will be then written as:

Y = AF (K, L)…… (1)

Where **Y** is output, **K** is the stock of capital, **L** is the amount of labour, and **A** is the level of technology which is exogenously determined. Change in the level of technology will cause a shift in the production function. Technology is incorporated in the production function in two ways, one way of incorporating it in the production function is to assume that technology is labour augmenting and this will mean that there will be an increase in the labour productivity and the function will be written as:

Y = F (K, AL)…….. (2)

The other way where technology can be incorporated in the production function is to assume that technological progress augments all factors both labour and capital in the production function. Then the production function will then be written as equation (1)

Y = AF (K, L)

In this way **A** will be representing total factor productivity which is productivity of both inputs. When estimating production function specified in this way, contribution of **A** is called Solow residual which means that total factor productivity measures the increase of output which is not accounted for by changes in factors of production which are capital and labour.
With these assumptions the neoclassical growth theory focuses its attention on supply side factors such as capital and technology for determining rate of economic growth of a country. The theory also assumes constant returns to scale which exhibits diminishing returns to capital and labour separately. Since the theory basically deals with the input-output relationship which can be expressed in physical and monetary terms, it can then be used to explain the sectorial growth which will then lead to economic growth when they are aggregated.

2.3 The Harrod-Domar Model

This is one of the models which were developed in the post-Keynesian era which attempts to show the role of the government in the growth of economies. The model was developed separately by Roy Harrod (1939) and Evsey Domar (1945) and the model tries to provide solutions to the key development questions in economics of why other communities are rich and others are poor. Harrod and Domar argued that if the amount of capital and labour is increased, output is also increased and their production function is as follows.

Q = f (K, L)

Where **Q** is output, **K** is capital and **L** is labour.

The model assumes constant capital-output ratio and Harrod and Domar believed that growth does not need to be sufficient in order to maintain full employment. They also suggest that full employment and stable growth cannot be attained mutually in an economy. Harrod (1939) and Domar (1945) argues that there is need for government involvement in developing nations to increase the savings rate which will then lead to growth. Government budgets surpluses can be used to substitute savings in an economy, making fiscal policy an important tool for growth. Since this model clearly recommends that government should use surpluses in budgets to stimulate savings which will then lead to growth, this theory can also be used to justify the need for government investment to stimulate growth of mining output.

2.4 Solow-Swan model

The Solow-Swan model is an economic model of long-run economic growth set within the framework of neoclassical economies which was developed by Robert Solow and Trever Swan in 1956 and the model attempts to explain long-run growth by looking at capital accumulation, labour or population growth and increases in productivity, commonly referred to as technological progress. The major assumption of this model assumes a standard neoclassical production function with decreasing returns to capital, taking the rates of technological progress, population growth, and savings as exogenous variables. They argue that these exogenous variables determine the steady-state level of income per capita because population growth rate and savings vary across countries.

The three major inputs to this model are capital (K), labour (L) and technology (A) and the major driving force of economic growth is effectiveness of labour and technological change. The output produced in the economy is determined with these three variables as argued by Solow-Swan (1956). According to this model the production function of time **t** can be expressed as follows

.

$Y(t) = K(t)^{\alpha} (A(t)L(t))^{1-\alpha}$ - $0 < \alpha. < 1$……..(1)

Y is output, **K** is capital, **A** denotes the level of technology, **L** is labour and **t** denotes time period. This model tries to quantify the contributions of different determinants of output

growth; therefore the potential role of government investment is much greater in endogenous growth model.

Within the framework of this model the impact of government and foreign direct investment on mining output was constrained by the existence of diminishing returns in the physical capital. This is mainly because Solow (1956) argues that productivity growth results from increase in the amount of capital that each worker is set to operate. However marginal productivity of labour turns to decline as capital per worker increases and at the same time technological progress comes into play which will then lead to a positive contribution to economic growth.

2.5 Rostow Growth Theory

Rostow (1960) in his book titled "The stages of economic growth" introduced an approach to development which was different from other theories. He viewed development as a cycle in which an increase in investment will directly lead to an increase in capital accumulation which will then increase the output levels. The rise in output will also lead to increased investment since individuals in the country will be encouraged to save more, Barder (2012). Rostow considers investment as a driving force which acts as a starting point for economic growth which will put the country into a state of self-sustained growth.

This model influences development economics in the 1960s and 1970s as many nations increase their foreign aid in an attempt to stimulate investment by funding infrastructure. This had also motivated many governments in developing countries including Zimbabwe to intervene in the market by investing more of their resources in the mining sector and other strategic industries.

2.6 Theory of Increasing State Activities or Wagner's Law.

Wegner's law is a principle named after the Germany economist Adolph Wagner (1835-1917) and it is also known as the law of increasing state spending. He first made observation in his country and the theory holds for other countries which stated that public expenditure

rises constantly as income increases. Wagner advanced his law by analysing trends in the growth of public expenditure and in the size of public sector.

The law postulates that as the functions of the state increases, public expenditure on administration and regulation of the economy also increases. Wagner (1835-1917) also states that the development of modem industrial society will increase political pressure for social progress and call for increased allowance for social consideration in the conduct of industry. The rise in public expenditure will be more than proportional increase in the national income and will result in a relative expansion of the public sector. Musgrave and Musgrave (1988) supported Wagner's law and they argued the share of public sector grows as progressive nations industrialise. This theory can also be used to justify the role of government investment and its contribution to mining output.

2.7 The Keynesian Growth Theory

This school of thought argues that government spending can contribute positively to sectorial growth like the mining sector. They state that an increase in government consumption is likely to lead to an increase in employment levels, investment, and profitability in the sector through the multiplier effect on aggregate demand. Keynes views government expenditure as an exogenous factor and therefore it can be utilised as a policy instrument which can promote both sectorial growth and the whole economy at large. The Keynesian economist also argues that public expenditure increases the aggregate demand which leads to increase in output depending on the expenditure multiplier.

The model by Keynes disintegrated output into four major components which includes spending on consumption, investment, government spending and net exports. The Keynesian model can be presented as follows:

GDP = C + I + G + (X-M)

Where: GDP is the output produced
I is the investment
G is the government expenditure

X is the value of exports

M is the value of imports

2.8 Empirical literature

Many researchers have carried empirical studies on the performance of mining industries across the globe guided by economic theories.

According to Bocoum and Tshimena (2009) the amount of investment funding both domestic and foreign direct investment available for minerals exploration and investment falls or rises in accordance with the commodity prices. They also pointed out the significance of the government in the performance of the sector as noted during the first quarter of 2008 in DRC as there was a significant fall-off in the amount of funding for smaller companies in the international exchanges due in part to the financial instability in the markets. This fall off in investment funding was further exacerbated by a significant downturn in commodities prices. Bocoum and Tshimena in their analysis of the factors that affected the performance of the mining industry found a high correlation between the government subsidy and the international prices of the minerals which where both very significant in increasing mining output

Econometric evidence (Ghura and Hadjimichael 1996, Ghura 1997, Beddies 1999) indicates that private capital formation(private investment) has a stronger, more favorable effect on economic growth rather than government capital formation(public investment) probably because private capital formation is more efficient and less closely associated with corruption. This gives an argument as to why private investment is presented as more desirable than public investment; due to subjectivity to corruption which hinders productivity and in turn reduces economic growth or rather put it to a level lower than the expected outcome.

Scheider (2004) whose work was supported by Andrews (2008), he tested the significance of government subsidy in the performance of the mining sector of China. They all used the data from coal mines across the country to test their claim and considered the annual revenues

from the fossil exportation as a measure of performance. They found that in a nation with abundant coal reserves like China government incentives on exports of the fossil would increase the revenue of the sector through increased exports by depressing the international price level thereby formulating their economic model with a positive relationship between export revenue and government subsidy. They found a positive relationship between the variables.

According to Saunders (2007) lack of machinery and modernized equipment and foreign currency has been considered as major setbacks to the productivity of the mining sector of the Zimbabwe's economy. He also explained measures which were taken by the government to counterfeit these limitations which included the removal of foreign currency surrender requirements and giving some investment funds and credit lines to reopen closed mines and increase the capacity utilization of the industry, this also supported the view of Schneider's study in China.

According to Mataya (1996) have analyzed the investment behavior of the public and private sector in Malawi over the period 1967-1988 using a multi-variant regression model against the theoretical propositions of the flexible accelerator model. In their findings, there is a distinct indication that a two-way causal relationship exists between public and private investments, while fixed private investments are typically responsive to GDP growth positively. This does not go without mentioning, as well, that there was a negative correlation between investment of both types and real interest rates. Most private firms in the southern African state acquire the bulk of their capital funding from the domestic financial market.

Mittnik and Newman (2001) estimated the dynamic effect of public investment on economic growth in VAR framework focusing on the six industrialized economies, including the U.S.A. They concluded that public investment is important to economic growth and that the decrease in its spending could be harmful to growth

The study conducted by (Kabelwa,2006) has attempted to explain the potential impact of FDI on mining sectors in Tanzania. Analysis of the prevailing situation of FDI on mining sector, in Tanzania, showed that the sector was growing and becoming stable economically. The sector performed well socially and economically and has a lot of benefits such as revenue generation, capital formation and employment generation. The researcher also concluded that for Tanzania to become one of the best performers in the sector, hardworking and investment is required from its stakeholders. Furthermore, the government has to focus on improving

various aspects of the industry such as accountability and transparency with particular regards to the nature of contracts and agreements signed with investment partners. The government and its stakeholders have to adhere to human rights and careful management of the environment in order to ensure sustainable development.

Empirical studies on the impact of public and private investment on economic growth based on the developing economies have been brought to the limelight by the work of Khan and Reinhart (1989). They used a typical neoclassical production function and separated aggregate investment into private and public components for a cross section sample of 24 developing economies. The empirical results reported overwhelmingly supported the importance of private investment more than public investment in the developing economies growth process.

In Tanzania a study by Rutaihwa and Simwela (2010) on examining the role of FDI on mining sector to Tanzania's export capacity. They used OLS as their analytical technique and their results showed that export performance was negative and insignificant. This implies that FDI contribute weakly in the mining sector and was influencing negative pressure on the export performance of the country's sector. From the results on relationship between Tanzania exports performance and FDI on mining sector, they were statistically insignificant though it confirmed the hypothesis of the positive relationship from other variables. Due to this we can conclude that sometimes benefits derived from mining transformation may take some time to turn up. Therefore, suggestions that were made were regarding attracting FDI and sustaining the current flow, but this can be done through enhancing growth in the sector through inventions, reviewing, and implementation of mining policies and also targeting value addition. They also suggested that there should be link between small scale producers and large scale mining companies.

Krishnan & Chandran (2008) examined the short and long run dynamics of Foreign Direct Investment (FDI) over the mining output growth in a developing country – Malaysia for the period of 1970-2003. Due to the small sample size, they used a fairly new co integration method known as "bounds test" and the autoregressive distributed lag (ARDL) approach to estimate the short and long run production elasticity of FDI. Estimated FDI elasticity in the short and long run were found to be statistically significant. In the long run, a 1% increase in FDI contributes to 0.115% increase in mining value added output in Malaysia. The model extracts the influence of FDI and technological progress towards mining output. As a

consequence of the results, strategies to enhance the competitiveness of Malaysian mining sectors in the world of intense competition for FDI especially among the Asian economies like China and other Asian members is further recommended.

Ramirez and Nazmi (2003) investigated the impact of public investment on economic growth over the period 1983 to 1993 for the nine major Latin American economies. They reported that both public and private investments are important in contributing to economic growth.

On the other hand study by Jeon (1992) on several cross-country studies found support for the hypothesis of a negative relationship between FDI and mining output. However, Sharma (2000) does not see any statistically significant impact of FDI on Indian mining performance.

Other studies indicated that FDI actually has a positive effect on mining performance of host countries (Cabral, 1995; Blake and Pain, 1994). Sikwila (2014) examined the factors that influence foreign direct investment (FDI) inflows into Zimbabwe between 1980 and 2012. Over the period, the country experienced low levels of both domestic and foreign direct investment leading to sluggish economic growth and high unemployment. The FDI that came into the country had a short life. The paper differs from existing researches in that it considers individual country's investment priorities. Based on the modified acceleration theory of investment and FDI theories, a regression equation using E-views on annual time-series data obtained from the World Bank database was estimated. The results indicate that output, trade openness, political stability, domestic investment, and inflation were significant factors that influenced FDI inflows into the country. The data used did not substantiate the hypothesis that indigenization and property rights policies curtailed FDI inflows into Zimbabwe.

Recent study by Li and Liu (2005), on the other hand, uses the panel data of 84 countries to investigate the influence of FDI on mining output. The study found a significant relationship between FDI and mining output. Additionally, a stronger relationship was extracted when FDI is interacted with human capital. The reason is that stronger human capital poses better absorptive capacities due to the complementary nature of the FDI and human capital, most importantly for the developing countries.

A research by Nyoni ,(1998) on the effect of corporate tax, interest rates and investment climate on FDI in Zimbabwe was carried out covering a period of 12 years from 1983 to 1994 estimated that FDI is negatively correlated to corporate tax and interest rates while it is positively correlated to investment climate. The researchers used a model that included those

three variables as the main determinants of FDI flows into the country. The results depicted that the explanatory variables explain about 62% variation of the foreign direct investment in Zimbabwe.

The study by Shangahaidonhi (2013) seeks to establish the effect of the Indigenization Policy in the country against the Value addition strategy which has been called for by policy makers to ensure that the country fully benefits from its resources. The study is significant because it contributes to existing knowledge on economic development in Zimbabwe and creates a base for further studies. The period under study was from1986 to 2012, secondary data and empirical studies by other researchers assisted in the formulation of the methodology. The classical linear regression model, Ordinary Least Squares was used to analyze the variables. The research found that, risk factors are significant even though with a negative sign showing a negative relationship between Risk Factors and FDI. The indigenization policy has a negative impact on FDI. Policies that reduce country risk levels and that promote peace, anti-corruption and transparency should be encouraged if the economy is to realize long term inflows of FDI.

2.9 Gap Analysis

It can be noted that few empirical studies on the impact of foreign and government investment on mining sector output have been done. From the empirical studies gathered by the researcher other researchers such as Sikwila (2014) and Shangahaidonhi (2013) have written on foreign direct investment in Zimbabwe. In addition it can be seen that most empirical studies concentrated much on the impact of foreign direct investment and mining output, hence there is need also to know the impact of the government to the mining sector as well. This study will also cover from 1985 to current period.

Also this study is unique from other studies due to the choice of explanatory variables which were used during the analysis therefore it is important for the researcher to further this study. It can also be noted from the above empirical literature review, that most studies on the foreign direct investment and mining have been done in developing countries as compared to developed countries. The reason behind this as given by (Oshikoya, 1994; and Naqvi, 2002) is that in developing countries, foreign direct investment plays a greater role in promoting output and economic growth

2.10 Summary

The above literature and studies based on the empirical and theoretical evidence indicate several areas of concern about government expenditure, foreign direct investment, and mining output. The literature shows the findings and conclusions of other researchers who have done studies which are almost similar to the main objective of this study. Research methodology is discussed in the next chapter which is designed from the literature review in order to construct an econometric model on the components of economic development in Zimbabwe.

CHAPTER III

RESEARCH METHODOLOGY

3.0 Introduction

The previous chapter looked at literature review, both theoretical and empirical. This chapter gives a description of how the research was carried out in order to meet the objectives of the study, which is to determine the factors that influenced mining production in Zimbabwe. This chapter focuses on the research methodology and the data analysis procedures that the researcher used. The chapter also includes the theoretical framework where the model is developed, the estimation procedures of the model and the diagnostic tests.

3.1 Research design

A research design provides a framework for collection and analysis of data as propounded by Bryman (2003). Leedy (1994) asserts that a research design is all the procedures which are selected by the researcher to answer a particular set of questions of the hypothesis. The research design can therefore be defined as a systematic and orderly approach taken towards the collection of data so that information can be obtained from that data as argued by Jankomicz (1995). The research design is used to obtain results which are judged to credible and should resemble reality and are taken to be true and reasonable

3.2 Theoretical Model

The theoretical model is derived from a Cobb-Douglas production function developed by Herzer Charles Cobb and Paul Douglas, (1947). The theoretical model which was used to investigate the interaction of government and foreign direct investment and mining output was the Neo-classical theory of growth and it is shown below. Its major components are output (Y), capital (K), and labour (L) and total factor productivity (A), as shown below:

$$Y=AK^{\beta 1}L^{\beta 2} \quad \text{..... } (i)$$

Where α and β are the output elasticity of capital and labour, respectively. These values are constants determined by available technology, and also the model stipulates that total factor productivity (A) is a function of labour productivity (PL) and capital productivity (PK). This can be represented by the following equation:

$$\mathbf{A} = TFP = f(P_K, P_L) \quad \text{..... } (ii)$$

3.3 Empirical model to specification

A captures the total factor productivity (TFP) its effects on growth in output. It is assumed that the effect of FDI on mining output operates through variable **A**. according to Study Moose (2010) the other variables that can affect mining productivity are availability of loans and inflation rates**. A** can be specified as:

A=f (FDI, GVT, MBL, Inflation, Φ…… (*iii)*

Where;

A refers to the total factor productivity

FDI is Foreign Direct Investment

GVT is government investment

LN is loans

INF is the monthly inflation

Φ refers to other factors that affect TFP but not specified

Combining equation (i) and (iii) we get:

$Y = \Phi, \beta_1 K, \beta_2 L, \beta_3 FDI, \beta_4 GVT, \beta_5 LN, \beta_6 INF$……..(*iv)*

Where;

Y is the mining sector output

K is the Gross Capital Formation in the mining sector

L is the amount of labour employed in the mining sector

FDI is the foreign direct investment to the mining sector

GVT is government investment to the mining sector

LN bank loans for the mining sector

INF is the monthly inflation.

and $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ are scale parameters of the variables.

However the method assumes a linear relationship within the variables, hence our equation is going to be linearized. Logarithms can also help to reduce the variability on the minimum and maximum values of the variables. Then specification of the model can be as follows:

$$\textit{In}Y = C + \beta_1 \textit{In}K + \beta_2 \textit{In}L + \beta_3 \textit{In}FDI + \beta_4 \textit{In}GVT + \beta_5 \textit{In}LN + \beta_6 \textit{In}INF + \mu \quad (v)$$

Where:

InY is the natural logarithm of mining output

C is ***In***Φ

InK is the natural logarithm of capital to the mining sector

InL is the natural logarithm of labour employed in the mining sector

InFDI is the natural logarithm of foreign direct investment to the mining sector

InGVT is the natural logarithm of government investment to the mining sector

InLN is the natural logarithm of advances of loans for the mining sector

InINF is the natural logarithms of inflation

3.4 Diagnostic Tests

3.4.1Stationarity tests

When estimating using the OLS estimator, the data must be stationary and empirical work based on time series data assumes that the underlying time series is stationary. If the data is not stationary it will create spurious regression and thus a very high R^2 can be noted even though there might be little or no correlation between variables. The Augmented Dickey Fuller Unit root test is used in this study in order to establish the order of integration of the time series variable hand in hand with Phillip-Peron test. Most time series variables are non-stationary which often leads to the problem of spurious regression whereby when regressing a time series variable on another time series variable sometimes we expect no relationship between two variables, yet a regression of one on the other variable shows a significant relationship. However if a variable is not stationary at its initial level first order differencing is conducted to it stationary. Second order differencing is conducted if the variable is not stationary at first order differencing. To test the order of integration of variables the ADF test proposed by Dickey and Fuller (1979) is applied.

3.4.2 Heteroscedasticity test

This refers to a situation where the variances of the error term (u_t) are unequal and therefore the disturbance term (u_t) will no longer be constant. Heteroscedasticity test will also be carried out in order to yield consistent estimates. One of the important assumptions of the classical linear regression model is that the variance of each disturbance term is not equal, conditional on the chosen values of the explanatory variables. This is the assumption of homoscedasticity, or equal (homo) spread (scedasticity), that is, equal variance. The homogeneous variance assumption would be relaxed and thus the use of the OLS estimator will provide misleading results since the estimator will cease to be the best linear unbiased estimator (BLUE). To test for the presents of heteroscedasticity, the researcher will use the Breusch-Pagan-Godfrey test. It is estimated under the null hypothesis that there is heteroscedasticity and the alternative hypothesis that there is no heteroscedasticity

3.4.3 Multicollinearity

This is the presence of linear relationship among the explanatory variables. The no perfect collinearity assumption concerns only the independent variables. This implies that the explanatory variables will be changing nearly in the same way and thus making it difficult to establish the influence of each variable. As a result of the stochastic nature of most regressors' correlation and interrelationships are bound to exist among them making Multicollinearity inherent in most explanatory variables. Multicollinearity poses a great challenge in obtaining numerical values for parameters when using the OLS estimator and thus the need to test for the existences of multicollinearity. Correlation matrix and adjusted R-squared (R^2) will be used to test for multicollinearity. According to Gujarati (2004) the values in the correlation matrix range from zero to one but the correlation among explanatory variables must not exceed 0.8. The researcher will detect Multicollinearity by using the correlation matrix and if a correlation coefficient matrix demonstrates correlations of 0.8 or higher among the variables then there may be Multicollinearity.

3.4.4. Durbin Watson (DW) test

According to Gujarati 2004, the assumption of the OLS regression analysis requires that there should be no autocorrelation amongst successive explanatory variables. This study is going to use to test for autocorrelation using the Durbin Watson (DW) test. Durbin Watson test is the ratio of the sum of squared differences in successive residuals Total Sum of Squares (TSS) to

the residual sum of squares (RSS) Gujarati (2014). The rule of thumb states that the (DW) must range from 0 and 4 and it should be approximately equal to 2, and this shows that there is no autocorrelation among the explanatory variables. More so, if DW is equal to 2 in the model this means that there is no first order autocorrelation that is either positive or negative. Also if DW closer to 0, there is positive serial correlation and if DW is equal to 4 there is perfect negative correlation among successive residuals. The closer the DW is to 4, the greater the evidence of negative serial correlation (Gujarati, 1995). In the event that the Durbin Watson test fails to provide sufficient evidence for the presence autocorrelation, Breusch-Godfrey Serial Correlation LM test can be employed to test for the presents of autocorrelation

3.5 Model Specification Tests

Specification tests shall be carried out to comprehend how these factors affect mining production. The R-squared test and the F-test will be employed in this model. The R-squared shows the goodness of fit and the F-test determines the validity of the whole model. A standard error is frequently used as a summary measure of the goodness of fit of the estimated regression line.

3.5.1 R-squared

Gujarati (2008) states that R-squared measures the proportion of the variation in the dependent variable explained by the independent variables. The value of R-squared lies between 0 and 1, when the value is closer to 0 it will be indicating complete lack of fit and when the R-squared value is closer to 1 it will be indicating perfect fit. R-squared have one major drawback which is that it turns to increase when the number of repressors is increased. The R-squared will be used to find out goodness of fit of the model.

3.5.2 The F-statistic

The F-statistic is a measures the overall significance of the estimated regression model. It provides a test of the null hypothesis that the true slope coefficients are simultaneously equal to zero. If the F-value computed is greater than the F-value from the tables at a certain percentage of level of significance the null hypothesis will be rejected, meaning that none of the variables explain the variations in government expenditure when it is greater than the critical value.

3.6 Estimation, Analysis, and Presentation method

We shall employ the OLS method for the equation and a computer package called E-views will be used to make the estimations. This package will be employed as it is easy to use and descriptive statistics are easily computed. The method of estimation, which is used in this research, is the Ordinary Least Squares (OLS). This measure is justified because it fulfils the criterion that is used to measure the goodness of fit of any estimator. As the model uses a linear relationship between the variables, OLS is the best estimator for this research model because OLS estimators minimize the sum of squared residuals. Data will be presented on the tables.

3.7 Justification of Variables in the Model

3.7.1 Mining Output (Y)

Mining sector output, is being measured in percentage of the Gross Domestic Product and is the dependent variable. Mining out is being measured in value instead of volumes this is because is if hard to measure using volume since the minerals have different units of measurements.

3.7.2. Foreign Direct Investment (FDI)

FDI is measured in millions of USD apportioned to the mining production annually. The presence of FDI in a host country, according to economic theory may either lead to the crowd in effects or crowd out effects, thus the impact of FDI on mining output is ambiguous. Crowding in effects occurs through different mechanisms such as competition effects between foreign and domestic firms leading to increased productivity or imitation effects, (Aitken et al, 1997). After noticing a product innovation from the MNCs, domestic firms observe and learn the successes and failures of foreign firms. Another mechanism is the labour mobility effects. In this channel, workers and managers originally employed and trained by the foreign firms or participating in joint ventures may later either move to local firms or establish own businesses in similar fields taking with them their upgraded human capital leading to increased productivity (Fosfuri etal, 2001). Despite all this the sign of FDI in relation to mining sector output is expected to be positive.

3.7.3 Government expenditure

Government investment is measured in millions of USD apportioned to the mining production annually .These are monetary contributions and loans granted by the governments to miners at a reasonable interest rate to increase the performance of the mining industry. These contributions are an aggregate of the Mining Industry loan Fund, export subsidies, and equipment bought by the government given to small scale miners on hire purchase. Therefore, if government grants these funds to improve the performance of the mining sector we would expect a positive relationship between the mining sector output and government funding.

3.7.4 Number of employees in mining production (L)

Labour is measured in thousands of people employed in mining production. This variable has a direct effect to total output of mining. Labour is included in the model as it was developed from the Cobb Douglass production function, and that output is affected by the amount of labour employed. The more the number of people employed the more the output. It is expected to be positively related to the dependent variable.

3.7.5 Capital (K)

Capital is measured in millions of USD in mining production. It is going to be substituted using gross fixed capital formation. This refers to the net amount of fixed capital accumulation for the accounting period. Stock of capital (K) which is determined using the perpetual inventory method is highly explained by variations in investment since the level of initial capital and depreciation are fixed. A positive relationship between capital and mining output is assumed.

3.7.6 Loans (LN)

Bank loans to the mining sector are being measured in thousands of USD per. Merchant banks are financial institution that specializes in services such as acceptance of bills of exchange, hire purchase or instalment buying, international trade financing, long-term loans and management of investment portfolios. MBL will help the mining sector to buy better equipment for production which will in-turn increase productivity in the mining sector. There are expectations that MBL has a positive relationship with mining output.

3.7.7 Inflation (INF)

Makinen (2003) defined inflation as a sustained or continuous rise in the general price level. Inflation has an expected negative impact on the performance of the mining industry; it influences the people's willingness to do productive work and this affect labour productivity by causing an inefficient mix of factor inputs, (Zell, 1979) hence a possibility of negatively influencing productivity of the mining sector.

3.8 Data sources and problems

The study estimates an empirical model using secondary data on mining output, are FDI to mining sector, government investment in the mining sector ,number of employees in mining sector, gross capital formation for mining sector, advances of merchant bank for mining sector, and taxation under mining sector for the period 1985- 2017. Data on mining output, number of employees, gross capital formation for mining sector, advances of merchant bank for mining sector, and taxation were gathered from ZimStats and data on FDI and government investment under mining sector was gathered from the Zimbabwe Investment Authority (ZIA). The choice of the data sources is based on the assumption that ZIMSTATS and ZIA provide data that are accurate, relevant, and reliable.

3.9 Justification for the use of secondary data

There were several reasons why this study used secondary data. The primary reasons are, the method was chosen because data already exists from published sources and trusted sources ZIA and ZIMSTATS being the major source. It is less expensive to use and collect data, as the data is readily available Zimkund (1991). Despite the above justification, the major weakness of secondary data is that it is subjected to several uses and interpretation, furthermore the data may be not relevant to the current study, also the data may be out-dated and inappropriate for the current purpose and one may not be able to correct for the errors in the data and some of the data is not tailor made to suit the specific need of this project, hence the need for it to be fine-tuned.

3.10 Summary

This chapter has covered the methodology of the study. There was outline of the estimation procedures that will be used in this research. The Ordinary Least Square regression will be used in this econometric analysis. This chapter also looked at the theoretical and empirical review and from the chapter it is noted that they support each other in sense that they all draw the conclusion that FDI and government expenditure positively affect mining output. The next chapter will focus on estimation, presentation, and interpretation of results.

CHAPTER IV

PRESENTATION AND INTEPRTATION OF RESULTS

4.0 INTRODUCTION

Chapter III was focusing on the methodology and also pointing out diagnostic test which should be done hence this chapter will focus of the presentation and interpretation of results with our research questions and objectives which were laid down in chapter one in mind, this chapter seeks to answer the questions relating to the obtained results after data estimation using regression analysis. Data was analyzed using Ordinary Least Squares (OLS) method using econometric software E-Views (Version 7.1). The results are presented as follows

4.1 DESCRIPTIVE STATISTICS

Descriptive statistics looks at the statistical properties of the data. It is used to know if the data can be estimated without problems. It focuses on skewness, normality of the data and variability of the data

Table 1: Summary Statistics

	LMQ	LLOAN	LL	LK	LINF	LGVT_EXP	LFDI
Mean	5.774675	6.485389	3.413629	6.883213	3.928652	2.752554	19.41367
Median	5.646748	6.461687	3.740048	7.272792	3.116518	2.809403	19.64411
Maximum	7.367709	7.383437	4.222445	7.780532	19.25858	5.441552	22.02817
Minimum	4.695757	5.408203	2.066863	4.019189	-0.10125	0.491079	17.2095
Std. Dev.	0.672935	0.426957	0.767516	1.008867	3.522196	0.831263	1.263987
Skewness	0.785976	0.214398	-0.80695	-1.40261	2.972691	-0.21275	0.095153
Kurtosis	3.045552	3.749463	1.991673	3.924887	13.58371	8.115164	2.192178
Jarque-Bera	2.988338	0.900887	4.375872	10.54226	178.0631	31.8347	0.83229
Probability	0.224435	0.637345	0.112148	0.005138	0	0	0.659585
Sum	167.4656	188.0763	98.99523	199.6132	113.9309	79.82406	562.9964
Sum Sq. Dev.	12.67958	5.104185	16.49427	28.49873	347.3643	19.34795	44.73458
Observations	29	29	29	29	29	29	29

Source: Own estimation using Eviews version 7

The table 4.1, above present descriptive statistics of 29 observations. It shows the measures of central tendency which are close to each other; this indicates that there is no outlier. . Descriptive statistics computed whilst the data was in logarithmic form shown with ***L*** behind the variables in the table. This was done in order to reduce variability of the data of the variables. Foreign direct investment recorded an average of **19.41367** and it was between a range of **22.02817** and **17.2095**. Government expenditure had a mean of **2.752554** and a minimum of **0.491079** and a maximum of **5.441552** also on the other hand capital had an average of **6.883213** and a between a range of **7.780532** and **4.019189**. Average number of people employed in the mining sector (Mean of L) was **3.413629** and the maximum was **4.222445** and a minimum of **2.066863** was recorded. Bank loans have a mean of **6.485389**, a maximum and a minimum of **7.383437** and **5.408203** respectively. Inflation has a mean of **3.928652** and a maximum of **19.25858** and minimum of **-0.10125**

The measure of dispersion, the standard deviation which shows the variations of a variable from the mean shows that Inflation had large variations with a standard deviation of **3.522196** and loans showed fewer variations with a standard deviation of **0.426957**. A low standard deviation shows that the data tend to be close to mean and high standard deviation shows that data is spread out over large range of values

The measure of skewness show that **MQ, FDI, INF**, and **LOANS,** distributions were biased to the right side of the normal distribution thus being positively skewed and **L, K,** and **GVT EXP** are positively.

The Jacque-Bera statistic tests the normality assumption that all the variables are normally distributed. Using the P-value of the Jacque-Bera statistic we accept the null hypothesis that the data is normally distributed for MQ, FDI, K, L, and LOANS at 10 % significance level since the P-value of the Jacque-Bera statistic is greater than 0.1. GVT EXP and INF are the ones which are not normally distributed however the normality assumption can be relaxed since it is only for convenience. A kurtosis value closer to 3 means the observations are nearly normally distributed. Green 2002 concurs with this notion saying the assumption can be relaxed and statistically true results are obtained.

4.2.0 DIAGNOSTIC TESTS

4.2.1 Stationarity test/ unit root at levels

The Stationarity of data has been tested using the unity root test at levels and below are the results which were obtained.

Table 2: Stationarity test at levels

Variable	ADF-test statistics	1% critic	5% critic	Decision
LMQ	-4.789466	-3.653730	-2.957110	Stationary
LFDI	-3.991921	-3.670170	-2.963972	Stationary
LGVT EXP	-3.930645	-3.653730	-2.957110	Stationary
LL	-1.612035	-3.653730	-2.957110	Non stationary
LK	-4.153900	-3.653730	-2.957110	Stationary
LLOAN	-0.832296	-3.661661	-2.960411	Non stationary
LINF	4.421584	-3.711457	-2.629906	stationary

*MacKinnon (1996) one-sided p-values

The null hypothesis of Stationarity test states that there is no Stationarity or there is unity root while the alternative hypothesis states that there is Stationarity or there is no unity root. From the results, labour force in the mining sector, and loans to the mining sector are non-stationary at both 1% critical value and 5% critical value since the absolute value of ADF is less than the absolute critical values of these variables. The only variables which are stationary are mining output, foreign direct investment, government expenditure ,capital employed and inflation its absolute critical values are greater that the absolute value of the ADF. Since there are some variables which are not stationary at all level, these variables were tested at 1st difference and there results which was found were presented below

4.2.2 Unity root test 1st difference

Table 3: Unity root test at 1st difference

Variable	ADF- test statistic	1% critic	5% critic	Decision
LL	-4.948713	-3.661661	-2.960411	Stationary
LLOAN	-8.835986	-3.661661	-2.960411	Stationary

MacKinnon (1996) one-sided p-values

From the results shown in the table the variables which were non stationary at all levels are now stationary all 1st difference level since the absolute values of the ADF are now greater than the absolute critical values at both 1% and 5% critical values. The data will then be used in estimation of the equation.

4.2.3 Heteroskedasticity test

This means the absence of homoscedasticity which means the variances of the variables are not equal. If data estimation proceeds with heteroscedastic data the confidence interval will be too wide and this reduces the evidence of rejecting the null hypotheses (significance level). Heteroscedasticity was tested using the Breusch-Pagan-Godfrey test and its summarized results are presented in the table below.

Table 4: Heteroskedasticity test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.793153	Prob. F(6,22)	0.1470
Obs*R-squared	9.524388	Prob. Chi-Square(6)	0.1462
Scaled explained SS	4.662374	Prob. Chi-Square(6)	0.5878

The Breusch-Pagan-Godfrey test was used to test for heteroscedasticity under the null test of the probability value of F static which is 0.1470. The F-static is greater than 0.05 which is the critical value, leading to the conclusion that there is no heteroscedasticity

4.2.4 Multicollinearity test

Multicollinearity is a situation where there is correlation between explanatory variables and it was tested using the correlation matrix which is presented in the table below.

Table 5: Multicollinearity test

	LMQ	LFDI	LGVT_EXP	LINF	LK	LL	LLOAN
LMQ	1.00000	-0.0016	-0.0555	-0.4098	0.25878	0.50082	0.70714
LFDI	-0.0016	1.00000	0.41226	0.391	-0.5021	-0.3761	0.34498
LGVT_EXP	-0.0555	0.41226	1.00000	0.59472	-0.3792	-0.2068	0.23974
LINF	-0.4098	0.391	0.59472	1.00000	-0.8015	0.0002	-0.0994
LK	0.25878	-0.5021	-0.3792	-0.8015	1.00000	-0.0949	0.0061
LL	0.50082	-0.3761	-0.2068	0.0002	-0.0949	1.00000	0.10453
LLOAN	0.70714	0.34498	0.23974	-0.0994	0.0061	0.10453	1.00000

The results shows that there is no multicollinearity since all variables have values which are less than 0.8 meaning that is weak relationship between the variables

4.2.5 Auto-correlation test

Gujarati (2004) asserts that auto-correlation or serial correlation is a situation of correlation between members of series of observations ordered in time.

The estimated regression has a D-W statistic which is approximately greater than 2 and lies in the region of indecision where it is difficult to determine whether there is perfect positive or negative autocorrelation. The D-W test statistic was found to be 2.174380. In the event that the Durbin Watson test fails to provide sufficient evidence for the presence autocorrelation, Breusch-Godfrey Serial Correlation LM test can be employed to test for the presents of autocorrelation as shown below

Table 6: Auto-correlation test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.363543	Prob. F(2,20)	0.6997
Obs*R-squared	1.017292	Prob. Chi-Square(2)	0.6013

According to the test, we accept the null hypothesis that there is autocorrelation if the probability value of Fstat < 0.1. Since the P-value of Fcal is 0.6997 which is greater than 10% and we do not reject the null hypothesis and conclude that there is no auto-correlation.

4.3 Model significance

The model has a high R-squared of 0. 839478 (see table below) which means that the model is greater than 60%, this implies that about 84% of variations in mining output are explained by the explanatory variables and only 16% are in the error term. The adjusted R-squared of 0.795700 which take into account of the degrees of freedom also shows that the model is still fit to explain the variations in mining output.

The F-statistic tests the model for fitness and the recommended F-statistic is anything greater than 5. The results obtained an F-statistic of 19.17553 which is a signal that the model is fit for use.

The normality test was tested using residuals of the variables to test if they are normally distributed. The P value of the Jacque Bera test is normally distributed at 10% significant level since the P value is 0.877565 hence greater than 0.1(see Appendix 8)

4.4 Regression results

The obtained results after the estimation of the model are summarised below and estimation was done using Eview 7.

Table 7: Regression results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.7645	1.91511	-1.9657	0.0621
LFDI	0.11458	0.07107	1.61235	0.0711

LGVT_EXP	0.14047	0.10094	1.3916	0.178
LINF	-0.0858	0.03456	-2.4839	0.0211
LK	0.08303	0.11265	0.73703	0
D(LL)	0.50748	0.09635	5.26715	0.4689
D(LLOAN)	0.76503	0.17248	4.43538	0.0002

R –squared	0 .839478	Adjusted R- squared	0.795700
Durbin-Watson stat	2.174380	Prob(F –statistic)	0.000000
F-statistic	19.17553		

LMQ=3.765+0.115**LFDI**+0.140L**GVTEXP**-0.086**LINF**+0.083**LK**+0.807**LL**+0.765**LLOAN**

4.5.0 INTERPRETATION OF RESULTS

Due to the fact that the function has been linearised by introducing the logarithms, the respective co-efficiencies of the explanatory variables are treated as respective elasticities of the variables in relation to the dependent variable MQ

4.5.1 Government expenditure (LGVT EXP)

Government expenditure is insignificant in explaining variations in mining output at both 1% and 5% level of significance because the P value is 0.1780.

For Zimbabwe to benefit and enjoy a sustained increase in mining output it have to increase government expenditure the finding where not in line with the expected sign in chapter 3. This can be due to corruption that is associated with the government spending.

In addition this is not in line with the empirical studies on the impact of public and private investment on economic growth based on the developing economies have been brought to the limelight by the work of Khan and Reinhart (1989). They used a typical neoclassical production function and separated aggregate investment into private and public components

for a cross section sample of 24 developing economies. The empirical results reported overwhelmingly supported the importance of private investment more than public investment in the developing economies growth process.

4.5.2 Capital (*L*K)

From the table above capital has a P-value of 0.0000 this shows that it is statistically significant at 1% level. Capital has a coefficient of (β_4 = 0.083029) which explains that indicates that an increase in the level of capital by 1% will increase mining output by approximately 0.83%.

The coefficient of capital shows a positive relationship between capital and mining output. An increase in capital productivity means that a unit of capital is producing more output and also extraction of minerals requires machinery in order to produce more output

Capital which was measured using gross fixed capital formation has a positive contribution to mining output according to the results obtained from the regression model. This implies that a permanent increase in the level of gross fixed capital formation results in a permanent increase in mining output ceteris paribus. Also in-turn increasing growth rates in capital formation signify increases in output. This is supported by Saunders (2007) lack of machinery and modernized equipment and foreign currency has been considered as major setbacks to the productivity of the mining sector of the Zimbabwe's economy. He also explained measures which were taken by the government to counterfeit these limitations which included the removal of foreign currency surrender requirements and giving some investment funds and credit lines to reopen closed mines and increase the capacity utilization of the industry, this also supported the view of Schneider's study in China hence he concluded that capital has a positive relationship with mining output

4.5.3 Foreign Direct Investment (*L*FDI)

FDI has a P-value of 0.0711 this shows that it is statistically significant at 10% level. It has a coefficient of (β_4 = 0.114581) which explains that indicates that an increase in the level of foreign direct investment by 1% will increase mining output by approximately 0.11%.

The coefficient of foreign direct investment shows a positive relationship between FDI and mining output. An increase in FDI means more output. Foreign direct investment has a positive contribution to mining output according to the results obtained from the regression

model. This is in line with other researches, econometric evidence (Ghura and Hadjimichael 1996, Ghura 1997, Beddies 1999) indicates that private capital formation (private investment) has a stronger, more favourable effect on economic growth rather than government capital formation(public investment) probably because private capital formation is more efficient and less closely associated with corruption. This gives an argument as to why private investment is presented as more desirable than public investment; due to subjectivity to corruption which hinders productivity and in turn reduces economic growth or rather put it to a level lower than the expected outcome. This is also supported by Krishnan & Chandran (2008) examined the short and long run dynamics of Foreign Direct Investment (FDI) over the mining output growth in a developing country – Malaysia for the period of 1970-2003 and he propounded that in the long run, a 1% increase in FDI contributes to 0.115% increase in mining value added output in Malaysia hence FDI contribute to variations in mining output.

4.5.4 Labour (*L*L)

From the table above labour has a P-value of 0.4689 this shows that it is statistically not significant in explaining changes in mining output. This is in contrast with what Machina (2010) found in his research. He found that labour force insignificantly affect output.

This means that there is no relationship between mining labour force and mining output in Zimbabwe. This is mainly because most mines use machinery which are not labour intensive. These findings are not in line with the findings of other researcher like this is in contrast with what Machina (2010) found in his research. He found that labour forces insignificantly affect output and also there is now the encouragement use of machines which provide greater output. In Zimbabwe increase or decrease of labour force does not have any significant effects of mining output.

4.5.5 Bank Loans (*L*LOAN)

Bank loans are statistically significant at 5% level shown by the P-value of 0.0002. Bank loans has a coefficient of ($\beta_6 = 0.765029$) which explains that indicates that an increase in the level of bank loans by 1% will increase mining output by approximately 0.77%.

This means that if the sector has access to loans they will have money to buy advanced machinery for production which will increase output of the sector. Bank loans also have a positive contribution to mining output according to the results obtained from the regression

model. It is significant in explaining variations in mining output. This implies that an increase in the loans given to the sector results in permanent increase in mining output ceteris paribus.

4.5.6 Inflation (LINF)

Inflation on the production of mining sector has a P-value of (0.0211), which shows that it is statistically significant in determining output of the sector at 5%. A 1% increase in inflation will result to a decrease in mining output by approximately 0.09% as shown by the coefficient ($\beta_3 = 0.085839$)

As is evidenced by the findings of the study, inflation has a negative contribution to the mining output. Conversely a policy variable that is inflation has proven to be dangerous to the performance of the sector since it pulls in a different direction. Increase in inflation will increase cost of production and to minimise increased costs the sector might decide to lower their production levels. They may also produce at higher costs and attach the cost to the prices of their minerals which will make them less competitive in the market and they will be forced to lower the production levels this is in line with the research done by Mendone and Nonnemberg (2005) found a negative relationship between inflation and output. However, the results are in contrast with Gross and Trevinos (2002) who found in their study that Inflation, are insignificant in explaining the variations in output

4.6 Summary

In this chapter diagnostic tests and interpretation of results was done and the results found shows that mining output is affected positively by Foreign Direct Investment, Bank loans; capital employed. Also mining output is affected negatively by inflation while government expenditure and labour force are insignificant in explaining variations in the mining output from 1985 to 2017. The next chapter will focus on summary, conclusions and recommendations which can be implemented to increase agricultural output

CHAPTER IV

Summary, Conclusion and Recommendations

5.0 Introduction

This chapter depicts the major findings drawn from the study and gives a precise summary of the study, the conclusions drawn as well as suggestions for further study. It also includes some recommendations to help increase the effectiveness of both government expenditure and foreign direct investment in Zimbabwe. The chapter primary gives an outline of findings of the study then avails conclusions which consider the research objectives and finally gives recommendations and suggestions for further study.

5.1 Summary

The purpose of the research was to determine the impact of foreign direct investment and government expenditure on the mining sector output in Zimbabwe. Time series data covering the period 1985 to 2017 was used so as to assess the impact of foreign direct investment on the mining sector output in Zimbabwe. A Neoclassical framework was adopted making use of OLS estimator, where analysis and presentation of data was done using E-views (statistical package). The ADF test procedure was used to check for unit roots where all variables were differenced at different levels until there were stationary.

From the first chapter the main objective was to assess the impact of FDI and government expenditure on mining sector performance, which is trying to establish the relationship between government expenditure and FDI and the mining sector. The researcher found that there is a positive relationship between FDI and mining sector performance as an increase in FDI leads to an increase in output as well. Also evaluating and finding the impact of labour and capital on mining sector performance was among the objectives of the study. Also from the result the researcher found that there is a negative relationship between inflation and mining output. From the results the research found and concluded that there is a positive relationship between capital and loans on the performance of the sector output whereas

labour was found to be irrelevant in explaining variations in mining output. Also government expenditure was found to be irrelevant in explaining variations in the mining output.

The study also looked at relevant theories and empirical evidences that are related to the study area which revealed that sometimes there is consensus on the impact foreign direct investment, government expenditure on the mining sector output performance. Furthermore, the study has identified research gaps which makes the study relevant and of importance to the mining sector and other stakeholders.

The third chapter of the study has looked at model development and the justification of the variables and their expected sign in determining mining sector output. Also the chapter looked at various diagnostic tests which ensure that results are meaningful and not misleading for policy recommendation.

The forth chapter focused on the data presentation thus the results of the diagnostic test and also the estimation results of the model using the E-views 7 statistical package for social sciences. The study used a sample size of 29 observations of mining output, FDI, labour, gross fixed capital formation, loans, and inflation data. All findings were interpreted and the outcomes of each variable were evaluated against their respective expected signs.

The findings of the study subscribe to the research that foreign direct investment notably and positively contribute to mining output than government expenditure in Zimbabwe. Capital formation and loans also exhibits a significant and positive effect on mining output in Zimbabwe. Never the less, total labour employed and government expenditure indicate that it is statistically insignificant. Inflation on the other hand established an adverse relationship with mining output growth in Zimbabwe.

5.2 Conclusions

This study has analysed the impact of foreign direct investment and government expenditure on mining output in Zimbabwe and found sufficient evidence supporting the argument that foreign direct investment is a remedy to mining output growth in Zimbabwe. Conversely a policy variable that is inflation has proven to be cancerous to performance of the sector since it pulls in a different direction. The level of labour employed and government expenditure proved to play little or no role in determining the performance of the mining sector output in

Zimbabwe. Capital and loans on the other hand plays an important role in determining the level of growth of output in the mining sector of Zimbabwe.

The effect of capital growth on mining output, as represented by gross fixed capital formation mining sector is significant and positive. This implies that a permanent increase in the level of gross fixed capital formation results in a permanent increase in mining output ceteris paribus. Also in-turn increasing growth rates in capital formation signify increases in investment and therefore exhibiting increased levels of economic growth of the country. And also the effect of loans on the mining output is significant and positive. This implies that an increase in the loans given to the sector results in permanent increase in mining output.

There is need for the government to encourage constant and increased levels in gross fixed capital formation since it is crucial to mining sector of Zimbabwe. Countries lacking accumulation and technological progress usually grow much smaller than countries with high investment rate and huge research and development (R&D) expenditures. Never the less total labour employed failed to display an effect on mining output in the sector. This can be attributed to the fact that increased labour does not necessarily mean increased productivity and hence increases in the labour force may have little or rather no effect on mining output production. Also this can be due to the law of diminishing returns which states that when more and more of units of a variable input are employed on a given quantity of fixed inputs, the total output may initially increase at increasing rate and then at a constant rate, but it will eventually increase at diminishing rates. In other words, the total output initially increases with an increase in variable inputs at given quantity of fixed inputs, but it starts decreasing after a point of time.

In addition the government should also increase their expenditure on the mining output so as to increase output. Government expenditure failed to display an effect on mining output in the sector. This can be due to the liquidity problem in the economy. Also the study found out that inflation has a significant effect and supreme negative on output growth in the mining sector in Zimbabwe. This therefore implies that policy variables play a significant role in determining the level of mining sector performance in Zimbabwe hence there is need for the government to pursue macroeconomic policies that ensure stability in macroeconomic variables such as inflation. These conclusions drawn in this study confirm the findings of immense prior studies which are in line with the topic.

5.3 Recommendations

Basing on the finding of the study there are some possible policies which can be done by the government of Zimbabwe as a way of improving the performance of the mining sector. The study offers the following recommendations to appropriate stakeholders like the government, investors to mention a few:

- The National budget resource allocation must recognize the role of mining and allocate resources for the growth of the mining sector
- The government should also provide regulations which reduce the level of interest rates which are charged to the mining sector when they are provided with loans from banks. Low interest rate encourages borrowing which will result in overall increase in the mining output.
- There is need for the government to ensure that FDI inflows achieve their intended purposes to effectively contribute to sustainable performance of the sector. This can be done through discouraging corruption and rent seeking behaviour among top officials by increased accountability and transparency.
- There is also need for the government to ensure sufficient or increased levels of domestic capital growth by reducing interest rates to promote domestic investment.
- Macroeconomic policy stability is also crucial in establishing the effectiveness of foreign developmental aid. The government should pursue policies that will try to reduce inflation rate in the country and lead to growth of the economy too.

5.4 Suggestions for further studies

The results obtained in this study should not be viewed as decisive but as a stimulant for further research on the impact of foreign direct investment on mining sector output in Zimbabwe. Further researchers are suggested to find out the effect of foreign direct investment on the different sectors of the country such as agricultural sector, manufacturing sector, tourism sector to mention a few. An interesting area for further research is to assess the impact of public debt on mining output. Further research can also be conducted to determine other factors which affect output of the Zimbabwe mining sector which are not included in this research.

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Appendices

Appendix 1: Summary statistics

	LMQ	LLOAN	LL	LK	LINF	LGVT_EXP	LFDI
Mean	5.774675	6.485389	3.413629	6.883213	3.928652	2.752554	19.41367
Median	5.646748	6.461687	3.740048	7.272792	3.116518	2.809403	19.64411
Maximum	7.367709	7.383437	4.222445	7.780532	19.25858	5.441552	22.02817
Minimum	4.695757	5.408203	2.066863	4.019189	-0.10125	0.491079	17.2095
Std. Dev.	0.672935	0.426957	0.767516	1.008867	3.522196	0.831263	1.263987
Skewness	0.785976	0.214398	-0.80695	-1.40261	2.972691	-0.21275	0.095153
Kurtosis	3.045552	3.749463	1.991673	3.924887	13.58371	8.115164	2.192178
Jarque-Bera	2.988338	0.900887	4.375872	10.54226	178.0631	31.8347	0.83229
Probability	0.224435	0.637345	0.112148	0.005138	0	0	0.659585
Sum	167.4656	188.0763	98.99523	199.6132	113.9309	79.82406	562.9964
Sum Sq. Dev.	12.67958	5.104185	16.49427	28.49873	347.3643	19.34795	44.73458
Observations	29	29	29	29	29	29	29

Appendix 2: Stationarity test at levels

Null Hypothesis: LMQ has a unit root

Exogenous: Constant

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.789466	0.8086
Test critical values:	1% level	-3.653730	
	5% level	-2.957110	
	10% level	-2.617434	

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

Null Hypothesis: LFDI has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.991921	0.1870
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

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

Null Hypothesis: LGVT_EXP has a unit root

Exogenous: Constant

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.930645	0.0050
Test critical values:	1% level	-3.653730	
	5% level	-2.957110	
	10% level	-2.617434	

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

Null Hypothesis: LL has a unit root

Exogenous: Constant

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.612035	0.4650
Test critical values:	1% level	-3.653730	

	5% level	-2.957110
	10% level	-2.617434

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

Null Hypothesis: LK has a unit root

Exogenous: Constant

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.153900	0.2262
Test critical values:	1% level	-3.653730	
	5% level	-2.957110	
	10% level	-2.617434	

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

Null Hypothesis: LLOAN has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.832296	0.7957
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

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

Null Hypothesis: LINF has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		4.421584	1.0000
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

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

Appendix 3: Stationarity test results at first difference

Null Hypothesis: D(LL) has a unit root

Exogenous: Constant

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.948713	0.0004
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

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

Null Hypothesis: D(LLOAN) has a unit root

Exogenous: Constant

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.835986	0.0000
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

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

Appendix 4: Heteroscedasticity test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.793153	Prob. F(6,22)	0.1470
Obs*R-squared	9.524388	Prob. Chi-Square(6)	0.1462
Scaled explained SS	4.662374	Prob. Chi-Square(6)	0.5878

Appendix 5. Multicollinearity test

	LMQ	LFDI	LGVT_EXP	LINF	LK	LL	LLOAN
LMQ	1.000000	-0.001621	-0.055494	-0.409831	0.258777	0.500819	0.707140
LFDI	-0.001621	1.000000	0.412263	0.391000	-0.502053	-0.376046	0.344978
LGVT_EXP	-0.055494	0.412263	1.000000	0.594723	-0.379149	-0.206813	0.239737
LINF	-0.409831	0.391000	0.594723	1.000000	-0.801526	0.000202	-0.099373
LK	0.258777	-0.502053	-0.379149	-0.801526	1.000000	-0.094915	0.006104
LL	0.500819	-0.376046	-0.206813	0.000202	-0.094915	1.000000	0.104529
LLOAN	0.707140	0.344978	0.239737	-0.099373	0.006104	0.104529	1.000000

Appendix 6: Autocorrelation test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.363543	Prob. F(2,20)	0.6997
Obs*R-squared	1.017292	Prob. Chi-Square(2)	0.6013

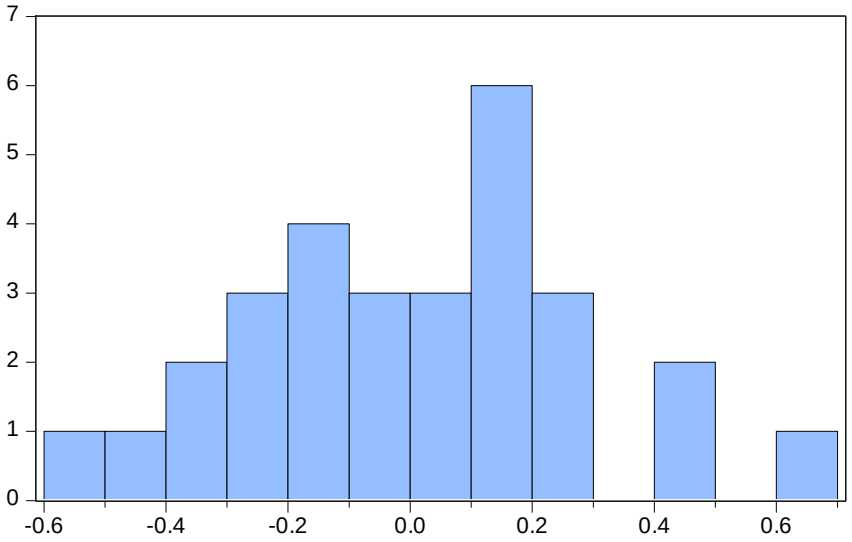
Appendix 7: Regression results

Dependent Variable: LMQ
Method: Least Squares
Date: 04/08/19 Time: 14:45
Sample: 1985 2017
Included observations: 29

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.764536	1.915106	-1.965706	0.0621
LFDI	0.114581	0.071065	1.612354	0.0711
LGVT_EXP	0.140465	0.100938	1.391600	0.1780
LINF	-0.085839	0.034558	-2.483862	0.0211
LK	0.083029	0.112653	0.737031	0.0000
D(LL)	0.507479	0.096348	5.267149	0.4689
D(LLOAN)	0.765029	0.172483	4.435384	0.0002

R-squared	0.839478	Mean dependent var	5.774675
Adjusted R-squared	0.795700	S.D. dependent var	0.672935
S.E. of regression	0.304164	Akaike info criterion	0.664006
Sum squared resid	2.035347	Schwarz criterion	0.994043
Log likelihood	-2.628090	Hannan-Quinn criter.	0.767370
F-statistic	19.17553	Durbin-Watson stat	2.174380
Prob(F-statistic)	0.000000		

Appendix 8: Normality test



Series: Residuals
Sample 1985 2017
Observations 29

Mean	6.99e-16
Median	0.014104
Maximum	0.640664
Minimum	-0.500400
Std. Dev.	0.270260
Skewness	0.176922
Kurtosis	2.698391
Jarque-Bera	0.261209
Probability	0.877565

Appendix 9:Data Series

Log transformed data for Mining output(LMQ),Government expenditure (LGVT EXP),Foreign direct investment (LFDI),Bank loans(LLOANS),Labour force(LL), Capital employed(LK) and Inflation(LINF).

Log transformed data for the period 1985 to 2017

obs	LMQ	LFDI	LGVT_EXP	LL	LK	LLOAN	LINF
1985	5.531842	17.53608	0.491079	4.19268	6.919678	6.067389	2.217055
1986	5.688561	18.02943	0.502758	4.222445	6.975402	6.021843	2.653861
1987	5.356086	18.14213	2.701361	4.154185	7.070364	6.057089	2.474342
1988	5.911793	18.17656	2.80336	4.099332	7.111847	5.967619	1.956985
1989	5.620192	18.3526	2.727853	3.998201	7.054163	6.278359	2.451531
1990	5.84148	17.2095	2.00148	3.994524	7.40212	6.328257	2.74084
1991	5.951124	17.9644	2.70805	4.005513	7.602297	6.452391	3.148453
1992	5.961276	17.68416	2.944439	4.037774	7.595545	6.358889	3.739869
1993	5.81312	17.98388	2.721295	4.055257	7.653904	6.415093	3.318742
1994	6.084667	19.17313	3.08191	4.01998	7.651118	6.295924	3.103326
1995	5.156543	19.64411	2.939162	2.163323	7.780532	6.339838	3.116518

1996	5.036512	19.62344	3.08191	2.186051	7.515033	6.461687	3.064626
1997	4.89144	19.68447	2.95491	2.104134	7.4524	5.408203	2.936504
1998	5.092793	19.70517	2.906901	2.066863	7.658037	6.468069	3.456309
1999	4.991636	19.67694	2.850707	2.151762	7.272792	6.532752	4.069331
2000	4.695757	19.65876	2.639057	2.251292	7.031132	6.477974	4.022325
2001	5.646748	19.72151	2.809403	2.517696	6.576904	6.092214	4.275806
2002	5.881988	20.53692	2.97553	2.572612	5.809089	6.674756	4.891937
2003	5.54571	20.63076	2.923162	3.169686	5.649882	6.642617	5.90002
2004	5.498927	20.80574	3.010621	3.653252	5.220409	6.591868	5.857898
2005	5.748301	20.78915	3.072693	3.640214	4.74148	6.639188	5.471502
2006	5.626872	20.69498	2.965273	3.754199	6.517638	6.527483	6.9243
2007	5.629549	21.65514	2.714695	3.756538	5.302273	6.442447	8.8134
2008	5.245036	20.44044	5.441552	3.837299	4.019189	6.583801	19.25858
2009	6.329385	NA	5.005288	3.953165	6.866659	6.806407	NA
2010	6.687623	19.04181	2.674149	3.730501	7.62486	6.903294	1.116993
2011	6.914032	22.02817	2.580217	3.575151	7.632292	6.986404	1.245343
2012	6.969456	20.34948	2.484907	3.583519	7.639724	7.316099	1.315098
2013	7.078799	19.18584	2.61007	3.740048	7.46898	7.361297	0.490645
2014	7.053551	18.88989	3.427515	3.517498	7.5355	7.340873	NA
2015	6.993398	20.0074	2.509599	3.586293	7.598613	7.438741	NA
2016	7.105786	18.89259	3.360375	3.740048	7.608564	7.397136	NA
2017	7.367709	18.87167	3.505557	3.7612	7.664088	7.383437	-0.10125