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DEPARTMENT OF ECONOMICS

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ANALYSIS OF THE RELATIONSHIP BETWEEN MINING EXPORT AND ECONOMIC GROWTH IN ZIMBABWE (1985) TO (2016)

BY

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DECLARATION

I, KUDZANAI SUNDIRAI proclaim that this research is my personal work and I confirm that it has not been submitted to any institution in fulfilment of any qualification.

Student..... Date……

SUPERVISORS APPROVAL FORM

The undersigned certify that they have supervised the dissertation entitled: Investigation on the relationship between mining export and economic growth of Zimbabwe (1985) to (2016)
done by KUDZANAI SUNDIRAI

	SIGNATURE
CHAPTER ONE	**……**
CHAPTER TWO	**……**
CHAPTER THREE	**…….**
CHAPTER FOUR	**…….**
CHAPTER FIVE	**…….**

APPROVAL FORM

The undersigned are certifying that they have supervised and read a research project entitled: investigation on the relationship between mining export and economic growth of Zimbabwe (1985) to (2016).The research submitted by Kudzanai Sundirai in partial fulfillment of the requirements for Bachelor of Commerce Economics Honours Degree at Midlands State University.

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Chairperson's Signature Date

DISCLAIMER

The views or strong statements in this research by any way do not represent university's views or the research supervisor and in any way are not meant to insult any individual, institution or establishment but instead are predestined only for intellectual purposes

DEDICATION

I dedicate this work to my mum, sister and friends, for without them I would not have reached this far. For they gave me a shoulder to lean on through thick and thin, all the love and support they have expressed to me and making sure that I become empowered, their sacrifices are greatly appreciated.

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ABSTRACT

This research investigated the relationship between the mining export and economic growth in Zimbabwe using time series data for the period 1985 to 2016 as well as employing the Ordinary Least Squares (OLS) approach. The study was aiming at examining the impact of mineral export on economic growth in Zimbabwe. The results obtained showed that mineral export, real growth in agriculture, population growth and tax revenue significantly affect economic growth. Moreso the results also showed that real growth in manufacturing and inflation have insignificant influence on the economic growth of Zimbabwe. Basing on the findings, the research proposes The at enhancement of the mining sector export will largely contribute to the economic growth of the country given its bulk mineral resources.

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LIST OF ACRONYMS

ADF	Augmented Dicky Fuller
DRC	Democratic Repulic of Congo
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GMM	General Methods of Moment
INF	Inflation Rate
LDCs	Less Developed Countries
MAN	Real Growth In Manufacturing
MNL	Mineral Export Share
OLS	Ordinary Least Squares
PG	Population Growth
PP	Philips Peron
SADC	Southern African Developing Countries
TX	Tax Revenue
VAT	Value-Added Tax
Yt	Per capita GDP Growth

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CHAPTER ONE

INTRODUCTION

1.0 Introduction

Less Developed Countries such as Zimbabwe, mining has been regarded by many researchers as a paramount prerequisite for industrialization and economic growth hence a need to know the relationship of mining exports to economic growth. Geological Survey (1990), shows that Zimbabwe is blessed with various types of minerals and metals. Metals and minerals present numerous potential for the nation to develop and foster economic growth. Given that Zimbabwe has a comparative advantage in mineral assets relative to other Southern African countries and other emerged economies, it is therefore vital to study the impact of mineral resources on the overall economic performance of the country.

Several researches have been carried to examine the relationship between mining exports and the growth of an economy in different countries (Olawumi 2016 and Weeks 2008). The findings of the studies have shown positive relationship between mineral exports and economic growth. The results of these researches are very useful for appropriate policy formulation and recommendations that will facilitate the growth of these studied economies from the international trade of minerals.

It is therefore vital to examine the relationship between mining exports and economic growth of Zimbabwe since mining sector is one of the major contributor to total exports of the country.

1.1 Background of the study

Since independence, mining industry has contributed an average of almost 40 percent of aggregate exports according to (Hawkins, 2009). Recently the massive discovery of minerals from Great Dyke presents excessive potential for the mining sector to become the key export driver and a major contributor to economic growth. Table 1.1 will illustrate the

changes in economic growth, share of mineral exports to aggregate exports and mineral exports growth between 1980 to 2016.

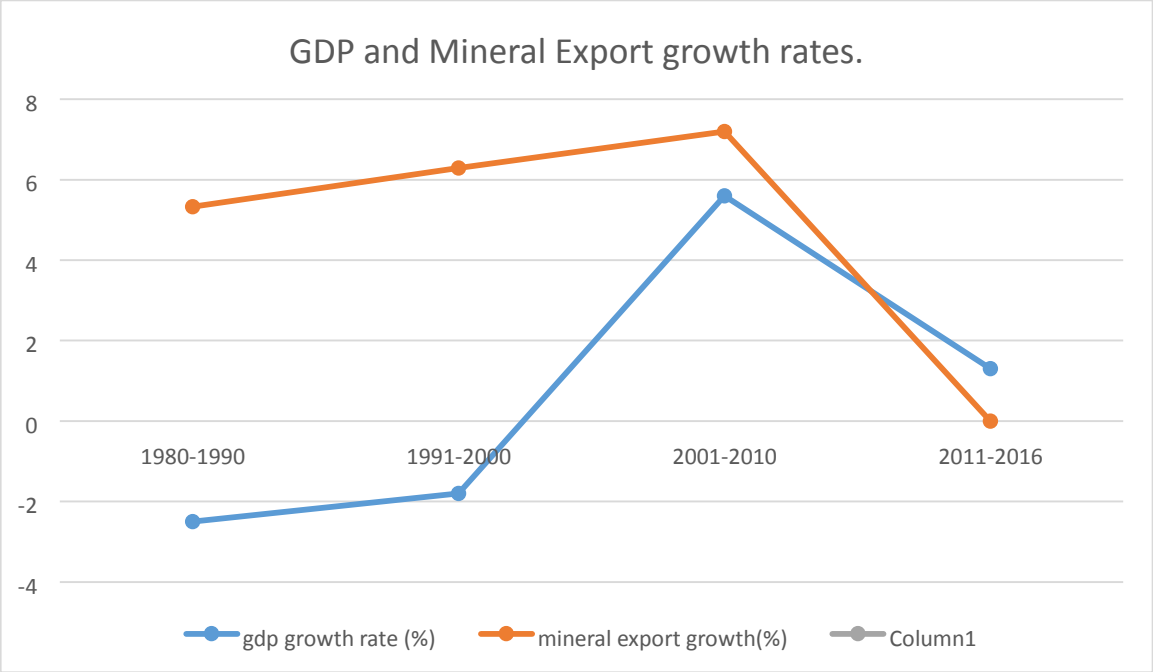
Table 1.1 Mineral exports, GDP growth rates and share of mineral exports.

Years	GDP growth rate (% p.a.)	Average annual mining exports(US$ millions)	Mineral export share in aggregate exports (%)
1980-1990	-.2.5	533	41.2
1991-2000	-1.8	629	32.3
2001-2010	5.6	720	40.4
2011-2016	1.3	564	37.8

Source; International monetary fund, world economic outlook (2015)

Data shows that from 1980 to 1990 Gross Domestic product growth rate was negative 2.5 percent whilst the average annual mining exports were US533 million dollars. In the next decade of 1991 to 2000 the GDP growth rate has increased from negative 2.5 to negative 1.8 whilst the average annual mining exports have also risen from US533 million dollars to US629 million dollars. This shows a positive relationship between mining exports and economic growth since they have both increased at the same time. Data indicates that since the beginning of the commodity booming in 2002, the contribution of minerals in aggregate exports has averaged 49 %. Table 1.1 indicates weighted annual mining exports in US dollars, GDP growth rate and mineral export share in total exports. This clearly spells out how the mining sector has been instrumental in economic growth and generation of foreign currency. During the period (2001- 2010), the Zimbabwean economy has registered the maximum average yearly mining exports of US720 million dollars as compared to other periods. This same period recorded the highest GDP growth rate of 5.6% and also the average share of minerals in aggregate exports of 40.4%, showing the domination of the mining industry in the export market its positive impact to economic growth. From 2011 to 2016 the average annual mining exports have dropped from US720 million dollars to US564 million dollars which was also in line with the reduction in GDP growth rate from 5.6 percent to 1.3 percent which shows the positive relationship between mining exports and economic growth.

The trends of the two variables under the study between the period 1985 and 2016 can be diagrammatically shown as on fig 1.1.



Source; International monetary fund, world economic outlook (2015)

Fig 1.1: Gross domestic product and Mineral export growth rates from 1980 to 2016

Fig 1.1 shows the trends followed by the two variables under the study. In the first decade that is from 1980 to 1990 the Zimbabwean economy have experienced a negative growth of about 2.5 percent though it was moving towards a positive growth. On the same period the mineral export had experienced a positive growth of 5.3 percent. In the period between (1991 to 2000) the economic growth has experienced a decreasing negative growth rate from negative 2.5 to negative 1.8 whilst the mineral exports have continued to show a positive growth of 6.29 percent. From 2001 to 2010 the economic growth has depicted erratic change from the negative growth of 1.8 to a positive growth of 5.6 percent which shows that it has increased at an increasing rate while the mineral export growth had experienced a decreasing positive growth of 7.2 percent. From 2011 to 2016 the two growth rates have been facing a decreasing positive growth rates when economic growth rate had decreased from 5.6 percent to 1.3 percent whilst the mineral export growth has reduced from 7.2 percent to 5.6 percent which is a smaller change relative to economic growth decline.

1.2 Problem statement

In the period under the study data has indicated a direct relationship between mineral exports and economic growth of Zimbabwe in the first decade as shown in the background. From the 1991 to 2000 the two variables have started to show erratic changes when the economic growth has now increased at a decreasing rate whilst mineral export growth was positive and increase at an increasing rate. The unpredictable behavior of economic growth in relation to the growth of the mineral exports continued in the 2001 and 2010 period when the economic growth increased at an increasing rate and become positive whilst the mineral export has just increased at a very low level. The stochastic behavior of the variables under the study continued in the period 2011 to 2016 when they both decrease at an increasing rate. Therefore, it implies that mining exports could have the impacts on growth of Zimbabwe but there is need to know the level of its influence in the economic growth of Zimbabwe. It is therefore against this argument that the researcher would want to examine the relationship between mining exports and Zimbabwe's economic growth.

1.3 Objectives of the study

The overall objective of the research is to investigate the relationship between mineral exports and economic growth of Zimbabwe, and the specific objectives being:

- Examining the impact of mining exports on economic growth.
- Make policy recommendations based on the finding.

1.4 Significance of the statement

Previous studies on mining exports and economic growth have focused on one mineral in determination of economic growth, for example Weeks (2008) solely focused on copper to determine the economic growth of Zambia. The researcher has used the time series data for the period 1975 to 2006 and applied the GMM method. Awolusi (2015), has also examined the impact of mining sector on economic growth of the fourteen SADC economies at large from the period 1990 to 2014. The researcher used the panel data and apply both the Ordinary Least Squares method as well as the GMM method. Also Mahonye and Mandishara (2015) have carried a research on the mechanism of mining sector broadly

for its employment, tax revenue to the government and its production output to economic growth of Zimbabwe After a close analysis of these previous researches, the study is therefore important since it gives its attention to a specific economy (Zimbabwe) and combination of all minerals and solely its exports. The researcher will use the time series data and will apply the OLS approach. The study of one economy (Zimbabwe) and a bunch of all minerals using time series data from the period 1985 to 2016 and application of the OLS approach will contribute to the literature of the subject. The study will help policy makers in government of Zimbabwe in ensuring that the mineral exports remains competitive in the Global Market and enhance its contribution to economic growth.

1.5 Hypothesis

H0: mining exports have no significant impact on economic growth.

H1: mining exports significantly affect economic growth.

1.6 Limitation of the study

The data sets have complications. Some figures are not included in the data sets, thus there are no records of such information which may require the researcher to interpolate to achieve the study objectives. More over the data is from many years long back so it may have been condensed or filtered hence often estimates are used rather than the actual measurements. The study focuses on economic growth only a number of potential factors which impacted on growth are not included in this model, which requires the researcher to include a stochastic error term.

1.7 Organization of the study

The rest of the study is structured as follows in the following chapters. In chapter two the researchers review the existing literature on the subject matter. It constitutes both theoretical and empirical literature review. Chapter 3 constitutes the methodology to be applied in the study. In this section, the researchers will indicate the adopted model from the literature. The relevant tests carried out will also be outlined in this chapter. Chapter four will then put the methodology outlined in chapter three into practice. The results from

the study will be presented and analyzed as well in chapter four. Chapter 5 will outline the conclusions and recommendations drawn from the research.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This section reviews all relevant literature, both empirical and theoretical. In the first section of this chapter the researcher will dwell on the theoretical aspect of the impact of mining exports on economic growth and on the last section will review empirics of the literature.

2.1 Theoretical Framework

The theoretical review of this research is based on the ideology that international trade of minerals increases welfare of the country's nationalities via economic growth. This idea was propounded by a merchant group, philosophers and government officials during the 17^{th} century and it was known as the mercantilism. For an economy to become powerful and rich, it has to import less and export more according to mercantilist. The export surplus is used to acquire precious metals such as silver and gold, thus the government has its power in the import control and the export stimulation. This will induce economic growth in the economy since the increase in net exports will lead to an increase in the GDP values.

Adam Smith propounded the classical theory of international trade and attacked the mercantilists' idea basing on the model of absolute advantage. The true measure of wealth of a country are manmade, human stock and natural resources rather than precious metal stocks according to Smith's arguments. He also argued that a country's wealth can be expanded if the mercantilist controls are abandoned by the government. Also research by Mannur, (1996) proposed that trade of minerals can make a country worse off with making another better off. Absolute advantage model however, have less explanation on the role of international trade of minerals today that is between developing and developed nations. Absolute advantage model could not explain trade of minerals among developed nations (Salvatore, 1990).

The factor endowment theory of external trade has also come in attempting to revise the works of Adam Smith in his theory of classical model of trade by Hecksher and Ohlin.

Different commodities require productive factors of production in relative different magnitudes and nations possess different endowments of factors of production. Regarding trade as an engine of growth has been given much emphasis by economists. Proponents of the theory still contend that trade of minerals can fund the development of primary-exporting nations. Many developed nations such as Canada, United States of America and Australia's growth is mostly attributed by their exports and mainly mineral exports as the case of Canada. However, some economists strongly argues that gains of mineral trade is biased in favor of developed countries growth.

Recently economists have continued to challenge the works of Adam Smith on his static neo classical model of international trade which has said to apply similarly in all countries both developing and developed. Contrasting to this traditional model economist propounded the so called North South models of trade which specifically put emphases on trade relations between developing and developed nations. Ocampo (1980) argues that trade among developed and developing economies lesily benefit the developing nations. This is because they are primary exporting nations which exports unprocessed commodities with less or no value added to the developed nations. These unprocessed products will be transformed to semi-finished and finished goods at low cost and exported back at higher prices to the developing economies.

The theory of export-led growth model shows that export contributing industry variables such mining export mostly determine growth of the economy. According to Aregbesola (2014), the growth should be based on an industry's capability to significantly contribute and adjust total exports, to promote economic growth. Increasing industry's capability has become the major objective of many economies in order to attract investments and boost the mining industry. North, (1995) claims that economies exploit their natural resources distributions and comparative advantages to produce commodities with a lower opportunity cost. All further economic activities within the economy that are not directly linked to this export activity (basic industry) are depending on growth of these exporting industry which in other cases might be the mining industry.

The notion that exports are the key engine for economic growth through exports revenue, provides the basis for the development of export base theory. The theory states that in order for an economy to grow it has to increase its monetary inflows through export sales according to Blair (1995). The theory divides the economy into two sectors namely basic and non-basic sector. The non- basic sector comprises of businesses that large depend upon locally based clients. The basic sector depends on the outside trade through exports that bring foreign currency inflows that will boost economic growth. The non-basic sector was said to support the basic sector (export sector) which is the engine for economic growth.

2.2 Empirical Literature review

Gemechu (2002) investigated the causal relationships among exports and economic growth in Ethiopia using time series data for the period between 1961 and 2000. The research had focused much in exploring the possible relation between economic growth and international trade. It also aimed at reviewing the undertaken policies by dissimilar regimes in relation to policies on exports. Also the study was attempting to analyze the structural constraints to export growth in Ethiopia. The study revealed that export positively impact on economic growth in the short run. One of the ways of achieving economic growth is promoting the exports of the nation. As one of the developing countries, Ethiopia is emphasizing to increase its exports since its inception.

The major share of Ethiopia's export has strong backward linkages with the mining sector. The results also showed that there is a bi-directional Granger-causality between mining exports and economic growth. Moreover, besides the direct effect of exports to economic growth it has been also found that it indirectly affects growth as evidenced from the simultaneous equation models

In 2013, Saaed carried out a research on the impact of exports and imports on the economic growth of Tunisia over the period 1977 to 2012. The study used Granger Causality approach for long run relationship using Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) stationarity test. Johansen and Juselius Cointegration test was used to determine the presence or otherwise of a cointegrating vector in the variables. To determine the direction of causality among the variables, at least in the short run, the Pairwise Granger

Causality was carried out. Economic growth was found to Granger cause imports and exports. The results show that there is unidirectional causality between exports, imports and economic growth. These results provide evidence that growth in Tunisia was propelled by a growth -led import strategy as well as export led strategy. Imports are thus seen as the source of economic growth in Tunisia.

Another study by Mahonye and Mandishara (2015), have been carried out when they studied the mechanism between economic growth and mining sector in Zimbabwe during the period 1970 to

2008 using time series data and OLS method was applied. The research was aiming to examine
how the mining sector impacted the economic performance of a nation endowed with vast metals and minerals The study uses human capital, property and political rights, population growth, share of mineral exports to aggregate exports, real growth in mining and foreign direct investment. The results have shown that mining sector growth, real manufacturing growth, share of mineral exports to total exports are significant variables in the economic growth determination. Findings have also show that there is an inverse relationship between mineral exports and economic growth. The government therefore should focus more to enhance mineral resources management in order to recognize economic advantages from these endowments.

To study the relationship among exports, economic growth and comparative advantage Bushra, (2010) had used the time series yearly data for the period of 1980 to 2009 on thirteen developing nations. The study was aiming at develop an understanding of casual relationship and also attempt to explore the similarities or differences among several economies that are in different development stage and how their exports are influenced by their comparative advantage which will also impact on the growth of the nation. Causal relationship among the three variables have been shown after the co-integration and vector error correction approaches were employed. Results have shown that there is bi-directional long run relationship between exports, economic growth and comparative advantage in the economies of the countries under the study. The short run causality goes from exports to

gross domestic product growth. These results support the export led growth in all other countries expect for Malaysia and Nepal on the countries under the study.

Another study by Manzoor and Saleem (2008), have been conducted to analyze the relationship between exports and economic growth in Pakistan. They used time series data for the period 1971 and 2007 and employed the Ordinary Least Square and General Methods of Moment. They used foreign direct investment, real growth in agriculture, real growth population, exchange rate and inflation as explanatory variables to economic growth. Except for exchange rate, all the other variables had significant effects on the dependent variable. Therefore, they concluded that improvements in exports would imply growth in Pakistan.

Moreover, Sayef (2015) conducted a research on investigating the relationship between exports, imports, and economic growth in Canada. In order to achieve this purpose, annual data for the periods between 1990 and 2015 was tested using Johansen co-integration analysis of Vector Auto Regression Model and the Granger-Causality tests. According to the results of the analysis, it was determined that there is a relationship between exports, imports and economic growth in Canada. On the other hand, the researcher found that there is a strong evidence of bidirectional causality from imports to economic growth and from exports to economic growth. These results provide evidence that exports and imports, thus are seen as the source of economic growth in Canada.

Olawumi (2016) investigated the impact of mineral resource endowments to economic growth of fourteen southern African countries. The time series data for the period 1990 to 2014 was used and the General Methods of Moments and Ordinary Least Squares methods were employed in order to fulfil the objectives of the study. Population growth, growth in manufacturing, real growth in services, real growth of mining, real growth in agriculture, trade openness and FDI growth proved to be the significant determinants of economic growth hence this theory validates the FDI fitness theory that for the countries under study to improve their growth, government should improve their policies to attract foreign investments in the mining sector. Therefore, the research concluded that SADC economies

should not be much concerned about the resource curse threat but to improve its development of their natural resources.

Mushiyimana (2016) analyze the contribution of mineral exports to Rwanda's total exports. Annual data covering 1975-2002 has been used to find the direction of causality in Granger sense between mineral export growth and economic growth through national export growth after employing unit root tests to see if the variables under consideration were stationary. Results of the study first suggested that mineral export growth and economic growth as measured by real gross domestic product growth are stationary at their levels, thus, they are naturally co-integrated. They are in long run equilibrium relationship. And secondly, there is feedback relationship between these variables that indicates bidirectional causation among them in the long run period.

2.3 Conclusion

The researchers managed to give a critical evaluation of the available literature on the impact of mineral exports on economic growth. The researchers also managed to give an outline of theories that has anchored this research. The results from the empirics outlined in this chapter differed across nations. In the following chapter the researchers will present the model adopted from the above outlined empirics in the analysis of the impact of mining exports on economic growth.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

Theoretical literature review and empirical studies have provided the crucial guideline in building up the research model. This chapter presents research methodology engaged in this research to answer the research questions, which is achieved through underlying model specification, variable definition and justification, diagnostic tests that are conducted as well as data sources and types in order to obtain results to be analyzed and presented in chapter four

3.1 Methodology

To achieve study objectives, the researcher will use time series data for the period 1980 to 2016. The Ordinary Least Squares method will be employed as it is the mostly used approach in the literature.

3.2 Model specification

After analyzing the literature review the researcher came up with a model adapted from Alowusi (2016) of the form:

$$Y_t = \alpha 0 + \alpha 1 TX_t + \alpha 2 MAN_t + \alpha 3 RGA_t + \alpha 4 INF_t + \alpha 5 t\ MNL_t + \alpha 6 PG_t + \varepsilon_t$$

Where:

Y_t = real per capita GDP growth

MAN = Real growth of manufacturing

MNL = share of mineral exports to GDP

RGA = Real growth of agriculture

INF = Inflation

PG = Population growth

TX = Tax Revenue

α_0= is an intercept, and

εt= is the error term.

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3.3 VARIABLE JUSTIFICATION

Population growth (PG)

It is the rate at which the aggregate population changes in the economy and expressed as a percentage. As postulated by Boserup (1965), population growth directly affects the economic growth rate through technological advancements brought by human interventions as the population increase, necessity is the mother of invention". This assertion therefore concluded that the variable has a positive effect on the economic growth of Zimbabwe. Also the empirical studies by Keen, (2010), exhibited that there is negative relationship between economic growth and population growth rates. Therefore, the researcher will expect any relationship between these variables.

Tax revenue (TX)

It is a form of government revenues obtained from taxes. Taylor (1984), denotes that Taxes includes all income obtained from duties and tariffs, profits on dividends from government institutions, interest on loans, sale of public goods and services. In Zimbabwe most tax revenue is obtained from sources like value added tax (VAT), individual and corporate incomes, customs duty, according to Keen and Mansour (2010). Eiya and Okafor (2009) observed a positive sign from their study of relationship of government expenditure and economic growth of Nigeria. Therefore, the researcher also anticipates a positive sign.

Share of Mineral exports to GDP (MNL)

For the purpose of this study, the share of mineral exports to the gross domestic product is going to be used. This is the value of the mining exports contribution to total gross domestic product. Two researches have been conducted earlier to investigate the impacts of mineral

exports to economic growth, (Osakwe, 2006; Osili, 2004). The results showed that it can have either relationship in respect with the economy. Therefore, it is in the interest of this study to know the relationship of the two in Zimbabwe. It is expected to have a positive relationship with economic growth.

Inflation (INF)

Inflation is the measure of macro-economic stability according to Fischer (1993). Inflation has been included in the model by Anyanwu, (2012) when examining the determinants of economic growth in DRC. It is hypothesized to negatively affect growth therefore its inclusion in the model is for controlling its impact on growth and also a negative relationship is expected by the researcher.

Growth in agriculture (RGA)

Katircioglu (2006), analyze the impact of agricultural sector on economic growth of North Cyprus and observed a positive relationship between the economic growth and agricultural growth. Warner, (2001) also use the real growth of agriculture in determine growth of India and also found a positive relationship. Hence the researcher will expect a positive relationship.

Error term

Gujarati (2004), state that a model should incorporate the error term to make the models stochastic. It capturers other variables that may impact on the economic growth of an economy which are not included in the model. Gujarati also pointed out that the error term helps in measuring the inaccuracy of variables in a model and human indeterminacy.

3.3 Data types and sources

This research is going to be undertaken using the secondary annual data in form of time series of the period, (1985) to (2016). The data used will be obtained from the World Bank website.

3.4 Diagnostic checks

3.4.1 Unit root test

Some notable time series analysts like Engle and Granger (1987), noted that running regressions with non-stationary data will yield spurious results. Since the research will use time series data, which is highly non-stationary, unit root test will be employed to find the order of integration before the regressions. If a variable fail to be stationary at level, then it will be first differenced to make it stationary. For the purpose of this study, the researchers will use the Augmented Dickey-Fuller Tests to test for stationarity. The stationarity test hypothesis is stated as;

$H_{O:}$ a unit root exists

$H_{1;}$ no unit root

Decision rule; if the ADF statistic is greater than the critical values at (0.01, 0.05 and 0.1), reject the null hypothesis

3.4.2 Co-integration test

Co-integration test will be the next step to see the number of co-integrating equations. This is done to determine the long-run relationship between the variables according to Madalla (1992). The test will be done using the Johansen Co-integration Test.

H_0: variables are co integrated

$H_{1:}$ no co integration

Decision rule; if critical value is less than the trace statistic, we do not reject H_0, Gujarati (2004).

3.4.3 Autocorrelation test

Autocorrelation describes the scenario whereby two error terms for different periods are correlated. This usually is as a result of inappropriate estimation of coefficients. There are

several tests that can be undergone in the determination of autocorrelation but for the purpose of this study, the researchers are going to employ Breusch-Godfrey Serial LM test.
H_0: no autocorrelation

$H_{1:}$ autocorrelation exists

Decision rule; if the p value is greater than 0.05 do not reject $H_{0.}$

3.4.5 Heteroscedasticity

Lack of uniformity in the variance of disturbance can leads to inefficiency in the process of estimating. The Breusch-Pagan test is being used in this study to test for heteroscedasticity. The hypothetical assumption is that heteroscedasticity does not exist but this hypothesis is rejected if p-value is greater than 0.05 at 10% level of significance. The hypothesis is stated as follows;

$H_{0;}$ there is homoscedasticity

$H_{1;}$ there is heteroscedasticity

Decision rule; do not reject the null hypothesis if the p value is greater than 0.05

3.4.6 Multicollinearity test

Multicollinearity describes the scenario where the explanatory variables bear a linear relationship which leads to larger confidence intervals. According to Gujarati (2009), since multicollinearity is inevitable, one can adopt the 'do nothing' approach. The hypothesis is stated as follows;

$H_{0;}$ no multicollinearity

$H_{1;}$ there is multicollinearity

Decision rule: do not reject the null hypothesis if the highest value from the correlation matrix is below 0.8 and conclude there is no multicollinearity

3.4.7 Normality

Gujarati, (2004) argues that to satisfy the CLRM assumptions the error term should be distributed normally. To conclude that the error term is distributed normally researchers can use the Jarque Bera test and the F-statistical probability value must be greater than 0.05.

$H_{0;}$ there is normality in the error distribution

$H_{1;}$ there is no normality

Decision rule; reject the null hypothesis if the p value is greater than 0.05

3.5 Conclusion

In this chapter, the researcher dwelt much on model specification and diagnostic tests carried out in this research. The results from the estimation equation and the diagnostic checks outlined in this chapter will be presented in the following chapter.

CHAPTER FOUR

RESULTS PRESENTATION AND INTERPRETATION

4.0 Introduction

In this chapter, the researcher is going to analyze and present the data on the impact of mining exports to Zimbabwe's economic growth. Econometric views (E-views) computer package was used in estimating the regression equation. This section will also test the diagnostic tests such as co-integration, unit root test, multicolineality, heteroscedasticity, autocorrelation and normality.

4.1 Diagnostic test

The researcher firstly performed the ADF test for stationarity. The Multicollinearity, autocorrelation, co integration, heteroscedasticity, normality and model specification test were also made.

4.1.1 Unit Root Test Results

To test for stationarity of all the variables included in the model, the ADF test was employed and were tested at 5% level of significance and the subsequent findings were obtained:

Table 4.1: Summary of Unit Root Test Results

Variable	ADF Statistic	Intercept	Trend	P value	Order of integration
Y	-3.455255	yes	Yes	0.0206	I (0)
PG	-0.8561142	yes	Yes	0.3367	I (1)
MAN	-6.018125	yes	Yes	0.0000	I (1)
MNL	-4.882394	yes	Yes	0.0000	I (1)
TX	-5.521033	no	Yes	0.0000	I (1)
RGA	-3.358980	no	Yes	0.0164	I (0)
INF	-5.185803	yes	Yes	0.0000	I (0)

Source: Generated from Eviews, see appendix 8

As shown in Table 4.1, the findings show that real per capita GDP growth, real growth in agriculture (RGA) and inflation (INF) were stationary at their levels that is at 1(0). Population growth (PG), real growth in manufacturing (MAN), real growth in mineral export (MNL) and tax revenue (TX) all become stationary at first difference, 1(1) which proves that they have one root. It is very important to take note of the stationarity levels of the included variables in the model since running the ADF test on the time series data would yield spurious results if the variables are not stationary. So it was concluded that the variables are cointegrated since they are stationary. The results show that all the variables are stationary at level and at first difference. Complete results on the unit root test are presented in Appendix 2.

4.1.2 Multicollinearity Test Results

Table 4.2 present the results shown on the correlation matrix after multicollinearity was tested.

Table 4. 2: Correlation Matrix

	AGR	INF	MAN	MNL	PG	TX	Y
AGR	1.000000						
INF	-0.139028	1.000000					
MAN	-0.184340	-0.248608	1.000000				
MNL	-0.307495	-0.124332	0.176187	1.000000			
PG	-0.213181	-0.107853	0.575452	0.045618	1.000000		
TX	-0.383701	-0.077190	-0.127317	-0.032084	-0.021771	1.000000	
Y	-0.082626	0.129561	-0.036589	0.186529	0.358955	0.418799	1.000000

Source: Generated from Eviews, see appendix 7

From the results in the Table 4.2, the correlation coefficients for all the variables is less than 0.8 with the highest being 0.575452 between PG and MAN. Therefore, the null hypothesis that there is no multicollinearity is not rejected. The researcher therefore concluded that there is no severe

multicollinearity among the variables included in the model since none of the variables was found to have a value which is greater than 0.8. This proves that the individual effects of the independent variables can be isolated since they do not move together in symmetric manner.

4.1.3 Autocorrelation Test Results

Table 4.3 presents the results obtained from Breusch Godfrey Serial Correlation test

Table 4.3: Summary of Autocorrelation Test

F-statistic	1.633017	Probability	0.2192
Obs*R-squared	4.037784	Probability	0.1328

Source: Generated from Eviews, see appendix 4

Table 4.3 above shows the results of the Breusch Godfrey Serial Correlation LM Test which produced a p-value of 0.2192 which is above 0.05. Therefore, the hypothesis that there is autocorrelation is not rejected and the researcher conclude that the model has no autocorrelation. This shows that successive error terms are not interdependent.

4.1.4 Model Specification Test

The CLRM states that the regression model used in regression analysis is correctly specified that is if there is no specification error or bias. In this study, Ramsey RESET test was used to test for model specification bias and Table 4.4 shows the results found

Table 4.4: Ramsey RESET test

F-statistic	0.120195	Probability	0.7321
Log likelihood ratio	0.163458	Probability	0.6860

Source: Generated from Eviews; see appendix 5

From Table 4.4, a conclusion that the model was correctly specified was made since the probability value of 0.6860 was obtained which is greater than 0.05. Therefore, the null hypothesis that the model is correctly specified is not rejected.

4.1.6 Normality

The Jarque-Bera test was used to test for the distribution of residuals and the following results were obtained.

Table 4.6: Jarque-Bera Test Results

mean	Skewness	kurtosis	Jarque-Bera stat	probability
-3.79e-15	0.021915	2.306584	0.603433	0.739548

Source: Generated from Eviews; see appendix 3

There was normal distribution in the error term in the series. This is true because the Jarque-Bera statistic of 0.603433 is greater than 0.05 and the probability of 0.73954 and the null hypothesis that there is normal distribution is not rejected.

4.1.7 Heteroscedasticity Test

The Breusch-Pagan-Godfrey test was conducted on to test for heteroscedasticity and the following findings were obtained

Table 4.7 Breusch-Pagan-Godfrey Test Results

Prob. F	Prob.Chi-square
0.4254	0.6936

Source: Generated from Eviews, see appendix 6

As shown in Table 4.7 the p-value is greater than 0.05 hence the null hypothesis that there is homoscedasticity is not rejected. Therefore, the researcher concluded that there is homoscedasiticity since the p-value is 0.6939. This means that the error variances are equally spread among the variables in the model.

4.3 Regression results

4.3.1 Presentation of Results

Table 4.8 shows the results of the OLS regression that was carried out between endogenous and exogenous variables.

Table 4. 8: Presentation of regression results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RGA	0.873439	0.410574	2.127359	0.0443
INF	0.139499	0.077472	1.800644	0.0849
MAN	-0.404642	0.319134	-1.267938	0.2175
MNL	1.380742	0.578910	2.385074	0.0257
PG	5.015178	1.466256	3.420397	0.0023
TX	0.828924	0.233587	3.548674	0.0017
C	-39.25691	13.26939	-2.958455	0.0070

R-squared = 0.640932

Adjusted R-squared = 0.621175

Durbin-Watson stat = 1.836797

F-statistic = 5.516923; Probability (F-statistic) = 0.005653

Using the results obtained in Table 4.8 the estimated model for the time under study is as follows:

Yt= -39.25691 + 0.828924TXt -0.404642MANt + 0.873439RGAt + 0.139499INFt + 1.38074MNLt + 5.015178PGt

Basing on the equation above, it shows that all other parameter coeffients have obtained their expected signs except for real growth in manufacturing probably because of exportation of primary commodities which are not processed to finished and semi-finished products in the country. It has been shown that tax revenue, real growth in agriculture, population growth and real growth in mineral export have significant effects on the growth whilst real growth in manufacturing and inflation proved not to significantly affect growth.

4.4 Interpretation of Results

After running the OLS regression the results obtained shows that, about 64% of the total variations in economic growth is explained by the explanatory variables specified in the model and 36% is explained by other variables which are not included in the model since the R^2 is 0.64. The variables included in this research are jointly significant since the F-statistic value of 5.516923 is greater than 5 and the probability of 0.005653 is significant at 5% level of significance. The absence of dubious regression is shown by the Durbin Watson statistic which is 1.836797 which is close to 2 than it is to zero. The results also show that the variables such as mineral export share, growth in agriculture, increase in total tax and growth in population under study have a significant and positive effect on economic growth given their lower than 0.05 p-values. The results are in line with many findings in the literature. The inflation rate was however, found to be insignificant in determining economic growth of Zimbabwe.

The study reveals that mining exports have positive relationship with economic growth as supported by previous researches, (Osakwe, 2006; Osili, 2004). Mineral export share has a coeffient of positive 1.380742 which also revealed a positive relationship. This postulates that a 1 % change in mining export will pose almost 1.4 % in the country's growth. Basing on the results, it implies that the possibility that discovery of many minerals from the Great Dyke have increased the total exports value and induces the economic growth positively. The results obtained match with the findings of the previous researches mentioned above when the researchers studied the impacts of mineral exports to economic growth.

Tax revenue have shown a positive relationship with economic growth of Zimbabwe since it had revealed a positive coeffient of 0.8828924. In the case of Zimbabwe, it implies that a percentage increase in the tax revenue would induce 0.09 percentage improvements in the growth of the economy in the period of 1985 to 2016, hence any adjustments in the government tax revenue will have significant impacts on the growth of the economy. This positive relationship has also been showed by previous researches such as (Mansoor, 2010; Eiya and Okafor, 2009).

It has shown that agricultural sector growth has significantly affected the growth of the Zimbabwean economy since it has a positive coefficient of 0.873439 which implies that it is significant in the economic determination. This economically implies that a % increase in agricultural sector will enhance an increase of 0.9% in the growth of the economy. These findings have conformed to the finding by (Warner 2001; Katircioglu 2006) which have also show the positive relationship.

The coeffient of population growth was also found to be positive with a value of 5.015178 and is statistically significant at the 5 percent level of significance. The coeffient of population growth have proved to be the highest of all the explanatory variables included in the model. The findings revealed that in the case of Zimbabwe a percentage increase in the population growth would approximately results in 5 percent increase in the economic growth. This economically means that in the period under study the increase in the population have promoted the growth of the Zimbabwean economy. These results conformed to the previous findings by Makina, (2010) which also showed a positive relationship between population growth and economic growth. However, the findings have shown different impacts of population growth on economic growth by Keen, (2010) which have shown an inverse relationship between the two variables.

4.5 Conclusion

This section has presented the results diagnostic test outlined in the former section. The section also present the interpretation results obtained from the E-views package. From the findings four variables have proved to be significant at 5% level of significance while the other two variables included in the model have proved to insignificantly determine the economic growth. The preceding chapter will give recommendations and conclusions of the research.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This section of the research will provide a summary of the major findings of the study. Also this chapter will provide the policy recommendations and possible suggestions for further researches.

5.1 Summary of the Research

The research was investigating the relationship between the mining export and economic growth of Zimbabwe using time series data for the period 1985 to 2016 as well as employing the Ordinary Least Squares (OLS) approach. The results obtained showed that mineral export, real growth in agriculture, population growth and tax revenue significantly affect economic growth at 5% level of significance. More so the results also showed that real growth in manufacturing and inflation have insignificant influence on the economic growth of Zimbabwe in the period under study. The research objective of examination of the impact of mining export growth to economic growth has been met. Basing on the findings, the research proposes that enhancement of the mining sector export will largely contribute to the economic growth of the country given its bulk mineral resources.

5.2 Conclusions

From the results found, there is a long run relationship between mineral export growth and economic growth of Zimbabwe. The research concludes that increase in mineral exports poses an improvement of economic growth since it has a positive coefficient which lead to the rejection of the null hypothesis that mineral export growth does not lead to economic growth of the country. The results have also shown that growth in agriculture, increase in tax revenue and population growth have a significant and positive impact to economic growth in Zimbabwe. On the other hand, real growth in manufacturing and inflation was found to insignificantly affect economic growth of Zimbabwe in the period under study.

5.3 Policy Recommendations

It is therefore recommended that the government have to mostly prioritize the production and exportation of mining output in its policy formulation. This would ensure that the country would gain foreign currency earnings enough to counter the demand for the imported products such as fuel and energy in the country. The liquidity problems currently in the country can be reduced to minimum if the increase in mineral exports could be sustained.

The government should also focus more on the international market of their agricultural products and acquiring necessary inputs needed in the production to enhance improvements in the growth of the economy. This is because growth in agriculture proved to be significant in determining economic growth of Zimbabwe. The government could do this by acquiring the necessary equipment needed to enhance production and value addition of their agricultural products by processing them such that they will attain high prices in the international market.

Population growth has also showed to be a significant variable in determining the economic growth of Zimbabwe. Increase in population alone is not sufficient in the growth of an economy but if the increased population acquire necessary education it can lead to the growth. Therefore, the government should invest in the development of the educational facilities to accommodate the growing population in an attempt to boost its economic growth.

The study also revealed that increase in tax revenue of the government have a significant effect in determining the economic growth of the economy. The tax value is determined by the tax base that is the number of people paying tax and the amount of taxes they pay. In order for the tax revenue to grow in line with the growth in the economy, government should set a tax regime which accommodates a larger base and pay a lower tax price.

5.4 Suggestions for future studies

The researcher suggests that since there is bi-directional relationship between real growth in mineral export and economic growth future studies can also focus on the direction of

causality that’s exist between the two variables. The researcher suggests that some future researches can be focused on the relationship between the mineral exports and aggregate exports of Zimbabwe

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APPENDICES

APPENDIX 1: DATA SET

year	Inf	y	mnl	Agr	man	Pg	tx
1985	-17.0166	3.033338	1.224261	22.67357	19.85	3.844696	17.47
1986	8.0258	-1.51062	0.990022	17.76078	21.44678	3.72408	18.05
1987	7.1893	-2.30043	1.267379	14.40753	22.68941	3.595706	18.91
1988	7.7851	4.069474	2.198848	16.38215	21.51136	3.413501	19.13
1989	0.7929	2.031431	2.061936	14.93031	25.59664	3.173956	20.77
1990	-0.9204	2.031431	1.229271	16.4763	22.7557	2.901111	21.57
1991	-6.7772	2.905069	6.051258	15.26726	27.15617	2.619385	19.96
1992	-14.1297	-11.0581	6.52947	7.413793	29.53704	2.356845	22.05
1993	-3.7911	-1.0138	5.22415	15.03891	23.01191	2.126068	22.97
1994	-3.8957	7.160025	5.285507	18.9734	21.16705	1.938141	19.85
1995	3.0385	-1.64156	3.148431	15.23519	21.79525	1.781822	23.16
1996	8.9843	8.464391	3.426345	21.77111	18.78067	1.651323	22.6
1997	-2.8791	0.999342	2.795411	18.93408	18.00749	1.522276	26.05
1998	-27.0486	1.299754	0.084575	21.78853	16.62786	1.37431	21.67
1999	8.0068	-2.22579	0.214712	19.17668	16.35255	1.197351	21.07
2000	0.6279	-4.3101	0.505309	18.2616	15.60509	1.012809	19.56
2001	-0.1309	0.259089	0.212757	17.30703	14.55854	0.828615	18.86
2002	2.713	-9.87326	0.459573	14.02901	13.25142	0.691377	21.98
2003	8.8013	-17.8713	1.254203	16.5934	13.64718	0.64975	24
2004	7.6115	-6.86622	2.532609	19.57505	15.11653	0.730571	23.65
2005	5.1366	-6.89531	2.690458	18.57728	16.3831	0.901978	20.07
2006	-2.0177	-4.81668	5.050159	20.28182	16.88896	1.099291	23.65
2007	0.8949	-5.13968	6.849455	21.59791	16.40135	1.285552	4
2008	1.3492	-19.0568	3.828356	19.39889	16.65897	1.475502	3.3
2009	74.2982	6.7246	1.842692	15.07177	15.47578	1.657381	17.3
2010	3.711	13.18718	3.941126	14.54142	13.9335	1.82638	30
2011	3.9105	13.90394	5.921995	13.20623	13.97816	1.995816	23.76
2012	2.3028	11.10561	5.800272	13.15408	13.56506	2.150523	26.23
2013	4.1844	2.867133	4.187337	12.00176	12.82006	2.257867	24.43
2014	1.3387	0.383663	4.171097	14.00744	11.91249	2.307451	26.67
2015	-3.1804	-0.92742	3.946536	12.53466	11.91596	2.313958	27.2
2016	-2.98	-1.6311	4.000211	15.33817	10.49163	2.323457	29.62

Source; World Bank 2016

APPENDIX 2: REGRESSION RESULTS

Regression results

Dependent Variable: Y

Method: Least Squares

Date: 09/22/17 Time: 03:54

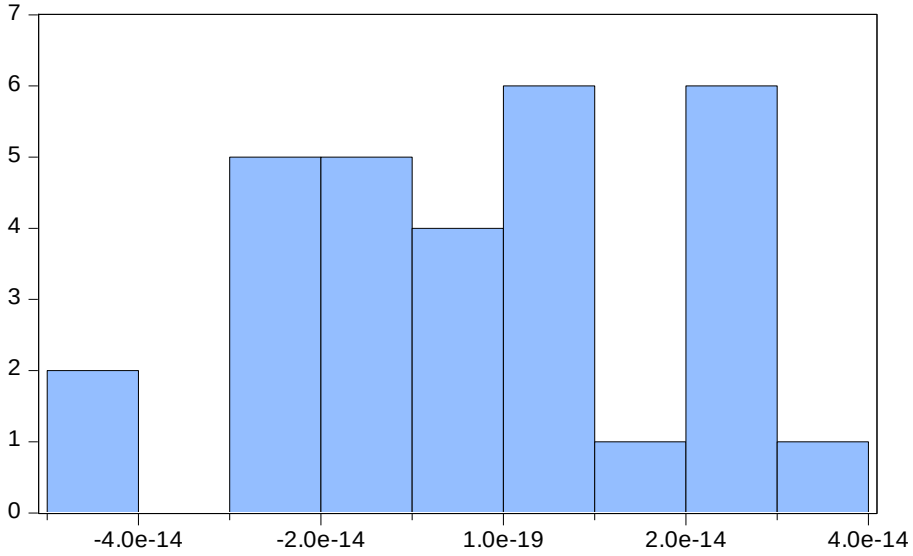
Sample (adjusted): 1985 2014

Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AGR	0.873439	0.410574	2.127359	0.0443
INF	0.139499	0.077472	1.800644	0.0849
MAN	-0.404642	0.319134	-1.267939	0.2175
MNL	1.380742	0.578910	2.385074	0.0257
PG	5.015178	1.466256	3.420397	0.0023
TX	0.828924	0.233587	3.548674	0.0017
C	-39.25691	13.26939	-2.958455	0.0070

R-squared	0.640932	Mean dependent var	-0.471809
Adjusted R-squared	0.621175	S.D. dependent var	7.849956
S.E. of regression	5.972287	Akaike info criterion	6.613101
Sum squared resid	820.3689	Schwarz criterion	6.940047
Log likelihood	-92.19651	Hannan-Quinn criter.	6.717693
F-statistic	5.516923	Durbin-Watson stat	1.836797
Prob(F-statistic)	0.003653		

APPENDIX 3 :NORMALITY TEST



Series: Residuals	
Sample 1985 2014	
Observations 30	
Mean	-3.79e-15
Median	-7.11e-15
Maximum	3.55e-14
Minimum	-4.97e-14
Std. Dev.	2.23e-14
Skewness	0.021915
Kurtosis	2.306584
Jarque-Bera	0.603433
Probability	0.739548

APPENDIX 4: AUTOCORRELATION TEST RESULTS

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.633017	Prob. F(2,21)	0.2192
Obs*R-squared	4.037784	Prob. Chi-Square(2)	0.1328

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 09/22/17 Time: 05:38

Sample: 1985 2014

Included observations: 30

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AGR	0.372584	0.455698	0.817610	0.4228
INF	0.054611	0.081253	0.672110	0.5088
MAN	0.116179	0.321283	0.361609	0.7213
MNL	0.235851	0.581094	0.405874	0.6889
PG	0.092779	1.428512	0.064948	0.9488
TX	-0.004173	0.230958	-0.018067	0.9858
C	-9.445127	14.01737	-0.673816	0.5078
RESID(-1)	0.456850	0.255571	1.787566	0.0883
RESID(-2)	0.003689	0.236598	0.015594	0.9877

R-squared	0.134593	Mean dependent var	-9.77E-15
Adjusted R-squared	-0.195086	S.D. dependent var	5.318701
S.E. of regression	5.814404	Akaike info criterion	6.601879
Sum squared resid	709.9532	Schwarz criterion	7.022238
Log likelihood	-90.02818	Hannan-Quinn criter.	6.736355

F-statistic	0.408254	Durbin-Watson stat	1.995218
Prob(F-statistic)	0.903114		

APPENDIX 5

MODEL SPECIFICATION TEST RESULTS

Ramsey RESET Test

Equation: UNTITLED

Specification: Y AGR INF MAN MNL PG TX C

Omitted Variables: Squares of fitted values

	Value	Df	Probability
t-statistic	0.346692	22	0.7321
F-statistic	0.120195	(1, 22)	0.7321
Likelihood ratio	0.163456	1	0.6860

F-test summary:

	Sum of Sq.	Df	Mean Squares
Test SSR	4.457663	1	4.457663
Restricted SSR	820.3689	23	35.66821
Unrestricted SSR	815.9113	22	37.08688
Unrestricted SSR	815.9113	22	37.08688

LR test summary:

	Value	Df
Restricted LogL	-92.19651	23
Unrestricted LogL	-92.11478	22

Unrestricted Test Equation:

Dependent Variable: Y

Method: Least Squares

Date: 09/22/17 Time: 05:15

Sample: 1985 2014

Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AGR	0.972136	0.506280	1.920153	0.0679
INF	0.156658	0.093222	1.680488	0.1070
MAN	-0.328162	0.393142	-0.834717	0.4129
MNL	1.417685	0.599851	2.363397	0.0274
PG	5.129281	1.530927	3.350441	0.0029
TX	0.917548	0.349396	2.626095	0.0154
C	-45.05494	21.51205	-2.094405	0.0480
FITTED^2	0.016265	0.046916	0.346692	0.7321

R-squared	0.543427	Mean dependent var	-0.471809
Adjusted R-squared	0.398153	S.D. dependent var	7.849956
S.E. of regression	6.089900	Akaike info criterion	6.674319
Sum squared resid	815.9113	Schwarz criterion	7.047971
Log likelihood	-92.11478	Hannan-Quinn criter.	6.793853
F-statistic	3.740719	Durbin-Watson stat	1.418333
Prob(F-statistic)	0.008122		

APPENDIX 6

HETEROSCEDASTICITY TEST

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.040244	Prob. F(6,23)	0.4254
Obs*R-squared	6.403368	Prob. Chi-Square(6)	0.3796
Scaled explained SS	3.874759	Prob. Chi-Square(6)	0.6936

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 09/22/17 Time: 05:34

Sample: 1985 2014

Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	99.09063	88.30513	1.122139	0.2734
AGR	-0.766222	2.732289	-0.280432	0.7817
INF	-0.312625	0.515558	-0.606383	0.5502
MAN	-2.266583	2.123770	-1.067245	0.2969
MNL	-1.624176	3.852526	-0.421587	0.6772
PG	-10.87576	9.757638	-1.114590	0.2765
TX	0.445717	1.554475	0.286732	0.7769
R-squared	0.213446	Mean dependent var		27.34563

Adjusted R-squared	0.008258	S.D. dependent var	39.90948
S.E. of regression	39.74436	Akaike info criterion	10.40378
Sum squared resid	36331.13	Schwarz criterion	10.73072
Log likelihood	-149.0567	Hannan-Quinn criter.	10.50837
F-statistic	1.040244	Durbin-Watson stat	2.802524
Prob(F-statistic)	0.425444		

APPENDIX 7

MULTICOLLINEARITY TEST RESULTS

	AGR	INF	MAN	MNL	PG	TX	Y
AGR	1.000000	-0.139028	-0.184340	-0.307495	-0.213181	-0.383701	-0.082626
INF	-0.139028	1.000000	-0.248608	-0.124332	-0.107853	-0.077190	0.129561
MAN	-0.184340	-0.248608	1.000000	0.176187	0.575452	-0.127317	-0.036589
MNL	-0.307495	-0.124332	0.176187	1.000000	0.045618	-0.032084	0.186529
PG	-0.213181	-0.107853	0.575452	0.045618	1.000000	-0.021771	0.358955
TX	-0.383701	-0.077190	-0.127317	-0.032084	-0.021771	1.000000	0.418799
Y	-0.082626	0.129561	-0.036589	0.186529	0.358955	0.418799	1.000000

APPENDIX 8

COINTEGRATION TEST RESULTS

Null Hypothesis: RESID01 has a unit root

Exogenous: None

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.691130	0.0006
Test critical values:	1% level	-2.647120	
	5% level	-1.952910	
	10% level	-1.610011	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(RESID01)

Method: Least Squares

Date: 09/22/17 Time: 04:58

Sample (adjusted): 1986 2014

Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID01(-1)	-0.684726	0.185506	-3.691130	0.0010

R-squared	0.326823	Mean dependent var	-0.166831
Adjusted R-squared	0.326823	S.D. dependent var	6.256026
S.E. of regression	5.132905	Akaike info criterion	6.143095
Sum squared resid	737.7078	Schwarz criterion	6.190243
Log likelihood	-88.07487	Hannan-Quinn criter.	6.157861
Durbin-Watson stat	1.906865		

APPENDIX 8

UNIT ROOT TEST RESULTS

APPENDIX 8.1

UNIT ROOT TEST RESULTS FOR MINERAL EXPORTS

Null Hypothesis: D(MNL) has a unit root

Exogenous: None

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.882394	0.0000
Test critical values:	1% level	-2.650145	
	5% level	-1.953381	
	10% level	-1.609798	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(MNL,2)

Method: Least Squares

Date: 09/22/17 Time: 04:18

Sample (adjusted): 1987 2014

Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MNL(-1))	-0.937432	0.192002	-4.882394	0.0000

R-squared	0.468892	Mean dependent var	0.007786
Adjusted R-squared	0.468892	S.D. dependent var	2.276277
S.E. of regression	1.658886	Akaike info criterion	3.885230

Sum squared resid	74.30133	Schwarz criterion	3.932809
Log likelihood	-53.39322	Hannan-Quinn criter.	3.899775
Durbin-Watson stat	1.951452		

APPENDIX 8.1

Unit root test for tax revenue

Null Hypothesis: D(TX) has a unit root

Exogenous: None

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.521033	0.0000
Test critical values:	1% level	-2.644302	
	5% level	-1.952473	
	10% level	-1.610211	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(TX,2)

Method: Least Squares

Date: 09/22/17 Time: 04:26

Sample (adjusted): 1987 2016

Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(TX(-1))	-1.027954	0.186189	-5.521033	0.0000

R-squared	0.512426	Mean dependent var	0.061333
Adjusted R-squared	0.512426	S.D. dependent var	8.019461
S.E. of regression	5.599706	Akaike info criterion	6.316070
Sum squared resid	909.3445	Schwarz criterion	6.362777
Log likelihood	-93.74105	Hannan-Quinn criter.	6.331012
Durbin-Watson stat	2.009185		

APPENDIX 8.2

Unit root test for population growth

Null Hypothesis: D(PG) has a unit root

Exogenous: None

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.856142	0.3367
Test critical values:	1% level	-2.644302	
	5% level	-1.952473	
	10% level	-1.610211	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(PG,2)

Method: Least Squares

Date: 09/22/17 Time: 04:37

Sample (adjusted): 1987 2016

Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PG(-1))	-0.039303	0.045907	-0.856142	0.3989

R-squared	0.014867	Mean dependent var	0.004337
Adjusted R-squared	0.014867	S.D. dependent var	0.044042
S.E. of regression	0.043713	Akaike info criterion	-3.389560
Sum squared resid	0.055415	Schwarz criterion	-3.342853
Log likelihood	51.84340	Hannan-Quinn criter.	-3.374618
Durbin-Watson stat	0.387997		

APPENDIX 8.3

Unit root test for agriculture growth

Null Hypothesis: AGR has a unit root

Exogenous: Constant

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.455255	0.0164
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(AGR)

Method: Least Squares

Date: 09/22/17 Time: 04:42

Sample (adjusted): 1986 2016

Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AGR(-1)	-0.526088	0.152257	-3.455255	0.0017
C	8.526458	2.587391	3.295389	0.0026

R-squared	0.291625	Mean dependent var	-0.236626
Adjusted R-squared	0.267199	S.D. dependent var	3.332228
S.E. of regression	2.852515	Akaike info criterion	4.996620
Sum squared resid	235.9683	Schwarz criterion	5.089135
Log likelihood	-75.44761	Hannan-Quinn criter.	5.026777

F-statistic	11.93879	Durbin-Watson stat	1.978208
Prob(F-statistic)	0.001714		

APPENDIX8.4

Unit root test for per capita GDP

Null Hypothesis: Y has a unit root

Exogenous: Constant

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.358980	0.0206
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(Y)

Method: Least Squares

Date: 09/22/17 Time: 04:47

Sample (adjusted): 1986 2016

Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	-0.556862	0.165783	-3.358980	0.0022
C	-0.421382	1.261362	-0.334069	0.7407

R-squared	0.280089	Mean dependent var	-0.150466
Adjusted R-squared	0.255264	S.D. dependent var	8.121379
S.E. of regression	7.008594	Akaike info criterion	6.794492
Sum squared resid	1424.491	Schwarz criterion	6.887007
Log likelihood	-103.3146	Hannan-Quinn criter.	6.824650

F-statistic	11.28275	Durbin-Watson stat	1.970321
Prob(F-statistic)	0.002203		

APPENDIX 8.5

Unit root test for inflation

Null Hypothesis: INF has a unit root

Exogenous: None

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.185803	0.0000
Test critical values:	1% level	-2.641672	
	5% level	-1.952066	
	10% level	-1.610400	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(INF)

Method: Least Squares

Date: 09/22/17 Time: 04:04

Sample (adjusted): 1986 2016

Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF(-1)	-0.926011	0.178567	-5.185803	0.0000

R-squared	0.472440	Mean dependent var	0.452794
Adjusted R-squared	0.472440	S.D. dependent var	21.14439
S.E. of regression	15.35787	Akaike info criterion	8.332859
Sum squared resid	7075.923	Schwarz criterion	8.379117
Log likelihood	-128.1593	Hannan-Quinn criter.	8.347938
Durbin-Watson stat	1.943633		

APPENDIX 8.6

Unit root test for manufacturing growth

Null Hypothesis: D(MAN) has a unit root

Exogenous: None

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.018125	0.0000
Test critical values:	1% level	-2.644302	
	5% level	-1.952473	
	10% level	-1.610211	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(MAN,2)

Method: Least Squares

Date: 09/22/17 Time: 04:11

Sample (adjusted): 1987 2016

Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MAN(-1))	-1.108609	0.184212	-6.018125	0.0000

R-squared	0.554852	Mean dependent var	-0.100704
Adjusted R-squared	0.554852	S.D. dependent var	3.105194
S.E. of regression	2.071766	Akaike info criterion	4.327445
Sum squared resid	124.4742	Schwarz criterion	4.374152
Log likelihood	-63.91167	Hannan-Quinn criter.	4.342387
Durbin-Watson stat	2.018554		