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EXCHANGE RATE VOLATILITY AND AGRICULTURAL EXPORTS: THE CASE OF ZAMBIA, 1991 – 2011.

A dissertation submitted to the University of Zambia in partial fulfillment of the requirement for the award of the degree of Master of Arts in Economics

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DEDICATION

This study is dedicated to my father Mr. Patrick .S. Ngoma, my mother Dr. Catherine .A. Ngoma, and my sister Helen Ngoma. Your encouragement pertaining to my education has been of great inspiration

Abstract

The aim of the study was to investigate the impact of real exchange rate volatility on Zambia's agricultural exports in an export demand framework this includes relative prices which are a measure of competitiveness and foreign incomes capturing foreign economic activity between 1991 and 2011.The study utilized annual data of exchange rate and trade flow of real agricultural exports of Zambia for the period 1991-2011. The study employed estimation techniques such as the Unit Root, Johansen Cointegration and Error Correction Model. The Exponential Generalised Autoregressive Conditional Heteroskedasticity (EGARCH) was used to measure exchange rate volatility as it takes into account periods of high and low exchange rate uncertainty. The results obtained from the econometric analysis revealed that exchange rate volatility has a negative long run effect on Zambia's agricultural exports. The results suggest that Zambia' institutional reforms must ensure a sufficient degree of macroeconomic stability so as to maintain a stable currency and minimize the degree of exchange rate volatility.

Keywords: Real exchange rate, volatility, Cointegration techniques and Error Correction Model, Agricultural Exports.

DECLARATION

I, Elina Ngoma, declare hereby that this study is a true reflection of my own research, and that this work, or part thereof has not been submitted for a degree in any other institution of higher education.

Signed:……..

Date:….……

CERTIFICATE OF APPROVAL

This dissertation of **ELINA NGOMA** is approved as partial fulfillment of the requirements for the award of the Master of Arts in Economics by the University of Zambia.

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LIST OF ACRONYMS

ADF	Augmented Dickey Fuller
AGOA	African Growth and Opportunity
AIC	Akaike Information Criteria
BOZ	Bank of Zambia
CSO	Central Statistical Office
COMESA	Common Market for Eastern and Southern Africa
DRC	Democratic Republic of Congo
EBA	Everything But Arms
ECM	Error Correction Model
EGARCH	Exponential Generalised Autoregressive Conditional Heteroskedasticity
EU	European Union
GARCH	Generalised Autoregressive conditional Heteroskedasticity
GSP	Generalised System of Preferences
GDP	Gross Domestic Product
FAO	Food and Agriculture Organisation
LDC	Least Developed Country
MFN	Most Favoured Nation
RER	Real Exchange Rate
SADC	Southern Africa Development community
SSA	Sub Saharan Africa
SDR	Special Drawing Right
UNDP	United Nations Development Programme
VAT	Value Added Tax
ZDA	Zambia Development Agency

CHAPTER ONE

INTRODUCTION

This chapter presents the background of the study. It also highlights on how agricultural exporters have been affected by the volatility in the exchange rate. The chapter further gives an explanation of the statement of the problem, research objectives and significance of the study. The Scope of the study and the Structure of the dissertation are also discussed.

1.1 Background of the Study

Agriculture is one of the major sectors in the positive economic performance of many countries in Sub-Saharan Africa. The sector shoulders a great deal of the economic burden of these countries with most of their problems being linked directly or indirectly to the performance of the agricultural sector. The dominance of agriculture in African economies is indicated by its substantial contribution to GDP, foreign exchange earnings and employment creation. The sector has an important and potentially pivotal role in enhancing overall economic growth and poverty reduction. In 1993, the World Bank observed that the sector contributed an average of 35 percent of GDP, 40 percent of export earnings and close to 70 percent of employment in Africa. Agriculture in Zambia consists of forestry, growing crops, fishing, and raising of livestock and poultry (Cuts International, 2011).

Zambia has a total land surface of about 75 million hectares of which 47 per cent is arable land. It also has 40 percent of the water resources in Central and Southern Africa which are vital for irrigation. Since 1964, the mining sector has been the main earner of foreign exchange. The role of agriculture was however, simply regarded as that of producing food for domestic consumption. The agricultural policies were restrictive, distortionary and counterproductive due

to heavy government intervention and participation and the dominance of one crop (maize). Cash crops and excess agricultural output were exported through government owned statutory marketing boards. However, efforts were made to integrate the agricultural sector with manufacturing of selected commodities within the country. This was more apparent in the textiles and beverages subsectors. Overall, government policies and strategies failed to stimulate sustained growth in the sector. The sector also lacked private sector participation in the areas of agricultural marketing, input supply and processing. (Cuts International, 2011).

Nonetheless, during the implementation of the IMF structural adjustment programmes in the 1990s, the Zambian government took interest in diversifying the economy as a way of reducing its dependence on mining and exporting of minerals. According to Samen (2010), a diversified portfolio could help minimize volatility in export earnings and boost overall growth by replacing commodities with positive price trends products and adding value through additional processing or marketing. Diversifying away from traditional exports is intended to raise growth rates as traditional exports face limited demand due to their low income elasticity and declining terms of trade and to lower variability of growth rates as traditional exports are particularly vulnerable to exogenous shocks.

Subsequently, the agricultural sector was identified as one of the key sectors that would positively contribute to Zambia's export earnings, poverty reduction and overall economic growth. With only 14 percent of cultivable land and 10 percent of the country's water resources utilized in the 1990s, Zambia had considerable untapped potential for agricultural development. Agriculture and agro-processing industries provided the greatest potential for export diversification. The priority agricultural products included floriculture and fresh vegetables, cotton, tobacco, coffee and paprika (Sajeev, 2004).

Since the liberalization of the economy, economic activities have slightly diversified with the establishment of private agricultural product processing facilities and private sector participation in out grower schemes and export promotion initiatives. More primary agricultural products are being produced and exported (Cuts International, 2011).

Nevertheless, the government's effort to revive the agriculture sector and stimulate agricultural exports continues to be challenged with policy irregularity and reversals coupled with persistent exchange rate volatility. Since the move to flexible exchange rate management in 1992, the Zambian kwacha has experienced high levels of volatility. The volatility in the exchange rate is

believed to create uncertainty to agriculture export promotion. The most affected have been producers of horticultural, floricultural and other non-traditional agricultural exports (Musonda, 2009:2). Therefore, this study attempts to contribute to existing literature by analysing the impact of exchange rate volatility on Zambia's agricultural exports between 1991 and 2011.

Economic theory suggests that exchange rate volatility creates uncertainty with regard to the prices exporters would have to pay and receive in the future. The argument is that higher exchange-rate volatility leads to higher cost for risk-averse traders and to less foreign trade. This is because the exchange rate is agreed on at the time of the trade contract, but payment is not made until the future delivery actually takes place. If changes in the exchange rate become unpredictable, this creates uncertainty about the profits to be made and, hence, reduces the benefits of international trade. Therefore, uncertain revenue will encourage producers to switch away from foreign markets to domestic ones, which in turn will cause a reduction in the level of exports (Ozturk, 2006).

Empirical evidence shows that the impact of exchange rate volatility on exports varies widely. Some authors, for example Wei,(1991) and Clark, (1973) have found a negative relationship between exchange rate volatility and exports and others such as De Grauwe, (1992) and Sercu, (1992) have found a positive relationship. The results found are however ambiguous depending on which assumptions used in relation to the exchange rate volatility. One of these issues is whether to use the nominal or the real exchange rate. (Backman, 2006).

There has been little work done on the impact of exchange rate volatility on agricultural exports in Zambia. However, Musonda (2009) investigated the impact of exchange rate volatility on Zambia's non-traditional exports from 1964 to 2008.In contrast to the work done by Musonda (2009), this study specifically focuses on agricultural exports. It also incorporates the Exponential Generalised Autoregressive Conditional Heteroskedasticity Model (EGARCH). Unlike the GARCH model used by Musonda (2009) to measure exchange rate volatility, the EGARCH model does not have any restrictions on the parameters in the model. In addition, the EGARCH model always produces a positive conditional variance independently of the signs of the estimated parameters in the model and no restrictions are needed. This is preferable when the restrictions in the GARCH model sometimes create problems when estimated parameters violate the inequality constraints.

1.2 Problem Statement

Despite the increase in the volume and value of Zambia's agricultural exports, Zambia still remains heavily dependent on copper exports. These contribute a significant amount to foreign exchange earnings. The economy consequently, continues to be vulnerable to the frequent fluctuations in copper prices which adversely affect the exchange rate. The real exchange rate is an important relative price which connects local and world markets for goods and assets. A fall in the real exchange rate reduces export earnings whereas a rise in the real exchange rate increases export earnings. Hence, unpredictable and persistent movements in the real exchange rate may eventually affect export earnings for Zambian agricultural exporters. It is believed that an increase in the fluctuations of the exchange rate lowers export earnings whilst a decrease in the fluctuations increases export earnings for exporters. Exchange rate variability may also bring about an increase in uncertainty or risk and can cause the agricultural export sector not to grow.

Many empirical findings support the hypothesis that an increase in exchange rate variability leads to a decrease in trade flows because in most international transactions, goods are denominated in terms of the currency of either the exporting or importing country. Therefore, unanticipated variation in the exchange rate can adversely affect trade flows as it affects the value of exports and imports .It is therefore important to investigate the impact of exchange rate volatility on Zambia agricultural exports.

1.3 General Objective

To analyse the relationship between real exchange rate volatility and agriculture exports in Zambia.

1.4 Objectives of the study

The objectives of the study were as follows:

a) To understand the factors affecting agricultural exports
b) To analyse the impact of exchange rate volatility on agricultural exports.
c) To analyse the impact of income of importing countries on agricultural exports.
d) To analyse the impact of relative prices on agricultural exports.

1.5 Hypotheses

The hypotheses that were tested are as follows:

1) There is a negative relationship between real exchange rate volatility and agricultural exports.

2) There is a positive relationship between income of importing countries and the demand for agricultural exports.
3) There is a negative relationship between relative prices and agricultural exports.

1.6 Significance of the study

The Zambian economy continues to be dominated by the mining sector. However, the government continues to promote diversification of the economy as a way of increasing its export earnings.Thus, the results of this study can be used by policy makers in the formulation of agricultural policies that will enhance the performance of the agricultural sector. Improving the agricultural sector will increase the production of agricultural products that can be sold in both domestic and foreign markets. This will further lead to a positive contribution to economic growth. The study will also contribute useful information to the already existing body of knowledge on exchange rates and agricultural exports. Additionally, the results will provide insight into the factors that affect agricultural exports.

1.7 Scope of the study

The study covers the period 1991 -2011. This period was chosen because of the availability of the data that was needed to undertake this study. Data before 1990 was excluded because of data inconsistency and unreliability.

1.8 Structure of the dissertation

The structure of the dissertation is as follows: chapter two gives an overview of the Agriculture sector and exchange rate policies. Chapter three focuses on the review of relevant literature to the problem under discussion. Chapter four presents the research methodology. Chapter five

provides the empirical results and discussion. Chapter six concludes the study and provides policy recommendations based on the findings of the research

CHAPTER TWO

OVERVIEW OF AGRICULTURE SECTOR AND EXCHANGE RATE POLICIES

2.0 Introduction

This chapter presents an overview of the Agriculture Sector and the exchange rate policies in Zambia. It further highlights on agricultural policy reforms and barriers to agricultural export growth and performance in Zambia.

2.1 Overview of the Agriculture Sector and Exports

Agriculture is by far the largest employer in the economy. The sector absorbs about 60% of the labour force while services and industry only absorbs 9% and 6% respectively. The sector generates between 18 and 20 % of GDP. Overall, it is estimated that 70% of Zambia's rural population are engaged in agriculture, largely subsistence farming. The most commonly produced agricultural crops include maize, cassava, fresh vegetables, sugarcane, wheat and groundnuts. Beef and dairy cattle are generally raised for domestic consumption. Major export crops include cotton, tobacco, maize, sugar, green coffee, peas, beans and fresh vegetables (Kapuya, 2011).

The sector comprises of subsistence farmers, emergent and commercial farmers. Subsistence farmers produce over 70 percent of the national food requirements. They play a critical role in the supply of staple foodstuffs, mainly maize. Despite this role, at least 25 percent of the subsistence farmers are food insecure each year. Most of the crops they produce are not captured in the post-harvest surveys. This makes it difficult to assess outputs against exports in this area. Most of the agricultural gains are often confined to large scale producers and the emergent farmers (Cuts International, 2011).

Most of the agricultural exports are produced by commercial farmers. Zambia has however committed itself to the commercialization of subsistence farmers by promoting higher value crops as a way of reducing poverty in rural areas. Though, it is difficult to commercialize all small scale producers. This is because the poorest producers face daunting challenges such as access to finances, making it difficult for them to participate in high risk yet high value and

specialized input intensive technologies required for cash crop production (Cuts International, 2011).Table1 gives an overview of sector contribution to GDP.

Table 1: Sector Contribution to GDP

Sector	Value added to GDP%		Real Sector GDP% growth
	1991-2000	**2001-2012**	**1995-2012**
Agriculture	16.4	13.6	4.2
Mining	7.9	8.5	1.6
Manufacturing	20.0	10.20	3.4
Services	55.7	51.7	39.9
total	100	84	49.1

Source: Researcher's estimates, ZDA, CSO database

The services sector as shown in table 1 has been the largest contributor to GDP, the sector contributed 55.7% and 51.7% during the period 1991-2000 and 2001 -2012. It is followed by the manufacturing sector which contributed 20.0% and 10.2%, respectively. The agricultural sector in turn contributed 16.4% and 13.9%. The lowest contribution came from the mining sector, at 7.9% and 8.5%.

The annual growth rate of the agriculture sector between 1995 and 2012 was 4.2%, the growth in the agriculture sector has mainly been on account of good weather and increased private investment. The sector continues to be dominated by the production of maize and other cash crops, such as tobacco, sorghum, groundnuts and cotton.

The mining sector experienced the lowest growth rate. Its annual growth rate was at 1.6% between 1991-2012. Although the mining sector is the lowest generator of formal sector employment in the country, it is the largest employer on the copper belt, where it is the economic anchor of the region, being the largest source of employment in terms of both direct and indirect employment. It is also the generator of substantial secondary economic activities on the copper belt. Furthermore, the sector is the major source of export earnings for the country (Ndulo et al, 2003).

The manufacturing sector performed well between 1995 and 2011, the sectors annual growth rate was 3.5%. This was mainly because of the rapid growth in the food processing, wood and wood products, paper and paper products, beverages and tobacco and wires and copper cables sub-

sectors. Most production is for local consumption. The surplus exported to regional and European markets. The latter being the major destination for products such as sugar, copper cables and wires. Moreover, most of the inputs in the manufacturing sector are imported into the country (Ndulo et al, 2003).

The services sector has been the main contributor to GDP and employment in the country over the years. The sectors annual growth grew was at 39.9% between the period of 1995 to 2012, driven by the transport, storage, communications, tourism, construction and wholesale and retail trade sub-sectors. It is also the largest source of formal sector employment.

2.2 Performance of Agricultural Exports

Zambia produces a wide range of agricultural products. Some of the country's agricultural products are sold in external markets. Table 2 gives the composition of Zambia's agricultural exports between 1997-2012.The major component of agricultural exports is primary agriculture. Other components include processed and refined goods, floricultural, horticultural, leather and leather products, animal products and garments. In 2012, 78 % of agricultural exports came from primary agriculture. The least contribution came from animal products at 1%.

Table 2: Structure of Zambia's Trade in Prominent Agriculture Exports (%)

Product	1997	2001	2004	2007	2012
Animal Products	2	1	1	1	1
Floriculture and horticulture	27	35	21	18	8
Primary Agriculture	55	25	53	45	78
Processed and Refined foods	4	21	16	28	9
Garments Leather Products & textiles	11	19	9	7	4.3
Totalagric exports(US$ 000)	36 223	206 174	306 584	406 605	458856

Source: CSO database, ZDA database.

Table 3 presents Zambia's main export markets for its agricultural products for selected years.SADC has been the major market for Zambia's agricultural products as is evident by its percentage share of agricultural exports. As of 2012, SADC accounted for 45% of Zambia's agricultural exports. The second largest market is COMESA, which is followed by the EU; other export markets include ASIA and U.S.A. The trend over time shows that the shares of Zambia's agricultural exports to SADC, EU, and COMESA have increased while those to the United States have declined.

Table 3: Percentage Share of Export Markets 2001-2012(%)

year	SADC	COMESA	EU	U.S.A	ASIA
2001	32	25	42	0.5	0.5
2003	30	25	27	0.4	0.2
2005	44	37	14	0.2	11.2
2007	43	29	26	0.06	1.2
2012	45	40	12	0.03	1
Total $million	203	346	409	652	1242

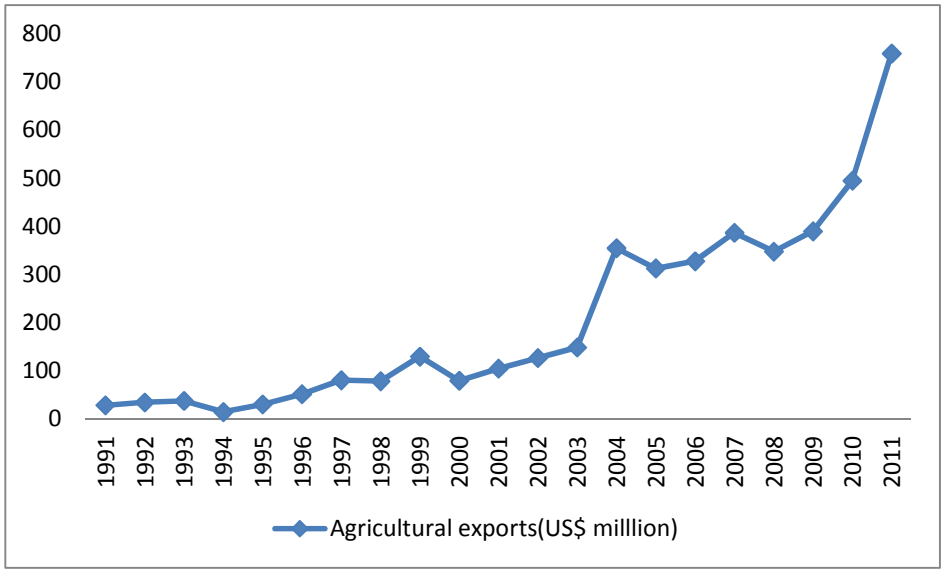
Source: calculations based on CSO and COMTRADE database.

In the early 1990s an expansion of agricultural exports came about as a result of the removal of exchange controls, improvement in input supplies, opening of markets and improvement in transport services. The agricultural sub-sectors exhibiting the most dramatic growth – floriculture and horticulture –involved very few farmers who, having gained access to European markets, exploited them by insulating their operations from domestic policy changes through establishing offshore arrangements for inputs and spare parts. In particular, they benefited from duty drawback arrangements and value added Tax (VAT) zero rating and can be said to have grown to a significant extent because of the policy environment. Growth in exports of traditional agricultural products, on the other hand, together with growth in processed food exports (notably maize meal exports to the DRC), were rather more "in spite of" than "because of" the policy environment (Robinson,2007).

Other incentives that have contributed to an increased investment in agriculture include the following: farmers are guaranteed an input tax claim for four years prior to commencement of

production for agricultural businesses. In addition, Farmers are allowed to pay VAT at a later date on some of their imported agricultural equipment and machinery. Furthermore, Farmers will receive Farm improvement allowance at 100 percent on fencing, brick or stone wall and an allowance of K10 000 for farm occupied by farm workers. Dividends paid out of farming profit are exempted from tax for the first five years the distributing company commences farming. Finally, development allowance is given for any person who incurs expenditure on the growing of tea, coffee or banana plants or citrus trees or similar plants or trees. An allowance of 10% of such expenditure shall be deducted in ascertaining the gains and profit of that business (Oxfam, 2013). Figure 1 shows the trends in Zambia's agricultural exports for the period 1991-2011.

Figure 1: Trends in Zambia's Agricultural Exports(1991-2011)



Source:FAOdatabase

As can be seen from figure 1, agricultural exports have shown an increasing trend which is not at least stable as evidenced by the continuous fluctuations in the exports. Between 1991 and 1990, growth in the agricultural exports was low. The low performance may be explained in part by an unfavorable macroeconomic environment, including exchange rate volatility. Since the early 2000s, agricultural exports have registered the strongest growth amongst non-mineral exports. However, between 2005 and 2007, growth in the agricultural exports reduced due to volatility in the exchange rate. The share of agriculture to total exports over the period 1991 to 2012 is shown

in table 4. In the period 1991 to 1995 the average percentage share of agricultural exports to total exports was 3.5%. It later on rose to 4% between 1996 and 2000. There was also a significant increase during the period 2001 to 2005, the average percentage share of agricultural exports increased from 4% to 20.8%. However, it reduced to 10% between the period of 2006 to 2012. Furthermore, Exports of agricultural products recorded an average growth rate of 24% between the period 1991 and 1995. During the period of 1996 to 2000 the average growth rate was 21.4%.The average growth rate between the period of 2001 to 2005 was 36.4%. However, between 2006 and 2012 agricultural exports registered an average growth rate of 20.4%.

Table 4: Trend of Agricultural Exports performance 1991-2012(Constant 2005 US$)

Year	Total agriculture exports	Total exports	Percentage share of agricultural exports to total exports	Agriculture exports average % growth
1991-1995	54.4	2553.1	3.2	24.0
1996-2000	167.9	4011.9	4	21.4
2001-2005	481.3	9626.1	20.8	36.4
2006-2012	1079.9	16,335.4	10	20.4

Source: Researcher's estimates from FAO database.

There has been great concern with Zambia's continuation with its exchange rate policy. It is believed that the continuous variability of the exchange rate can pose significant threats to the sustainability of the recent achievements in increasing agricultural and other non-traditional exports. In fact an appreciation of the Kwacha risks making much of Zambia's export agriculture uncompetitive on world markets (Bonaglia, 2008).

Fynn (2006) states that, the rapid Kwacha appreciation between 2005 and 2006 reduced the value of agricultural exports by over 30 percent, forcing reductions in farm-gate pricing and eroding exporter profit margins. The largest exporters in cotton, horticulture and tobacco experienced the greatest reductions in profits, while floriculture with a lower domestic content experienced less pressure from a strong Kwacha. A simulation of different exchange rates found that at an exchange rate of K 2.5 per US dollar there would be mass exit of enterprises from the agricultural sector. At an exchange rate of K 3.5 per US dollar, agricultural export earnings would fall by more than 38 percent and adversely affect more than one hundred and ninety

thousand farm households. A permanent appreciation would also affect agricultural production for domestic consumption, as imports become more competitive with local products (maize, wheat and dairy products). Whatever the cause of exchange rate volatility, the consequences appear serious for agricultural exporters. The situation is even worse for farmers who do not have access to a range of risk mitigation products – forward and future contracts and options as well as various insurance policies – that shield them, at least partially, from the worst effects of exchange rate volatility. In Zambia, these products are generally either non-existent or only offered at a high price. Excessive fluctuations in the exchange rate will risk crippling the engines of Zambia's highly successful agricultural export diversification.

2.3 Agricultural Policy Reforms in Zambia

Until 1991, agricultural trade policies in Zambia were dominated by price controls. The government not only controlled crop prices, but also mill prices as well as final product prices. Concentration and public sector dominance of agricultural business through nationalised companies encouraged price fixing and allocation of resources only to state owned enterprises. Imports and market entry were restricted through licensing regulations. The result was that the processing and distribution of food and other agricultural commodities became dominated by a limited number of large-scale, state owned companies located in a few large urban areas. The net effect was the crowding out of the private sector and the obliteration of opportunities for rural industries. Since these policies and strategies failed to stimulate growth in the agriculture sector, agricultural productivity was low and fewer products were exported (Sajeev, 2004).

Further, in order to maintain administered prices and at the same time keep consumer prices down, a number of subsidies had to be applied. Prices became the subject of public protests and trade union lobbying. Agricultural small holders became government contract farmers through the provision of subsidised farm credit. When crops failed, farmers would not repay and loans were even written off. By the 1980s, the agricultural support system had become unsustainable. Urban consumer markets were hit by consumer goods shortages, food production lagged behind population increases and food imports became regular(Sajeev, 2004).

In 1991, government introduced liberalization and market reforms. In agriculture, this entailed the decontrol of agricultural prices and the liberalisation of maize marketing. The policy emphasized government withdrawal from direct involvement in agricultural marketing and input

supply, removing subsidies, privatizing agro-parastatals, renting out and selling public storage facilities to the private sector and the overall removal of constraints and distortions to international trade in farm products. Consequently, commodity and input markets, and markets for agricultural land and capital were to be allowed to develop. In this new policy framework, the new role of government was to be confined to policy formulation, legislation and development of sustainable market support services such as market information, extension, finance and infrastructure (Mwanaumo, 1999).

The government's policy is to promote development of an efficient, competitive and sustainable agricultural sector, which assures food security and increased incomes. It recognizes the need to strengthen and expand the emerging opportunities and deal with the challenges facing the agricultural sector. The specific objectives of the agricultural sector are: To assure national food security, and maintain and improve the existing agricultural resource base. To generate increased incomes and employment. To contribute to sustainable industrial development, and expand significantly the sector's contribution to the balance of payments through increased agricultural exports (Ministry of Agriculture, 2004).

2.4 Barriers to Agricultural Export Growth and Performance

The major constraints or barriers faced by exporters of agricultural products in Zambia are characterised as being both internal and external. The major internal constraints have to do with the unstable and weak macroeconomic performance of the economy .The external constraints have to do with tariff and non- tariff barriers faced by Zambian firms in the export market (Common wealth Secretariat, 1993).

2.4.1 Macroeconomic Environment

In the early 1990s Zambia's macroeconomic policy reforms largely centered on macroeconomic stabilization, trade and financial liberalization. A stable environment would hopefully attract investment in different sectors of the economy including the agricultural sector. However, the economic environment was not conducive to encourage private investment as it was characterised with high inflation and interest rates, averaging about 69% and 20% per annum respectively between 1990 and 1999. Further, the exchange rate was overvalued. Since 2000, there has been some improvement in the economy. 1n 2011, GDP growth rate was about 6.8%, inflation rate was 7.2% while the interest rates were 10.5 %. The interest rates are still

considered to be high and hinder farmers especially small scale farmers from accessing finances from financial institutions which are vital for increasing productivity. However, the exchange rate continues to be volatile and affects export earnings for exporters (BOZ, 2011).

2.4.2 Production Costs

Zambian agricultural exporters incur high costs of production due to various reasons among them are transport costs, access to energy and telecommunications services. Because transport costs are embedded in the cost of producing goods, the condition of transport services and infrastructure has a direct effect on the costs of procuring needed production inputs as well as packaging materials. Speed to market is crucial for perishable products, such as agricultural goods, or products that become obsolete in the market place because of technological change or shifting consumer preferences (USITC, 2009). Slow delivery effectively increases costs and reduces profit margins.

Another important factor that affects production is Energy. Zambia has abundant energy resources. The most important energy source is electricity stemming from its significant hydroelectric energy potential. The country has an estimated hydropower capacity of 6000MW. Only about 27% of the total has been installed. This is despite the fact that entry into generation, transmission, distribution and supply of electricity has been liberalized and is free. The sector is dominated by one supplier (ZESCO) and there has been little private investment flowing into the sector to increase the generating capacity. There has also been deficit in power especially after 2007 leading to insecurity and an unreliable power supply which has disrupted productive activities and has adversely affected production and tends to push the cost of production. For example, wheat producers suffer losses resulting from poor quality and erratic supplies of electricity (Ndulo et al, 2015).

Telecommunications infrastructure and a competitive telecommunications sector are strongly associated with regional and global value chains (ADB, 2014). Furthermore, a strong telecommunications sector will enable activities of value addition and diversification to take place thereby enhancing export and economic growth. However, the telecommunications sector in Zambia is limited, unreliable and high cost (Ndulo et al, 2015).

2.4.3 Trade Costs

Trade costs incorporate various aspects such as customs procedures, product standards and technical regulations .In a broad context, national customs administrations are in charge of

implementing a country's trade policy at the border. This implies levying tariff duties and preventing the importation of prohibited or unsafe imports. Delays in customs procedures increase trading costs in Zambia not only in terms of opportunity costs, but also represent additional expenditures such as storage and wage charges for agricultural exporters. Each day of delay at customs is equivalent to a country distancing itself from its trading partners by additional 85 km. Keeping customs procedures as simple and transparent as possible contributes to reduce the time needed to clear customs, and thereby to reduce this dimension of trade costs(Perez and Wilson, 2008).

Product standards and technical regulations can have a dual impact on trade costs. On the one hand, they can impose additional variable or fixed costs on exporters to the extent that it is necessary to alter production processes to adapt products to such standards and regulations in the importing country. Moreover, certification aiming to demonstrate compliance with this set of rules can generate additional costs for the exporter. On the other hand, product standards and technical regulations in the importing country can potentially reduce exporter's information costs if they convey valuable information as to consumer tastes or industry needs in the importing country. In absence of standards, such information would be costly for the exporting firm to collect. Accordingly, standardization in sectors where information costs are important could help reduce trade costs and promote trade (Perez and Wilson, 2008).

2.4.4 Market Access

The importance of access to markets cannot be over emphasized as the lack of it hinders growth. Markets are pivotal to development and the ultimate impact of any business entity. With reference to agriculture, "the Zambian economy is relatively small and growth in the agricultural sector would have to be driven by exporting to overseas markets but more importantly by development of regional markets (Mtonga, 2012).

Zambia continues to work towards the promotion of economic diversification through active participation in multilateral and regional trade. The country enjoys preferential market access to a number of countries that offer duty and quota free market access to their markets. The major markets are the Southern African Development Community (SADC) and Common Market for Eastern and Southern Africa (COMESA). In addition, Zambia receives non-reciprocal preferential market access through the Least Developed Countries (LDC), Generalised System of Preferences (GSP) to most developed economies, the Cotonou Agreement and Everything but

Arms (EBA) Initiative of the EU, and the African Growth and Opportunity Act (AGOA) to the US market, as well as, the Canadian and the Japanese Initiatives (Ndulo et. al, 2009).

Acharya and Daly (2004) state that, the major constraint on potential market access for most developing countries to markets of developed countries are tariff peaks and tariff escalation prevalent in those markets in products in which developing countries have an export interest. However, most of Zambia's trade with the EU and the United States benefits from preferential rates, thus the existence of tariff peaks and tariff escalation in Most Favored Nation (MFN) rates might not be of immediate relevance to Zambian policymakers (Ndulo and Mudenda, 2003).

There are several non-tariff barriers faced by Zambia's exporters. Non-tariff barriers influence the price and availability of key agricultural inputs, such as seeds and fertilizers, which could have substantial impact on agricultural yields and output, especially for smallholders (Moise, 2013). These non-tariff barriers take such forms as sanitary and phytosanitary standards, pest risk assessments and minimum residual levels in food products. The exporters also face a complex tariff structure and import requirements, as well as restrictive rules of origin (IMCS, 2003). For example, all Zambian exports to the EU are subject to strict inspection at port of entry, which adds costs and delays. The EU has also set marketing standards such as size and packaging of goods. Tariff profiles in agriculture rates on agriculture goods are very complex, restrictive and far from transparent (Ndulo and Mudenda, 2003).

2.5 Exchange Rate Policies in Zambia

Zambia's exchange rate policy has undergone various changes. Soon after independence in 1964, the Zambian Pound was fixed to the British Pound Sterling. However, in 1968 the Kwacha was introduced to replace the Zambian pound as the domestic currency. From 1971, as the Dollar was emerging as the only reserve currency under the Bretton Woods system, fixing of the exchange rate was switched from the British pound to the US Dollar (Mungule, 2004).During this period both price and non-price factors played an important role in shaping trade policy. However, the government failed to diversify the country's export base away from the declining copper sector. When copper prices plummeted in 1974, the country experienced severe economic difficulties. The government's efforts to develop the agricultural sector in a bid to offset the damage caused by the declining mining industry were not rewarded. This was due to a host of constraints

emanating from its own crippling policies which included a single channel marketing system, fixed agricultural producer prices, regulated road haulage rates, marketing and consumer subsidies in the maize area. Hence, trade in agricultural products maintained its relative insignificance in Zambia's total export earnings (Saasa 1996).

In July 1976, the exchange rate was de-linked from the dollar and pegged to the SDR with occasional devaluations. This was necessitated by the continued deterioration in Zambia's external balance position and terms of trade as the price of copper fell significantly while at the same time oil prices surged (oil shock). In July 1983, the kwacha was de-linked from the SDR and pegged to a weighted average basket of five major trading partner currencies. The kwacha was allowed to adjust but within a narrow range, that is, a 1 per cent devaluation every month. (Chipili, 2007).

The rate of crawl was further increased to 2.5% per month. This policy stance was meant to be in line with the reform measures put in place. However, as the external position deteriorated further and external debt increased, the kwacha was allowed to float against major currencies in October 1985.This was the foreign exchange auction system. The auction system was designed to eliminate the parallel market for foreign exchange which had emerged during the fixed regime; improve the allocation of foreign exchange previously allocated on non-price criteria; and allow for the interaction of supply and demand in determining the external value of the kwacha (Chipili, 2007).

The massive kwacha devaluation under the auction system was not without costs. Inflation short up and created economic uncertainty. Agriculture which initially benefited from the increased foreign exchange allocation began to face stiff competition from imports. The auction system made it easier and profitable to import than to produce goods locally. Since the supply of foreign exchange remained unchanged, the exchange rate continued to rise sharply thereby making it even more difficult for local producers to bid for foreign exchange because they could not meet the necessary kwacha cover. Contrary to expectations, capacity utilization declined drastically since most companies could not afford to import the necessary raw materials and intermediate input. The government eventually decided to abandon the auction system in 1987 (Mushili, 1997).

In May 1987, the system reverted to a fixed rate (kwacha was fixed to the US dollar) and a Foreign Exchange Management Committee (FEMAC) was established to implement this system of foreign exchange transactions. The FEMAC would allocate foreign exchange and issue permits to eligible importers. Preferential treatment was given to Non-Traditional Exporters in that they could retain 50 percent of their foreign exchange earnings and were allowed to sell it above the official rate. However, these transactions outside the official fixed market were still subject to approval by the FEMAC. This was a way of encouraging faster growth of NTEs (Kamwi, 2011).

In February 1990, another dual system was put in place and was once again, managed by FEMAC. The new dual system involved two windows, a retail and an official one. In the retail window, importers applied for foreign exchange through their banks, while the official window, which operated with a lower rate, catered for remittances and payments for the mining company. The dual system lasted until 1991, when a number of reforms were made to liberalise the foreign exchange market. Among the reforms done was the unification of the two windows, and legislation was passed to authorise the setting up of bureaux de change. By 1994, all capital controls were removed. Thus, as a result of the unification of the rates and the liberalisation of the foreign exchange system, the exchange rate became market-determined (Mkenda, 2001).
These economic reforms stimulated the growth of agricultural products and promoted export diversification. Between 1990 and 1999, the performance of non-traditional exports was relatively favourable, mainly because of an increase in exports of floriculture and horticulture products, which grew by an average of 36.1%. The increase in the floriculture and horticultural subsector was spurred by favourable investment flows into the sector (Musonda, 2009).Table 5 summarizes the evolution of exchange rate policy in Zambia.

Table 5: Exchange Rate Policy Regimes

Period	Exchange rate policy description
1964-1971	Rates fixed to the British pound sterling
1972-1976	Rates fixed to the US dollar
1977-1982	Pegged to the SDR with occasional devaluations.
1983-1984	Pegged to a basket of major trading partners' currencies.
1985-1987	Foreign exchange Dutch auction system introduced.
1988-1989	Fixed parity to the US dollar re-introduced with occasional devaluations.
1990-1991	Dual exchange rate system.
1991-to date	Managed exchange rate system.

Source: Bank of Zambia

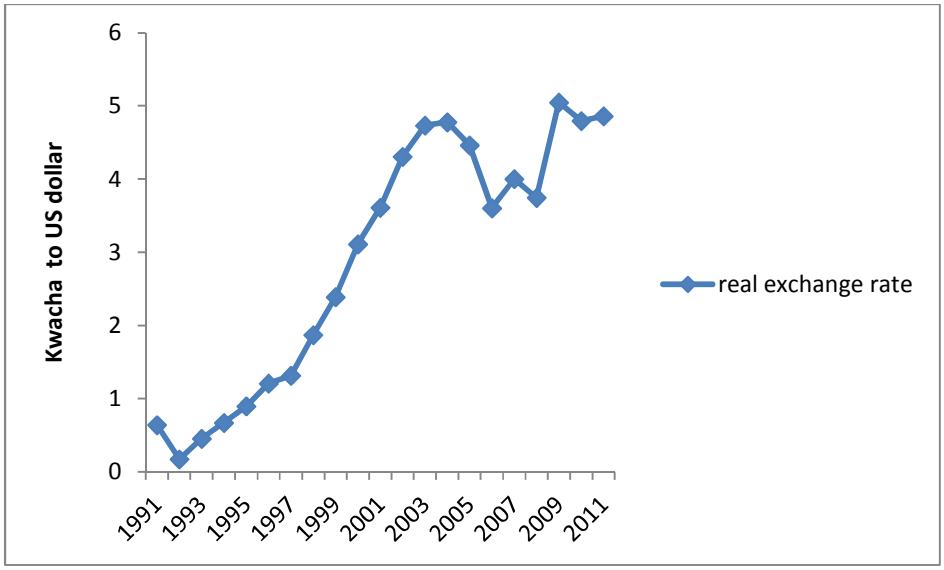
2.4 Exchange Rate Volatility in Zambia

Zambia currently operates under a market determined exchange rate. Market determined exchange rates are prone to excess volatility that can be damaging to the real economy. Exchange rate fluctuations might impact negatively on exporters and economic growth by discouraging firms from undertaking investment, innovation and trade. It may also deter firms from entering the export market. Large fluctuations in the exchange rate impose adjustment costs on the economy as resources keep shifting between the tradable and non-tradable sectors. This could permanently shift resources to non-tradable sectors if firms are put off from export markets due to high exchange rate fluctuations (Wamukhoma, 2013).

Figure 2 presents monthly US dollar real exchange rate between 1991 and 2011. In 1991, the exchange rate was K 0.064 per US dollar; by 2004 it had increased to K4.779. During this period the value of the kwacha depreciated against the dollar by over 200 per cent. This was due to shortages of foreign exchange resulting from low export earnings from copper. The kwacha, however, appreciated between 2005 and 2006; the value of the Kwacha reduced from K4.467 to K3.603 per US dollar. The appreciation of the currency emanated from higher copper revenues. This was due to increases in the production of copper, the net government savings secured

following the country's attainment of HIPC completion point, and the inflow of foreign direct investment (SADC, 2006). However, in 2007 the Kwacha depreciated from K3.603 to K4.002. Between 2008 -2011 the kwacha to US dollar was as follows: K3.746, K, 5.047, K4.797and K4.861 per dollar respectively.

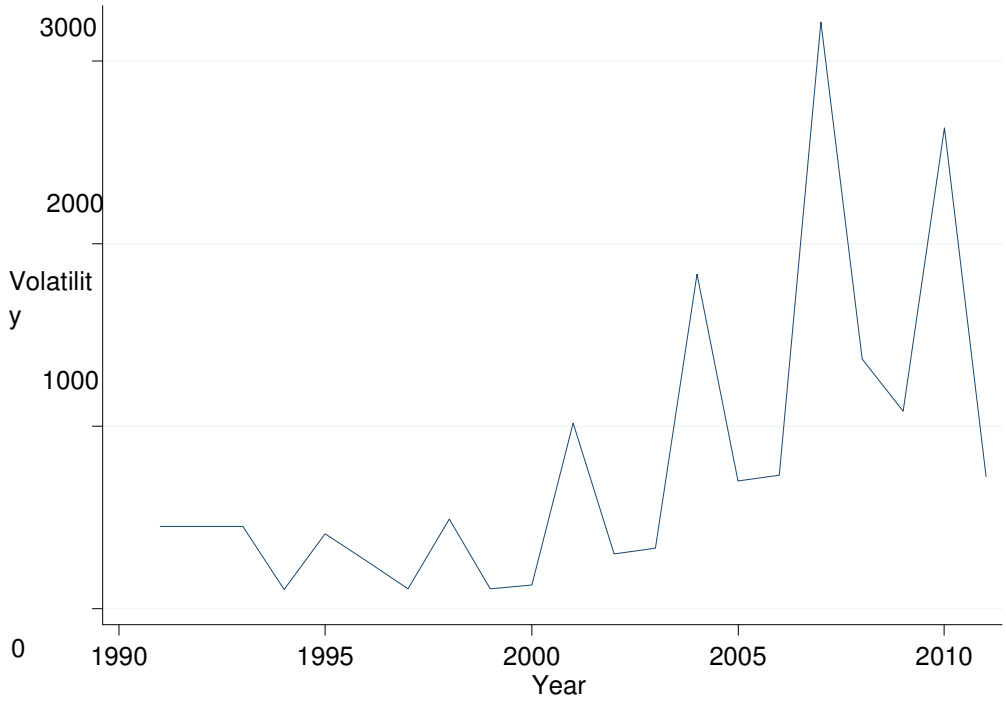
Figure 2: Kwacha to US Dollar monthly Exchange Rate between 1991- 2011.



Source: Bank of Zambia database.

To measure the volatility of the exchange rate, we use the Exponential Generalised Autoregressive Conditional Heteroscedasticity (EGARCH). Figure 3 shows a plot of the volatility series generated for the period 1991-2011.

Figure3: Exchange rate volatility in Zambia



Source: Authors calculations

Figure 3 shows that the exchange rate has been volatile. It shows the relative changes of wide fluctuations for some periods and moderate fluctuations in other time periods. Before 2000, moderate fluctuations were observed in the exchange rate. However, the biggest volatilities in the exchange rate were observed between 2005 and 2011.

CHAPTER THREE

LITERATURE REVIEW

3.0 Introduction

This chapter reviews both theoretical and empirical evidence from various studies on the impact of exchange rate volatility on trade. The chapter concludes with a summary of the literature review.

3.1 Theoretical Evidence

This study is based on two major models that will be used to explain the effect of exchange rate volatility on trade in agricultural products. These models were developed by Hooper and Kohlhagen (1978) and De Grauwe (1988).

3.1.1 Hooper and Kohlhagen Model

Hooper and Kohlhagen (1978) developed a model which explains how exporters behave when faced with exchange rate volatility. They assumed that the proportions of the importers and exporter's foreign exchange credits or debits hedged in the forward exchange market are invariant to the degree of risk associated with foreign exchange exposure. They further assumed that contracts are invoiced only in the importer's and exporter's currencies. In addition, the import demand and export supply functions are first derived for individual firms from their utility functions and then aggregated.

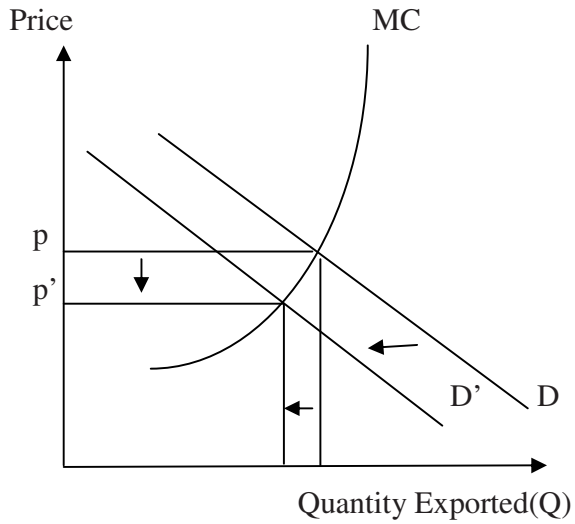
To simplify the analysis they used a two- period framework: In the first period (t=0), the firm that exports agricultural products receives orders for its domestic output and places orders for its imported agricultural inputs. However, it is uncertain how much the firm will pay in the domestic currency for the inputs it orders, since they are priced in the foreign currency and the exchange rate in the second period is unknown in the first period. And in the second period (t=1), it receives and pays for the imported inputs and ships and is paid for its own output. Alternatively the firm could meet current domestic demand by running down its inventories of the imported input and replenishing its inventories in the next period. In either case the firm sets the level of its output so as to maximise its utility, which is an increasing function of its expected profits and a decreasing function of the standard deviation of those profits. The utility of an

importer or exporter depends on the expected profits and on the variance of these profits, which itself is affected by the degree of exchange rate volatility. Whether the variance of profits is negatively or positively related with utility depends on the attitude towards risk of the importer or exporter (Altvater and Kottmann, 2012).

Agricultural exporters are either risk averse, risk neutral or risk lovers. Hooper and Kohlhagen (1978) stressed that if agents (importers and exporters) are risk-averse an increase in exchange rate variability increases their cost. This induces them to reduce the volume of trade and reallocate production towards domestic markets. This is so because the exchange rate is agreed upon at the time of the trade contract but payment is not made until the future delivery takes place. If changes in the exchange rate become unpredictable, it creates uncertainty about the profits to be made and reduces the benefits of international trade.

Figure 4 shows the effect of an increase in exchange rate volatility on a risk-averse agricultural exporter. Price is in the domestic currency, MC represents the marginal cost and D represents the aggregate demand. All else equal, an increase in the exchange rate volatility leads to a shift to the left of the aggregate demand schedule for imports. This shift leads to a decrease in the quantity exported and eventually a fall in price.

Figure 4: <u>The Effects of Increased Exchange Rate Volatility on a Risk Averse Exporter</u>.



Source: Hooper and Kohlhagen

For risk-loving trading partners the opposite is true. An increase in the exchange rate volatility shifts import demand to the right. The equilibrium level of trade is not affected in the case of risk-neutral trading partners: No shift occurs. The attitude towards risk of the importers and exporters are crucial for the direction of the effect of exchange rate volatility on the equilibrium level of trade. If both parties are risk-averse there is a negative relationship between the two variables. In the case that both importers and exporters are characterized by having a neutral attitude towards risk there is no effect on the trade volume due to a change in the degree of exchange rate volatility. A risk-loving attitude causes a positive relationship between the two variables in question (Altvater and Kottmann, 2012).

3.1.2 De Grauwe Model

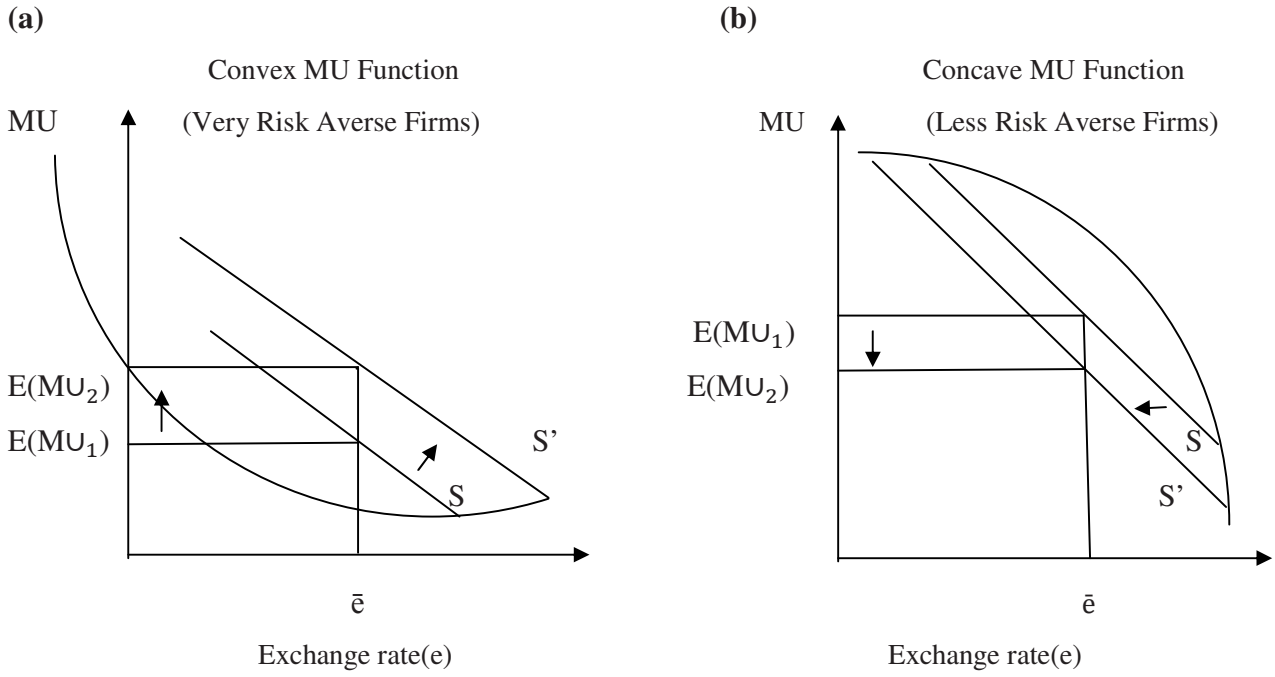
De Grauwe (1988) argues that the effect of movements in the exchange rate will depend upon the dominance of the income effect or substitution effect, as well as, the degree of risk aversion. Risk-neutral agricultural traders are unlikely to be affected by exchange rate uncertainty but risk adverse traders will, although in different degrees. Paradoxically, for very risk-averse traders, exporting more agricultural products could be a response to increased volatility, in order to compensate for the expected fall in revenue per exported unit.

The export volume is determined by maximising the utility function. This is dependent on the income that the agricultural exporter earns from his or her trade activities. Due to the fact that the exporter is assumed to be risk-averse the utility function has a concave shape. In this model, a firm's profit depends on the amounts it produces for the domestic and the foreign market. The producer has to decide what amount of resources to use in these two sectors. The only element of risk in this model is the exchange rate, which determines the profit a firm receives from its exports. The utility is maximised with respect to the quantity produced that will be exported (Altvater and Kottmann, 2012).

De Grauwe arrives at a marginal utility (MU) function of the exports depending on the exchange rate (e). Whether this marginal utility function is concave or convex depends on the degree of risk-aversion of the trading firms. Very risk-averse agricultural exporters have a convex marginal utility function, whereas less risk-averse agricultural exporters have a concave marginal utility function. He then analyses the effects of a mean-preserving increase in the spread of the exchange rate (S) on expected marginal utilities (E (MU)). That is, how a higher volatility with the same mean value of the exchange rate ($\bar{e}$) affects the expected marginal utility of exports. An

increase in exchange rate volatility may either increase the expected marginal utility of exports or not, depending on the shape of the marginal utility curve (Altvater and Kottmann, 2012).

Figure 5: <u>Effects of an Increase in the Mean Preserving Spread of e on MU</u>



Source: De Grauwe

figure (a) shows that the expected marginal utility of export revenues increases when there is an increase in the exchange rate volatility for the very risk averse agricultural exporters. However, this is not the case for less risk averse agricultural exporters in figure (b). Their expected marginal utility of export revenues reduces with an increase in exchange rate volatility.

This is because income and substitution effects lead to different results for very risk-averse and less risk-averse individuals. The substitution effect describes the reduction in risky activity due to an increase in its riskiness. The income effect has the opposite consequences. The income effect describes the increase in risky activity to compensate for the reduction in total expected utility. The total expected utility of exports decreases with an increase in risk. In order to compensate for that, agricultural exporters allocate more resources to the export sector, and thus export more goods. Agricultural exporters would choose to export less if the substitution effect is dominant over the income effect and more if the income effect is the dominant one. An increase in exchange rate risk (increased spread of export revenue around the mean) lowers total expected

utility but may in fact increase the expected marginal utility. Thus, although all agricultural exporters are made worse off by the presence of exchange rate risk, some may choose to export more because of it. De Grauwe postulates that this is because very risk-averse individuals are concerned about the worst possible outcome. In order to avoid the possibility of a radical decline in revenues they export more. On the other hand, less risk-averse individuals are not as concerned with extreme outcomes and choose to export less (Altvater and Kottmann, 2012)**.**

3.2 Empirical Evidence.

3.2.1 The negative impact of exchange rate volatility on exports

The negative effect of exchange rate volatility arises from the degree of risk aversion or uncertainty. Countries with flexible exchange rate regimes, where the movement of exchange rate is driven by exogenous factors, are the ones that will be affected the most by exchange rate volatility. Most of the key studies that looked at developing countries found that there is a negative relationship between exchange rate instability and the performance of exports of most of the countries.

Kiptui (2008), examined the short and long-run effects of exchange rate volatility on Kenya's major export commodities, namely tea and horticulture between 1997 and 2007. He used cointegration and error correction modelling approaches. The results show that exchange rate volatility has significant negative short and long-run effects on Kenya's real exports of tea and horticulture. The elasticity with respect to the exchange rate risk variable is found to be -0.02 for tea and -0.33 for horticulture. This implies higher sensitivity of horticultural exports to exchange rate volatility.

Cho, Sheldon, and McCorriston (2002) used panel data on bilateral trade and exchange rate volatility for the set of G-10 countries. They investigated the effects of long-run real exchange rate volatility on agricultural trade in comparison to other sectors. They conclude that real exchange rate volatility has a significant negative effect on agricultural trade. The estimated impact on agricultural trade is much larger than the estimated impact on trade in other sectors and on aggregate trade.

Arize, Osang and Slottje (2004) investigated the impact of real exchange rate volatility on the export flows of eight Latin American countries between 1973 and 1997. The results show that increases in the volatility of the real effective exchange rate exert a significant negative effect

upon export demand in both the short-run and long-run. The long-run elasticities range from a low of 0.10 in the Dominican Republic to a high of 0.69 in Venezuela. This implies that exchange rate volatility exerts a significant adverse long-run effect on export volume.

Arize, Malindretos and Kasibhatla (2003) investigated the impact of exchange rate volatility on trade flows of 10 LDCs. They tested for long-run Cointegration and used the error correction technique to model the short-run dynamics of the variables. They found that exchange rate volatility exerts a significant negative effect on export demand in both the short run and the long run in most of the countries studied.

Chit et al. (2008) employed a generalized gravity model that combined a traditional long-run export demand model with gravity type variables to analyze the impact of bilateral real exchange rate volatility on real exports of five emerging East Asian countries. In the empirical analysis they used a panel comprising 25 years of quarterly data and performed a unit root and co-integration tests to verify the long-run relationship among the regression variables. The results provided strong evidence that exchange rate volatility has a negative impact on the exports of emerging East Asian countries.

Studies that took into consideration the trend characteristics of the time-series also suggest a significant negative effect of exchange rate uncertainty on the trade variables. For instance, Fountas and Aristotelous (1999) found a significant negative long run effect of exchange rate uncertainty on trade. Wei (1999) found a negative and statistically significant effect for the exchange rate volatility on exports. He took account of futures and options instruments to hedge risk. Ozturk and Avaraci (2002) also found a negative relationship between exchange rate volatility and Turkey's real exports during the period 1989 and 2002.

In Zambia however, there has not yet been any study conducted on the effects of exchange rate volatility on agricultural exports. Musonda (2009) investigated the impact of exchange rate volatility on the performance of nontraditional exports (NTES) in Zambia between 1965 and 1999. Using a generalized autoregressive conditional heteroscedasticity measure of real exchange rate volatility, the results of the study showed that the exchange rate volatility depresses exports in both the short run and the long run.

A study by Luneta (2000) analyzed the impact of exchange misalignment and volatility on Zambian NTEs. He used two models in his study. The first model specifies a function of the exchange rate, to establish the relationship between Real Exchange Rate (RER) and its

determinants. The second model is a reduced form of the export function. This seeks to analyse relationship between NTEs and RER with other factors. Secondary annual data from 1966 to 1991 was used. Testing for cointegration was done using the Engle and Granger two step procedure, while short run dynamics are analysed using the ECM. A proxy was included to capture the effect of liberalization of economy in the 1990s on NTEs. It was found that the RER affected NTES in Zambia both in the short run and the long run. In particular RER misalignment and instability was a significant factor discouraging the growth of NTEs in Zambia. Exporters in Zambia were found to be more risk averse with regard to losses arising from exchange rate changes, especially since hedging instruments were limited.

Moono (2010) investigated the effects of exchange rate volatility on Zambia's bilateral trade with South Africa between 1992 and 2009. He generated nominal exchange rate volatility series using a Generalised Autoregressive Conditional Heteroscedastic (GARCH) model after analysing the time series properties of the variables. The export demand specification showed that Zambia's exports are negatively affected by volatility. However, results from the imports specification shows that imports are not affected by exchange rate volatility. Therefore, it was concluded that Zambia's bilateral trade with South Africa is negatively affected by volatility through the depression of exports.

3.2.2 The positive impact of exchange rate volatility on exports

Broll and Eckwert (1999) postulated why exchange rate volatility can have a positive effect on international trade flows. Empirically, they showed that the higher the exchange rate volatility, the higher will be the value of the real option to export to the world market. This increases the potential gains from trade. The standard property of option is that when exchange rate volatility raises the value of the options to the world, export to the world increases. If the exchange rate fluctuates heavily, there is extremely high realization of the foreign spot exchange rate. The higher the foreign spot exchange rate, the higher will be the potential gain from trade. At the same time, there is also a low realization of the foreign exchange rate and thereby potential loss in trade, but this loss does not offset those gains. The reason is that firms always cut off their production and export activities and walk away from the export option when there is lower realization of the foreign exchange rate .

Mushili (2001) investigated the impact of real exchange rate movements and macroeconomic stability on the growth of non-traditional exports in Zambia between 1970 and 1996. The results of the study revealed that there is a positive relationship between the performance of non-traditional exports and RER movements and macroeconomic stability. The sluggish performance of the NTES was explained by the real net appreciation in the RER over the study period.

In his study of Hungarian agricultural exports to its export destination, Jozsef (2011) found a positive effect of nominal exchange rate volatility on agricultural trade between Hungary and its trading partners between 1999 and 2008. He used the gravity model and panel data procedure in his analysis. He concluded that because of the positive effect that exchange rate volatility has on agricultural trade flows, Hungarian agri-food entrepreneurs are not interested in joining the Eurozone.

Goudarzi et al (2012) investigated the effect of exchange rate volatility on Iranian agricultural exports. He used a GARCH model to measure exchange rate volatility. He further went on to establish the long-run and short-run relationships between variables in his model by using the ARDL approach. The results of the exchange rate volatility show that this factor has had a positive effect on exports of agricultural products. Similarly, Hashemi and Akbaris (2009) made an attempt to analyze the impact of exchange rate volatility on Iran‘s agricultural exports using a VECM procedure. Their results indicated that exchange rate volatility did not have a significant impact on Iran‘s agricultural export flows in short run but it had a significant positive impact in long run.

Erdal et al., (2012) analyzed the relationship between exchange rate volatility and agricultural imports and exports of Turkey using the data between 1995 and 2007. They claimed that the exchange rate volatility has a significant positive impact on the agricultural exports but a negative impact on the agricultural imports.

3.2.3 The neutral effect of exchange rate volatility on exports

Some researchers have failed to find a significant effect of exchange rate volatility on exports. This is the case with Khalilian and Farhadi (2002). They studied factors affecting the supply of Iran’s agricultural exports between 1962 and 1999. Experimental results of this study show that the country's output, the relative prices of exports and domestic consumption has a significant

impact on the supply of agricultural exports. The effect of variable effective exchange rate on supply of agricultural exports was found to be insignificant.

Todani and Munyama (2005) used the ARDL model to analyze the impact of exchange rate volatility on South African exports to the rest of the world. The study estimated an export demand equation and concluded that South African exports to the rest of the world are largely unaffected by exchange rate volatility. Baum (2010) also found no evidence suggesting that exchange rate volatility does have an impact on the level of trade, but they did find a robust positive link to the volatility of bilateral trade flows.

Furthermore, Mousavi (2012) investigated the relationships between the quantity of agricultural exports and the real exchange rate in India. He used time series data for the period between 1980 and 2010. The long run relationships between exchange rates and agricultural export were explored by using co-integration analysis. A Granger-causality analysis was carried out in order to assess whether there is any potential predictability power of one indicator for the other. The findings show that there is no significant relationship between the quantity of agricultural exports and the real exchange rate. The results also show that the variables are not co-integrated. This implies that there is no the long run relationship between agricultural exports and exchange rates in India.

Fidan (2006) argues that the real effective exchange rate has no significant effect on Turkish agricultural imports and exports. Clark (2004) however, suggested that whether exchange rate uncertainty affects exports positively or negatively depends on the assumptions that are made in the research. If traders are perceived to be risk averse, heightened volatility will have a negative effect. If they are assumed to be less sensitive to risk, the volatility will have little or no effect.

On the other hand, it is important to note that some studies have shown mixed results on the impact of exchange rate volatility. For example, Bahmani- Oskooee and Hegerty (2009) analyze the impacts of real exchange rate volatility on the trade between Mexico and the U.S. for the period 1962 and 2004 for 102 industries. The authors argue that there is a short run significant impact of the exchange rate volatility on most of the sectors. Although most industries are not affected by the increased exchange rate volatility, the number of negatively affected industries (such as agriculture and textile) is much higher than of the positively affected ones.

Ekanayake et al. (2011) investigate the effects of the real exchange rate volatility on both export flows of South Africa to the European Union (EU) and imports from the EU by using quarterly

data between 1980 and 2009.They report that exchange rate volatility has mixed effects on both imports and exports in the short and long run. Although negative impacts could be seen in the short run, no adverse effects could be seen in the long run.

Hsu and Chiang (2011) assert that the non-existence of a consensus about the impacts of the exchange rate volatility on international trade could be due to the non-linearity of the effects. By applying a threshold regression model based on bilateral export data between the US and its major trading partners between 1973 and 2004, they find that real exchange rate volatility has a positive impact on low-income trading partners of the US. But for the trading partner countries whose real GDP per capita is over a threshold level, the negative impact of increased volatility on the US exports become apparent in their analysis.

It is clear that the theoretical ambiguity of real exchange rate volatility effect on exports is present in empirical studies. Cote (1994) reviewed some studies, mostly for industralised countries and observed the effect of exchange rate volatility on trade flows was mixed. Overall, however, a larger number of studies appeared to favour the conventional assumption that exchange rate volatility depresses the level of trade.

3.3 Summary

The chapter gave insight into the various literature available on the impact of exchange rate volatility and exports. The chapter presented both the theoretical and empirical evidence on the impact of exchange rate volatility on exports. Empirical evidence shows that the exchange rate volatility has had either a positive, negative or neutral effect on exports. However a large number of studies favour the assumption that exchange rate volatility depresses the level of trade.

CHAPTER FOUR

METHODOLOGY

4.0 Introduction

This chapter presents the methodology and model that is used in the study. It also gives the definitions of variables used in the model and explains the data sources and types of data employed. The study uses a quantitative approach to analyse the relationship between exchange rate volatility and agricultural exports. Different estimation techniques are employed to establish a long run and short run relationship between variables.

4.1 Empirical Framework Model

In this study we employed an empirical model based on De Grauwe (1988).In this model, a firm's profit depends on the amounts it produces for the domestic and the foreign market. The producer has to decide what amount of resources to use in these two sectors. The only element of risk in this model is the exchange rate, which determines the profit a firm receives from its exports. The utility is maximised with respect to the quantity produced that will be exported. A firm's export function can be presented as

Ex= f (y, p, v) ……. (1)

Growth in exports (Ex) will depend on the income exporters earn from their trade activities (y), relative price level for traded goods between the countries engaged in trade (p), and exchange rate volatility (v) which determines the profit a firm receives from its exports.

The following equation is applied in testing Zambia's agricultural exports:

$lnExt = \beta_1 + \beta_2 \ln Y + \beta_3 \ln P + \beta_4 v + \varepsilon t$ ..... (2)

Where:

· *Ext* is the value of Zambia's agricultural exports to the rest of the world in real terms.

· *Y* is the income of the importing countries

· *P* is the relative price of Zambia to the world price.

· V is real exchange rate volatility.

· ε_t is a random error term, and t indexes time.

In equation (2), the coefficients were assumed to be constants. The signs of the coefficients are expected to be positive for both relative price and income of importing countries. The sign of the coefficient volatility is expected to be negative or positive.

4.2 Data and Variable Description

The study employed annual data for the period 1991 to 2011. This period was the sample for the study. The data was collected from various data sources such as World Bank and International Monetary Fund publications, economic survey reports from the Central Statistics Office, Bank of Zambia, among others. The data covers a wide range of macroeconomic variables that include GDP, inflation, exchange rate, interest rate, and exports of agricultural goods.

4.3 Agricultural exports

Real agricultural exports were calculated using the following formula:

$$Y=\frac{EXP}{CPI}*100$$

Where EXP represents the nominal value of Zambia's aggregated agricultural exports to the world and CPI is the consumer price index.

4.4 Income of Importing Countries

The income is a weighted average of the real GDP of respective trading countries. However, industrial production indexes was used as a proxy variable due to missing data on GDP in some years for some of Zambia's main importers of agricultural products. Thus, the main importers used in the sample size were industralised countries.

4.5 Relative price

A relative price may be expressed in terms of a ratio between any two prices or the ratio between the price of one particular good and a weighted average of all other goods available in the market. Many indices are used to compute the relative price index. The most ideal indices are the producer price indices due to the fact that only goods produced and exported are exposed to international demand conditions. However, due to data constraints, the relative price is basically represented by Zambia's real effective exchange rate which is the weighted average of the

kwacha relative to an index of other currencies. The REER has been used since it is also the value that consumers will pay for imported goods at the consumer level.

4.6 Exchange rate volatility

There has not been a general consensus about which measure of volatility is appropriate. It is argued that there are different factors that affect what measure of volatility to use for the study on hand. Various measures of real exchange rate volatility have been proposed in the literature. However, this study utilized the EGARCH model proposed by Nelson (1991). The EGARCH model is given as:

$$\ln \sigma_{j,t}^2 = \omega_t + \beta_j \ln(\sigma_{j,t-1}^2) + \gamma \frac{\varepsilon_{t-1}}{\sqrt{\sigma_{t-1}^2}} + \alpha \frac{\varepsilon_{t-1}}{\sqrt{\sigma_{t-1}^2}} - \sqrt{\frac{2}{\pi}} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

Note that $\sigma_{j,t}^2$represents the conditional variance, ω_t is a constant and β_j measures the persistence in conditional volatility irrespective of anything happening in the market. When β_j relatively large, volatility takes a long time to die out following a crisis in the market. γ measures the leverage or asymmetry effect. If $\gamma = 0$, then the model is symmetric. When $\gamma <$ 0, then positive shocks (good news) generate less volatility than negative shocks (bad news). When $\gamma >$ 0, it implies that positive innovations are more destabilizing than negative innovations.The αparameter represents a magnitude effect or the symmetric effect of the model also known as the garch effect.

4.7 Estimation Techniques

There are different econometrics techniques that can be used to estimate equation (2) or time series data. However, before carrying out regression analysis there is needed to carry out a unit root test to determine whether the variables of interest are stationary. The problem of non stationarity is a common problem encountered when using time series data. If this problem is not dealt with then we will encounter the problem of spurious regression. This study will employ the augmented dickey fuller test to test for stationarity.

4.7.1 Unit Root Test

The unit root test is used to determine whether the variables used in the study are stationary or non-stationary. Since times series data will be used in this study, there is a possibility of non stationarity, where the variables may have a time- varying mean or a time- varying variance or

both. The study employed the Augmented Dickey Fuller (ADF) test which involves determining the order of integration of the variables and therefore refers to the number of times the variables must be differenced to become stationary. The advantage of the ADF over the DF is that it adjusts the DF to take care of possible serial correlation in the error terms by adding the lagged difference terms of the regressand.

To have a clear picture of the Unit root test, consider the following ADF test equation.

$\Delta y_t = \mu + \gamma T + \alpha y_{t-1} + \sum_{i=1}^{m} \lambda_i \, \Delta y_{t-i} + u_t$ …….. (4)

Where y_t is the variable in question, T is the time trend, m is the lag length, and u_t is the error term assumed to be white noise, where $\Delta y_{t-1} = (y_{t-1} - y_{t-2})$,and so on…This equation will be applied to all the explanatory variables and the dependent variable.

4.7.2 Cointegration Test

This test is conducted to ascertain whether two or more variables share a stochastic trend. It is normally done if all the variables under investigation are of the same order. Cointegration analysis is basically used in the estimation of the long-run equilibrium parameters in a relationship with non-stationary variables. According to Gujarati (2004), time series variables are cointegrated if the linear combination of the variables, the error term, is stationary but the variables are individually non-stationary. This technique further provides a means of identifying and avoiding spurious regression arising from non-stationary time series. Cointegration test can be conducted using different methods; this study will however use the Johansen test which is deemed more superior to the Engle -Granger test.

The Johansen methodology is illustrated below as presented by Hjalmarrson and Osterhona (2007).The Johansen methodology draws its starting point in the vector auto regression (VAR) of order *P*, given by

$Y_t = \mu + A_1 Y_t + \ldots\ldots + A_p Y_{t-p} + \varepsilon_t$ ……. (5)

Where Y_t is an $n \times 1$vector of variables that are integrated of order one, denoted I(1),and ε_t is an $n \times 1$vector of innovations.

Equation 5 can be rewritten as

$\Delta Y_t = \mu + \pi y_{t-1} + \sum_{i=1}^{p-1} \sum_{j=i+1}^{p} A_j + \varepsilon_t$ ..... (6)

Where $\pi = \sum_{i=1}^{p} A_i - I$.

Now if the coefficient matrix π has a reduced rank $r < n$, then there exists $n \times r$ matrices α and , each with a rank r such that $\pi = \alpha\beta'$ and $\beta' Y_t$ is stationary. r is the number of Cointegration relationships while the elements of a are known as the adjustment parameters in the vector error correction model (which will be discussed in the next section) and β is the Cointegrating vector. The Johansen methodology provides two distinct likelihood ratio tests of the relationships between ΔY_t and Y_{t-1} and thus the reduced rank of the matrix π (Moono, 2010).

These test ratios are the Trace test and the Maximum Eigen Value, which are shown in the equations below:

$J_{trace} = -T \sum_{i=r+1}^{n} ln\ (1-\lambda_i)$ ..... (7)

$J_{eigen\ value} = -T \ln (1-\lambda_{r+1})$..... (8)

Where T is the sample size and λ_i is the ith largest ΔY_t and Y_t correlation. The trace test tests the null hypothesis of r Cointegrating vectors against the alternative hypothesis of n Cointegrating vectors. The maximum eigenvalue test, on the other hand, tests the null hypothesis of r Cointegrating vectors against the alternative hypothesis of r +1 Cointegrating vectors. Neither of these test statistics follows a chi square distribution in general; but critical values are found in Johansen and Juselius (1990).

4.7.3 Error Correction Model

The purpose of the Error Correction model (ECM)is to capture the short run dynamics of the variables in the cointegrated system. In other words, it illustrates the short run dynamics that restores the equilibrium relationships represented by the Cointegrating vectors in the event of asymmetric shocks (Gujarati, 2004). We can define the ECM for Zambia' agricultural exports as follows:

$$\Delta EX_t = \alpha_0 + \alpha_1\ ECT_{t-1} + \sum_i^n \beta_{1i}\ \Delta X_{t-i-1} + \sum_i^n \beta_{2i}\ \Delta Y_{t-1}^{foreign} + \sum_i^n \beta_{3i}\ \Delta P_{t-1} + \sum_i^n \beta_{4i}\ \Delta Vol_{t-1} + \varepsilon_t$$

Where ECT_{t-1} is the error correction term. Given that all the variables under consideration are cointegrated, the error correction term becomes the period lagged residual in the Cointegration equation. This formulation allows us to capture short-run dynamics. The greater the co- efficient of the parameter, the faster the speed of the adjustment of the model from the short run to the long run.

4.8 Summary

This chapter discussed the research methodology employed in the study. The empirical model was specified. A quantitative approach was used to collect and analyze data. The data was collected from the central statistical office, World Bank and IMF. The sample period was from 1991-2011. Finally, different estimation techniques were revealed.

CHAPTER FIVE

ESTIMATION RESULTS AND DISCUSSION

5.0 Introduction

This chapter presents the results obtained from various tests conducted on the data that was collected. The statistical package that was used to analyse the data was stata 11.3. The chapter begins with the results attained from the unit root test and egarch model.it further highlights on the results acquired from the Cointegration test. Finally, a vector error correction model was estimated.

5.1 Descriptive Statistics

Table 6 presents the summary statistics of the major variables.

Table 6:Descriptive Statistics

Variables	Observations	Mean	Std.dev	Min	Max
Foreign income	21	2.160959	0.81759	0	3.0445
Relative price	21	4.465174	0.27044	4.103304	4.9324
Agricultural exports	21	3.762355	1.32685	0.51599	5.7221
volatility	21	6.230102	1.00601	4.66003	8.0756

5.2 Unit Root Results

Since the research was dealing with time series data the first test that was conducted was a unit root test. This was to ascertain whether the data was stationary or non-stationary. Table 7 shows the results obtained from the Augmented Dickey Fuller (ADF) test. The Akaike criterion (AIC) was used to select the lags for each variable.

Table 7: Unit Root Test

series	Model	Variables in level	Variables in first difference
		ADF	**ADF**
lnagx	Trend	-3.120	-4.471*
	Without tend	-0.926	-4.710*
lny	Trend	-1.463	-8.016*
	Without trend	-1.941	-4.487*
lnp	Trend	-2.581	-3.672**
	Without trend	-0.873	-3.418**
vol	Trend	-2.983	-9.662**
	Without trend	-0.043	-9.173**

Note :*(**) represent 1% and 5% significance levels respectively.

The ADF results reveal that all variables had a unit root at level form. This means that the variables were non-stationary or shared a common stochastic movement. In other words, the means and variances of the variables vary over time. In order to prevent spurious regression results (that is estimates that are invalid and having no economic implications), there was need to difference them. Therefore, all of the variables (agricultural exports, income of importing countries, relative price and exchange rate volatility) became stationary only after the first difference. Thus, implying that they were integrated of order one I(1). The presence of a unit root provided an adequate basis for conducting the johansen Cointegration test. The purpose for conducting the johansen test was to determine whether there was a long run association among the research variables.

5.3 The Measurement for Exchange Rate Volatility

Before commencing with measuring the exchange rate volatility it was vital to test for Arch effects. The results from the Arch Lagrange Multiplier are presented in table 8.

Table 8: Arch Lagrange Multiplier Results

Test	LM statistic	p. value
Archlm	6.35	0.0118

The results show that the Lagrange Multiplier (LM) statistic is significant. Therefore the null hypothesis which stated no arch effects was not rejected. Thus, this confirmed that there was heteroscedasticity. Thereafter, an exponential garch (2, 2) model was employed to measure the exchange rate volatility. The following results were obtained in table 9.

Table 9:Exponential Generalised Auto- regressive Conditional Heteroscedasticity Model

Variance Equation	**coefficient**	
constant	76.08781**	
	(36.32)	
β_j	1.542786**	
	(4.35)	
γ	-1.511594**	
	(-2.07)	
α	0.5611203**	
	(2.99)	
Diagnostic tests	**z-statistics**	**P.value**
Q test	9.232	0.323
Arch Lm test	0.370	0.542
Normality test	3.680	0.159

Note:** denotes significant at 5% level and t-statistic in parenthesis

The results from the egarch model show that β_j is relatively large and statistically significant at 5% level. Therefore the implication is that when there is volatility in Zambia's exchange rate, it will take a while to die out following a crisis even if the crisis is caused by external or internal factors. Since $\gamma < 0$, it entails the presence of asymmetric effect. Therefore, positive shocks or good news will generate less exchange rate volatility in the Zambian economy than negative shocks or bad news. The coefficient of γ is also highly significant at 5% level. The general presence of asymmetry in the exchange rate is consistent with the findings by Kahya et al. (1994), Koutmos and Theodossiou (1994), Kanas (2002), Kočenda and Valachy (2006), Koay and Kwek (2006) and Stancik (2006).The symmetric effect α shows that the exchange rate volatility is sensitive to market events.

Furthermore, diagnostic tests were conducted to determine whether the egarch model was the best fit for this research. The Q test was not significant. Hence, the residuals from the model

were not correlated. The Arch-Lm revealed that there were no remaining arch effects and the egarch model also passed the normality test.

5.4 Johansen Cointegration Test

This test was used as it is more appropriate when more than two variables are used in an equation. It is also considered to be superior to Engle and granger Cointegration test. Since there are four variables in the research model, there can be at least three Cointegrating vectors and so we test the null hypothesis that r=0, r ≤1, r ≤2 and r ≤3. The results of the test are shown in table 10.

Table 10: Johansen Cointegration Test

Null Hypothesis	Eigen value	Likelihood ratio statistics	5% critical value
r=0	0.763	51.96	47.29
r≤1	0.567	23.10**	29.68
r ≤2	0.214	6.34	15.41
r ≤3	0.073	1.51	3.76

Note:**= significant at 5% level

The results from the Cointegration test indicate that there is a single Cointegration relationship at r≤1. Since the likelihood ratio statistics 23.10*is smaller than the 5% critical value of 29.68, we cannot reject the null hypothesis of one Cointegrating equation. The single Cointegration relationship implies that the variables move together in the long run.

5.5 Estimation of Long Run Relationships

Since there is an existence of a long run association, we were able to estimate the long run relationships. Normalizing the Cointegrating vector with respect to real agricultural exports gives the following long run results.

Table 11: Long Run Estimates

Variables	coefficient
lny	0.40
	(10.96)
lnp	-17.33**
	(-9.43)
vt	-2.70**
	(-26.48)

Note: **=significant at 5% level and t- statistic in parenthesis

The results from table 11 suggest that an increase in income of importing countries (lny) causes Zambia's agricultural exports (lnagricxports) to increase but the coefficient is not statistically significant. The relative price (lnp) has a negative relationship with the agricultural exports. This implies that when there is an increase in relative price it will lead to a decrease in Zambia's agricultural exports. The coefficient of the relative price was statistically significant at 5% level. However, this finding is in line with the study's hypothesis which indicates that an increase in relative prices is expected to have a negative effect on agricultural exports.

The coefficient for the measure of volatility (vt) has a negative sign and it shows that increase in exchange rate volatility causes agricultural exports to decrease. The coefficient is statistically significant at 5% level. This finding is in line with the study's hypothesis which states that there is a negative relationship between real exchange rate volatility and agricultural exports. This result confirms with the findings of Kiptui (2008), Cho, Sheldon, and McCorriston (2002) and Chit et al. (2008). These researchers established that agricultural exports were indeed negatively affected by exchange rate volatility. However, the result is in contrast with the research findings by Garba (1998) who found out that exchange rate volatility was significant at 10% level and that it had the expected positive sign suggesting that the nominal devaluation of the Naira/US$ exchange rate had a positive impact on agricultural exports in Nigeria.

Therefore increased exchange rate volatility increases uncertainty about profits and future exchange rate behaviour. This implies that Zambia's agricultural exporters are most likely displaying risk aversion behaviour. When the volatility in the exchange rate increases the agricultural exporters will opt to reduce their exports or choose to sell their products within the

domestic market. This in turn will help to minimize their risk exposure. The exporters reduce their exports due to lack of well-developed hedging facilities and institutions in Zambia's foreign exchange markets. According to Musonda (2009), even where hedging opportunities are readily available, however, they tend to be very costly especially for small firms. Consequently, exporters bear all the risk of unexpected exchange rate movements.

Although Zambia needs to maintain competitive exchange rate in order to sustain its exports performance, it cannot ignore real exchange rate variability of the kwacha in relation to policies that aim at enhancing its exports performance and overall macroeconomic stability. Hence, it is important for Zambian policy-makers to enact intervention policies that aim at reducing excessive variability of real exchange rate of the kwacha in order to improve its export sector and economic growth, and overall external macroeconomic stability.

5.6 Error Correction Model

The finding of one Cointegrating vector provided the bases to estimate an error correction model (ECM). The ECM illustrates the short run dynamics that restores the equilibrium relationships represented by the Cointegrating vectors in the event of asymmetric shocks. The results from the ECM are displayed in table 12.

Table 12: Error Correction Model

Variables	**Coefficient**	**Standard error**	**z-statistic**	**prob**
ECT(-1)	-0.337	0.1633	-5.58	0.039
ΔlnAgx(-1)	-0.5279	0.2440	-2.16	0.030
ΔinY(-1)	-0.0555	1.1869	-0.05	0.963
ΔlnP(-1)	-3.7025	2.2597	1.64	0.101
ΔVol(-1)	1.9180	0.4380	4.38	0.000
constant	0.127	0.2531	0.50	0.615
		Diagnostics tests		
Serial correlation		LM (12.195)	Prob (0.730)	
Normality		Jarque bera (0.192)	Prob (0.908)	
Heteroscedasticity		F (1, 15) = 3.06	Prob(0.100)	
Stability		VECM specification imposed 3 unit moduli		

In Table 12, ln represents natural logarithm, the symbol Δ is the first difference operator, Agx is the agricultural exports volume, Y is incomes of importing countries, P is relative prices, Vol is exchange rate volatility and ECM is the error correction term. The coefficients of the lagged values of Δinwi, Δlnp and Δvol are short run parameters measuring the short run immediate impact of independent variables on agricultural exports(Δlnagx).

The Error Correction Model passed the relevant diagnostic tests such as normality, serial correlation, and stability tests. The Breusch-Godfrey Lagrange Multiplier test was used to test for serial correlation and results revealed that it there was no presence of serial correlation. The jarque-bera test was used to test for normality. Since, there was no evidence of heteroscedasticity. The table is normal. The table was also found to be stable.

The long-run equilibrium relationships were confirmed by the significant negative coefficient of the error correction term (ECT). The coefficient of the error correction term was -0.34 and was significant at 5% level. The results imply that the model adjusts at the rate of 34% towards long run equilibrium in the first period. In other words ,the speed at which agricultural exports adjusts to changes in world income, relative prices and exchange rate volatility to achieve long run equilibrium is low. Only 34 percent of the disequilibria of the previous period's shock adjust back to equilibrium in the current period.

Of particular interest in this study was the exchange rate variable. The ECM revealed that the exchange rate volatility in the kwacha had a positive and highly significant short run effect on Zambia's agricultural exports. That is a rise in the previous exchange rate will lead to an increase in current agricultural trade. This result is similar to the findings of Ramli and Podivinsky (2011) who found a positive relationship in the short-run between exchange rate volatility and exports for Indonesia. In addition, Ragoobur and Emandy (2011) also found a significant positive short run effect on Mauritius exports. How, the result contradicts with the research findings of Kenen and Rodrik (1986), Cushman (1988), and Arize (1995).

The positive short run impact of exchange rate volatility on agricultural exports could imply that Foreigners may take advantage of the volatility in the kwacha to increase their consumption. Moreover, foreigners being conscious of previous period variability make more appropriate decisions regarding their volume of imports (ragoobur and emandy, 2011).

Surprisingly, income of importing countries has a negative and insignificant short run effect on agricultural exports. This is not consistent with the study's hypothesis that there is a positive relationship between income of importing countries and the demand for agricultural exports. Whereas; the relative price has a negative short run effect on the agricultural exports which is not statistically significant.

5.7 Summary

The data that was collected was analysed using stata 11.3 version. The estimation results indicate that all the research variables were non-stationary. Thus, a Cointegration test was done to ascertain whether the variables shared a long run association. The results from the johansen Cointegration test revealed that there was one Cointegrating vector. The estimation of the long run relationships showed that the exchange rate volatility in the kwacha had a significant negative impact on Zambia's agricultural exports. The relative price had a negative impact on the agricultural exports. The income of importing countries had an insignificant positive impact on agricultural exports. Finally, an error correction model was employed.

CHAPTER SIX

CONCLUSION AND POLICY RECOMMENDATIONS

6.1 Conclusion

The study investigated the impact of exchange rate volatility on Zambia's agricultural exports between 1991 and 2011 using time series data. The study is different from previous studies as it focuses specifically on Zambia's agricultural exports and employed an EGARCH model to measure exchange rate volatility.

After undertaking unit root tests using the Augmented Dickey Fuller test, it was discovered that all the research variables were non-stationary and only became stationary after they were integrated of order one I(1). By use of the Johansen Cointegration analysis, the study established that the research variables shared a long run association. The estimated long run elasticities, with an exception of income of importing countries, are consistent with the study's hypothesis. Income of importing countries was found to have an insignificant positive effect on Zambia's agricultural exports. This is not in line with study's hypothesis which suggests that an increase in income of the importing country will lead to an increase in exports. The long run elasticity of relative prices indicated that an increase in relative prices has a negative effect on the agricultural exports. Its coefficient was statistically significant. This finding confirmed the study's hypothesis which was there is a negative relationship between relative price and agricultural exports. The negative long run elasticity of the real exchange rate volatility implies that a rise in real exchange rate volatility has an adverse effect on agricultural exports. This result was significant and hence is in line with the study's hypothesis which states that there is a negative relationship between real exchange rate volatility and agricultural exports.

The results from the error correction model show that the exchange rate volatility has a significant positive effect on agricultural exports. On the other hand income of importing countries and relative price has a negative effect on agricultural exports. However, both the coefficients for income and relative price were insignificant. The ECM coefficient in each case implies that about 34 percent of the disequilibrium of the previous month's shock adjusts back to equilibrium in the current month.

6.2 Policy Recommendations

The results from the study provide strong evidence that exchange rate volatility has a negative impact on agricultural trade in Zambia. It leads to a reduction in the exportation of agricultural

products. Thus, the study recommends that the government should seek to maintain a stable and competitive exchange rate. Inorder to maintain stability in the kwacha and minimize the degree of volatility, there is need to ensure a sufficient degree of macroeconomic stability. Macroeconomic stability should be reflected in various economic variables such as current account and fiscal balances consistent with low and declining debt levels, inflation in the low single digits and rising per capita GDP. This is more likely to encourage capital inflows which boost growth of the agricultural exports and in turn will contribute to economic growth of the country.

In addition, the results also suggested that Zambia's agricultural exporters are risk averse because they tend to reduce their exports to foreign markets and opt to produce more for the local market as a means of securing relatively certain profits. Therefore, there is need for Zambia to develop hedging facilities and institutions in order to reduce the exchange-rate risk.

Further research should focus on incorporating more measures of exchange rate volatility inorder to compare and establish the relationship between exchange rate volatility and agricultural exports. Research can also take a more theoretical approach and conduct studies where interviews are used. By using interviews one can have a greater understanding of the choice behind the actions of exporting firms when they face exchange rate volatility.

6.3 Limitations of study

The study covers the period 1991 to 2011.The sample size was limited in scope due to problems of data quality and availability. Hence, estimates obtained in other studies may be different depending on the sample size and sources of the data.

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Appendix

Summary of statistics

summarize lnwi	lnreer lnagricxports	volt		
Variable	Obs Mean	Std. Dev.	Min	Max
lnwi	21 2.160959	.8175958	0	3.044523
lnreer	21 4.465174	.2704417	4.103304	4.932457
lnagricxpo~s	21 3.762355	1.326857	.5159922	5.722179
volt	21 6.230102	1.006019	4.66003	8.07565

Unit root test

dfuller lnagricxports, trend lags(1)				
Augmented Dickey-Fuller test for unit root Number of obs = 19				
---------- Interpolated Dickey-Fuller ---------				
	Test	1% Critical	5% Critical	10% Critical
	Statistic	Value	Value	Value
Z(t)	-3.120	-4.380	-3.600	-3.240
MacKinnon approximate p-value for Z(t) = 0.1016				

dfuller lnagricxports, lags(1)				
Augmented Dickey-Fuller test for unit root Number of obs = 19				
---------- Interpolated Dickey-Fuller ---------				
	Test	1% Critical	5% Critical	10% Critical
	Statistic	Value	Value	Value
Z(t)	-0.926	-3.750	-3.000	-2.630
MacKinnon approximate p-value for Z(t) = 0.7792				

dfuller lnagricxportsd1, lags(1)				
Augmented Dickey-Fuller test for unit root Number of obs = 18				
---------- Interpolated Dickey-Fuller ---------				
	Test	1% Critical	5% Critical	10% Critical
	Statistic	Value	Value	Value
Z(t)	-3.872	-3.750	-3.000	-2.630
MacKinnon approximate p-value for Z(t) = 0.0022				