EFFECT OF DERIVATIVE TRADING ON COMMODITY PRICES OF SORGHUM SMALLHOLDER FARMERS IN KITUI COUNTY, KENYA

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NOVEMBER, 2018

DECLARATION

I declare that this is my original work and has never been presented for a degree in any other university Signature...... Date....... RONO KIPKOECH

D61/84211/2015

This project has been submitted for examination with my approval as University supervisor.

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DEDICATION

This research project is dedicated to my family for their encouragement, support and understanding my absence while undertaking my research project. My wife Mrs. Rono and son Kimutai who has worked so hard to support my project, the love and care they gave me and also providing for my other needs. For this I say thank you all and God bless.

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ABBREVIATIONS AND ACRONYMS

ANOVA	Analysis of Variance	
СВК	Central Bank of Kenya	
EAB	East African Breweries	
GMM	Geometric Mean Model	
KNBS	Kenya National Bureau of Statistic	
КСЕВ	Kenya Commodities Exchange Board	
LSE	London Stock Exchange	
NAFIS	National Farmer's Information Service	
NSE	Nairobi Securities Exchange	
OTC	Over the Counter	
ROA	Return on Assets	
SPSS	Scientific Package for Social Sciences	
UK	United Kingdom	

ABSTRACT

Commodity market failure and inefficiency has caused traders to make losses at the expense of cartels and brokers who profit from these market inefficiencies. As such derivative trading is an important tool for risk management by investors in different sectors and thus sorghum farmers can trade in derivative tools. This research pursued to examine the relations between derivative trading and the commodity prices of sorghum in Kitui County, Kenya. It adopted a descriptive design of the study in which secondary data was used from reports of EAB contracted farmers, NAFIS, KNBS, KCEB, KALRO and Ministry of Agriculture, Kitui County. Data was analyzed using SPPS and the descriptive statistics (mean, medium, maximum, minimum, standard deviation and frequencies presented in forms of tables and graphs). ANOVA test was done and explanation given in prose. The findings from this study revealed the presence of an important statistical variance between the mean of spot market prices and contracted prices. This means that farmers in Kitui County who engage in forward contracts with EAB in the long run enjoy higher prices for their commodities compared to those selling on the spot market. This was as a result of rather stable prices for the commodity from the contractual agreement with EAB for commodities supplied at a given date at an agreed price. Since the derivative trading is an important tool of risk management by investors in different sectors, commodity derivative could be used in hedging to reduce potential losses by investors in their commodity market. Moreover, commodity prices are characterized by high volatility of commodity prices which makes commodity derivative trading to be an important instrument for investors to manage their risk while enjoying a given return on individual ventures.

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Derivative trading involves exchange where the forwards, futures, options and swaps contracts of underlying assets are traded. These derivative instruments can be traded over the counter and also in organized exchange. The market's participants in the derivative trading involve the hedgers, speculators and arbitrageurs. Derivative market is dissimilar from the traditional spot market where the market's partakers include middle men, producers and consumers. Agricultural commodity prices influence the earnings and wealth of farmers and since investors' goals are to enhance their earnings and maximize their wealth as they manage risk associated with their portfolio returns, development and innovation of derivative trading might facilitate investors to manage their investment portfolios and associated risks. Usually hedgers in a derivative market try to counterbalance any huge possible losses' risk while risk-takers work to gain from fluctuation of market prices of imitative contracts and take up position to absorb and provide quality as they absorb risk where market traders are not willing to get involved (Hull, 2006).

The study is anchored on Price Discovery Theory (Gardbade & Silber, 1983) and Risk Management Theory (Niemann & Morgenstern, 1953). Price Discovery Theory states that the price of securities, commodities and services or goods is determined correctly when the available information is incorporated on the setting of the prices. Derivative trading avails information and analyzes it faster in the market. The market reacts to the new information, demand and supply leading to the correct determination of prices hence price discovery function. Risk Management Theory on the other hand states that every investment is associated with a risk and that an investor expects a maximum utility in their investment in that they want to maximize their returns with minimum risk. Derivative market provides an avenue for hedging investments against exposure to investment risks and managing price volatilities. Since derivatives trading help to address price volatility and price discovery functions which are caused by markets inefficiency it could also be used to stabilize earnings considering that the risk is mitigated by derivative trading.

Kitui County covers an area of 30515 km square. The area is mostly occupied by small scale farmers growing sorghum for commercial and subsistence purpose. Approximately 5000 households are engaged in the commercial trade of sorghum (KNBS, 2016). Sorghum farming is best suited since it can grow in low raining conditions of Kitui County. Farmers can sell their sorghum produce to East African Breweries (EAB) through forward contracts or directly to willing buyers at the spot market.

1.1.1 Derivative Trading

Derivative Trading is a tool for finance that originates its values according to the primary prices of assets (Hull 2006). There are several derivative tools' types (futures, swaps, forwards) and can be traded in exchange trade market for standardized contracts. Over the counter platform is also available for non-standardized contracts. Future derivatives are contracts where traders of the underlying asset make obligations to trade particular quantities of a given asset at a predetermined price in the present on specific future date. It is same with forwards only that forwards are traded on over the counter. Options are contracts that provide rights to the owner, but not the duty to trade a specific option at prices predetermined on an upcoming date.

Conversely, swaps are agreements used to hedge in contradiction of the volatility of price assets. Hedging is an approach used to diminish enormous extensive losses recognised in that a party repairs the price in its maximum value it receives or pays for the asset while the commodity market price defines the cash flows exchanged.

Derivative markets provide instruments used in trading which act as risk management tools. These tools can be used by investors to hedge them against exposure to investment risk (Shen & Hartarska 2013). It is also important since it provides market information and processes it faster thus speculators can gain profits from derivative trading. Moreover, it avails more information that investors can use to make decisions and lead to price discovery function (Beelders & Massey 2003). Price stabilization is also the key role of derivative trading since it provides instruments like swaps to protect prices (Lien & Zhang, 2008). Financial markets have created their dependent way of giving insurance against financial losses in the form of contracts which is the derivative trading. Derivative trading can be measured by the transactions at the organized exchange.

1.1.2 Commodity Prices

Commodity prices are the values that are put on the commodity and are usually based on the commodity's demand and supply (Irwin et al, 2009). Prices of commodities are agreed upon by parties based on the available information in the market. Commodities can be exchanged immediately when sold (spot markets) or the prices can be agreed upon for the product to be exchanged at an agreed future date. Parties agree on a predetermined price to cover themselves against adverse price movements when making future prices in a contract. The commodity prices of agricultural producers vary depending on the supply and demand factors, production volumes and the prevailing market dynamics (Jaee, 1987). The investor's main goal in any business or venture is to maximize wealth and increase profits in the business venture (Smith, 1790). Enhancing commodity prices could be one of the main agendas for investors. Jensen (1976) agency theory tries to realign the business goal and risk avoidance. Having commodity prices will enable investors to plan for their investment well since they can estimate their expected earnings based on available prices and also make decisions on which market to invest in, either spot or derivate future markets. They can also access credits to increase their business venture because of the assurance of future earnings.

Commodity prices are determined as a function of its market as a whole by interaction of market supply and demand at a given quantity. Markets react quickly to variations in demand and supply to attain an equilibrium quantity and price for the commodity, (Frankel and Rose, 2009). Prices can also be determined by parties who agree on a future price using fixed, floating, floor or ceiling price. A fixed commodity price is determined at the beginning of the future contract, that is, the price set to be delivered on a given future date. Ceiling and floor commodity price is the agreed minimum and maximum prices for the commodity while floating commodity prices is an aggregate of commodity prices over a given time, hence giving the average price.

1.1.3 Derivative Trading and Commodity Prices

Derivative trading provides an avenue for commodity derivative instruments to be traded in the derivative markets. Since forward instruments are agreements to be executed at an upcoming time at an agreed price, the groups in the contracts tend to use the contract to fix their commodity prices and reduce possible losses from price fluctuations. Traders have their core business as being to maximize the shareholders' wealth. By using the derivative instruments, they can manage their risks through price hedging. Traders can also speculate in the market using the derivative instruments to profit from fluctuations of market prices of derivative contracts and absorb excess risk and provide liquidity. Whereas arbitrageurs aim at making riskless profits when instruments are traded at different prices on different markets, the speculators are usually involved.

Market efficiency do influence the commodity prices in that when the market is inefficient and unpredictable it is characterised by cartels and costly complex chain process that involve production, assembly sorting, packaging, distribution and retail stage in which producers and consumers are linked through a series of middlemen who control the market and prices. This gives the market dramatic turbulence involving price fluctuations and demand and supply problems. Derivative markets provide instruments which can be traded by hedgers, speculators and arbitrageur to beat market inefficiencies, that is, commodity derivative trading provides interlink services, including markets information hence stabilization of commodity prices. On this commodity, derivative market becomes an established solution to market failures in the market and information (Key & Runsten, 1999, Grosh, 1994).

The establishment of derivative futures could provide hedges against losses since traders are assured of the market and commodity prices based on the agreement to transact during an upcoming date at a given price. This helps in budgeting and planning for the cost of trading hence turn impact on their earnings because of assured market thus providing an avenue for traders to efficiently allocate their minimum resources to make the most of returns on the products (Du et al 2013). The use of derivative instruments to mitigate price volatility risks gives traders confidence and certainty in investment planning. This will in turn affect earnings since producers can increase volumes hence benefitting from economies of scale. Moreover, alternative investment instruments facilitate availability of credit and insurance facilities hence access to cheaper input capital. For investors to improve their income they must be able to assess the market and information on markets prices that would prevail in future and thus start allocating restricted resource to the efficient portfolio to maximize profits.

1.1.4 Sorghum farming in Kitui County, Kenya

Kitui County has an estimated number of 5000 smallholder farmers with approximately 70% of them engaging in sorghum farming. The county enjoys favorable weather condition suitable for growing the commodity in seasons. Though the community has been practicing sorghum farming for a long period they still earn little from it. This is due to poor prices and lack of market for their produce. The rise of demand for low end beer brand (senator keg) in the Kenyan market has necessitated the East African Breweries (EAB) to have forward contracts with sorghum farmers in a bid to meet the demands for the product. This has driven the demand for sorghum to more than 110%. The entrance of EAB into Kitui for search of the sorghum commodity for use in production of the local beer has led to massive improvement of sorghum farming in the region since the commodity can be used as a cash crop and food source. Kitui County Assembly in support of the said commodity has enacted the Kitui Sorghum Farming Act No. 8 of 2014 with the aim of emphasizing the importance of sorghum to the community and the County at large. The forwards arrangements of EAB with sorghum farmers have enabled many farmers in Kitui to be parties in the forward contract to produce sorghum for the EAB at a specific agreed price at a future date. Some farmers choose to use conventional market to sell their sorghum products at spot prices on their harvesting periods. EAB through their contract arrangements has enabled farmers to access credit facilities for inputs and technical services for better production to facilitate efficient and higher production volumes at the agreed price in the future.

1.2 Research Problem

Commodities are characterized by high price volatility as a result of market fundamentals such as the yields' fluctuations which are dictated by weather conditions. Demand and supply elasticity with respect to price as well as time lag of production activities which are sometimes unpredictable are also exhibited in commodity market. Market failure and inefficiency also causes traders to make losses at the expense of cartels and brokers who profit from these market inefficiencies. This necessitates the establishments of derivative markets which will help traders hedge against price volatility and provide them with market information to help in making their investment and funding decisions while discovering the prices for their product hence price risk management. Moreover, due to the variance in future prices from future spot price due to factors such as government price intervention, changes in volume of demand and supply and unexpected change in foreign exchange rate, this necessitates the establishment of derivative markets to mitigate against such risks.

KNBS (2016) poverty index report ranged Kitui County among the poorest despite them producing sorghum and other commodities. This has been attributed to poor prices and market inefficiencies for their commodities. The oil industry has used derivative trading to hedge crude oil price volatility (Nzuki 2010) while commercial banks have used it to manage foreign exchange risk exposure (Mumoki, 2009). It is insightful to note that under uncertainty investors will prefer stable income and consumption stream to highly variable ones. In order to manage the price fluctuation and stabilize sorghum earnings, risk management tool, efficient market and price discovery instruments such as derivative trading have been put in place in Kitui County.

Studies on derivative trading have been done locally and internationally. For instance, the World Bank Research Report (2008) found that commodity derivative trading only favors dependable business associates like large scale farmers who generate lower transaction cost. Locally, Chege (2016) studied the association between hedging strategies and non-financial firms' financial performance listed at the NSE while Ndugu (2013) did a study on how techniques of financial innovation affect management of risk of non-financial bodies in Kenya. Further, derivatives' value examined by Nasurutia (2013) in handling foreign exchange disclosure in Kenya commercial banks. Transport sector was studied by Kathure (2011) who examined the association between financial hedging strategies and impact of finance (gain or loss) on Kenya Airways Limited.

While different local studies have looked on the impact of derivative trading in different contexts, the question as to whether or not the derivative trading (forwards) affects agricultural commodities prices locally has remained largely unexplored. International studies such as World Bank have found that, derivative trading is effective on large scale agriculture compared to small scale hence creating research gap. The researcher efforts to bridge the aforementioned gap in the research by providing an answer to the subsequent question. Does derivate trading affect sorghum prices of small–scale sorghum farmers?

1.3 Research Objective

The project's objective is to determine the effect of derivative trading on commodity prices of sorghum farmers in Kitui County.

1.4 Value of the Study

The outcomes of the research project will be significant to the regulators since prices of commodities forecast are key input in the "macroeconomic policy planning and formulation." It will also show Nairobi Securities Exchange (NSE) the importance of establishing a structured commodity exchange market. The regulators like Capital Market Authority and organized small-scale farmers' cooperatives can use this finding and recommendations to enact and improve regulation and operations of commodity market.

Investors in the agricultural sector and farmers will benefit as they will be able to understand the influence of derivative trading on the commodity value of small scale farming. They will make informed decisions in entering forward contracts. It will also help investor choose competitive markets and quote realistic prices for their transactions.

Scholars will also find it significant as it will provide updated information on the how derivative trading on commodity affects sorghum prices of small scale farmers. Fellow researchers will also find it important to further their research on significance of alternative investment in commodity futures and how to manage risk. Practitioners in the beer industry and commodity producers will find it significant as it will shed more light on their trading impact on society. This can also be viewed as corporate social responsibility if it impacts positively to the society.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter reviews the existing different academics' literature, authors and researchers on the subject of the study, that is derivative trading and earnings. It covers theoretical reviews, determinants of earnings, empirical studies reviews, literature review summary and conceptual framework.

2.2 Theoretical Review

The theories covered include Price discovery theory (Gardbade & Silber, 1983), Economic theory (Friedman, 1970) and Black and Scholes (1973) option pricing theory.

2.2.1 Price Discovery Theory

The landmark study on price discovery was done by Gardbade and Silber (1983) where they argued that derivative commodity market plays a price discovery role in storable commodities. This arises when investors anticipate future values of the commodity by analyzing the activities in the derivative market. This is resultant from the progressive derivatives nature and also since information is rapidly engrossed in the derivate markets. It was supported by Kavussanos *et al* (2008) that discovery of price role gains the market of commodities firms and farmers as it empowers them to make risk management assessment management, demand forecast, management of portfolio and decisions of budget planning.

The theory is applicable in derivative trading as it enables price discovery for commodities produced. This means that prices set by the producers of those commodities will be reflected fully. As a result, the producers can plan on their budgets and costs of production in reference to prices hence making informed decisions on whether the venture is profitable or not while keeping other factors constant. The Garbade-Silber studied the discovery or price role of future prices, the arbitrage outcome on the prices change in spot and future commodities of market.

2.2.2 Economic Theory

This theory was championed by Friedman (1970). It noted that society determines and meets its needs and wants through the market place resultant from the self-interest pursuit by biasness. This theory articulates the responsibility of the business to increase profits and earnings in a free market with free flow of information and no market asymmetry. Even while conforming to the business rules and ethical standards, the main goal of a firm is usually to increase shareholders wealth. To achieve this, the firm must minimize its risks.

It was further supported by studies of Brown and Toft (2002) that were of the view that one of the ways through which a firm challenged with financial distress costs can reduce its risks is by using different derivatives in line with the aim of value maximization. As such, this theory is applicable in that commodity prices and returns of investors should be improved by enabling management of price volatility and the costs in line with business goal for wealth maximization.

2.2.3 Black Scholes Option Pricing model

The derivative model's equation was developed by Scholes and Black (1973) for price estimating of options over time. The primary objective of using Black Scholes theory is the calculation of the theoretical value of the option. However, in other environments an exchange traded options and an actual market price is used. Options are mostly quoted in terms of volatility hence the price comparison across strikes currencies and the term to expiration is instantly achieved. After trading the volatility price can be converted to price in currency.

The theory is important for investors in a derivative market. The main aim of the model is to hedge options by selling and buying the assets underlying in the best way possible to eradicate the risk. The key assumption of the theory is lack of arbitrage opportunity and frictionless market. Arbitrage occurs when prices of the same commodity vary in different markets. While no arbitrage argument for pricing derivatives is based on a replication strategy, this strategy uses market instruments to replicate the final and initial positions required by derivatives. The theory conditions that by unceasingly amending the stock and proportion of selections s in a portfolio, a risk-taker is able to make a non-risky hedge portfolio where all risks in market are eradicated. This theory is applicable in accumulation and managing returns and commodity prices of investors since the market price volatility and other costs of the markets inefficiencies are eliminated by hedging through the use of options.

2.3 Determinants of Commodity Prices

Factors affecting commodity prices include: market accessibility, storage costs, weather conditions, cost of inputs, market efficiency, production volumes, demand and supply constraints and economic conditions.

Accessibility to market influences the commodity prices of the producers. When the market is thin and inaccessible, it is characterized by high price volatiles, few transactions, asymmetric information, and low volumes of production, high transaction costs and agents from cartels in control of the markets. The results are inefficient and price volatility (Lapis, 2012). When investors trade in derivative

market they incur smaller transactional cost than trading in the spot markets. This makes trading in commodity derivative markets an economically sound tool to be castoff as a tool of cost management by investors as they are able to maximize their returns while saving on cost. Savings are attained because there will be no storage cost for farmers as their market is ready. Other costs saved include marketing cost since the farmers have already established contracts hence they need not to market their commodity. Moreover, speculation and price volatility is managed hence increasing the earnings of the producers.

Weather and economic conditions affect the agricultural commodities prices (Solomou, Wu, 2003). When the weather is unfavorable, the resultant productions are poor hence low supply of the commodity increasing prices and vice versa. The volumes of production conversely affect the commodity prices level since economies of scale are enjoyed when one does bigger shares than when the production is small.

Market efficiency affects the commodity prices if it efficiently incorporates all available information hence price discovery. If it is inefficient it is characterized by high price volatility (Ranganathan, Usha, 2014). Lack of credits and input capital for production by farmers greatly influences their commodity prices. As a result, they might not be able to produce the quality products required by the purchasing entity. Moreover, they may not be able to sustain their productions leading to poor production hence attracting poor prices.

Supply and demand constraints influence the commodity prices, in that when there is high demand with low supply the price rises and like-wise. Lack of access to markets and crop storage facilities cause post-harvest losses while inadequate infrastructure to supply to spot markets lead to inefficient and hence prices fluctuations (Assa 2016).

2.4 Empirical Review

Ndugu (2013) studied how techniques of financial innovation affect management of risks of Kenya non-financial institutions. The study used descriptive research design and primary data from Thirty One (31) Nairobi Securities Exchange non-financial firms. The finding was that institutions use derivatives for hedging, liquidity and risk management purposes. There was also evidence that arbitrageurs and speculators too use derivatives for different reasons. Despite challenges such as complexity in the use of derivatives and lack of organized markets, the efficacy of derivatives as a means of managing economic and other forms of risks remained widely accepted. Data collected was analysed using multiple regression model and Statistic Package for Social Sciences (SPSS). From the findings, information diffusion, transparency, skills, regulations and technology support at 1%, 5% and 10% level significance are significant in explaining the variation in derivate usage. These outcomes advocate that financial innovation strategies are linked with risk.

Anyango (2016) conducted a study involving a high depth analysis of financial derivatives and its effect on the commercial banks financial performance using descriptive research design. From the Annual Report 2011-2015 of Central Bank of Kenya Supervision, secondary data was collected and analysed using multiple regressions. SPSS Version 18 was used to obtain the regression output, returns on asset (ROA) was used as proxy for financial performance while financial derivatives, liquidity ratio and shareholders' equity ratio were the predictor variables. The findings indicated that there existed an insignificant association among the financial

performance (ROA) of Kenyan commercial banks and financial derivatives. Additionally, adverse nature of the association meant that a unit variation (rise) in financial derivatives eventually result to a decrease in commercial banks financial performance. It is imperative that financial derivatives should be properly used in a manner that is instrumental to the goal of a sound and safe banking system in Kenya.

Kathure (2011) examined the relationship between financial hedging strategies and financial impact (gain or loss) on Kenya Airways Limited. The study used descriptive research design, both primary data and secondary data from Kenya Airways Limited financial statements and interviews were conducted on financial managers. Data was analysed using descriptive statistic (frequencies, percentage, mean and standard deviation) and regression analysis. Findings were presented in bar graphs form, pie charts and tables while explanations were done in prose. The findings revealed that Kenya Airways had adopted the financial hedging strategies in the financial management. These strategies included operations of "Currencies' money market, currencies forward contract, operations for interest and forward exchange contract for interest." With these strategies in place, Kenya Airways managed to reduce risks related to finance such as commodity risk, volatility risks and interest rate risk. Consequently, there was reduction in financial loss and improved financial performance. The study also noted that the company could reduce the financial impact on profitability through adoption of hedging on all major expenses denominated in US Dollar.

Chege (2016) studied the association between hedging strategies and financial performance of non-financial firms listed at NSE using a descriptive research design

targeting 46 listed non-financial firms on the NSE. Data for the study was collected for a duration of 5 years that is 2011 to 2015. The results of correlation analysis revealed that the Pearson Correlation between return on assets and lead and lag strategy of hedging indicated that a strong positive correlation exists between financial performance (ROA) and the application of lead and lag hedging strategy among non-financial listed firms at the NSE. The findings of regression analysis indicated that forwards and currency invoicing were significant in explaining the variations in financial performance. From this research it can be concluded that a strong positive correlation exists between financial performance (ROA) and the application of lead and lag hedging strategy among non-financial listed firms at the NSE. Moreover, that a strong positive correlation exists between currency invoicing and performance of non-financial companies listed at NSE. The forwards and currency invoicing were significant in financial performance.

Derivatives impact in handling foreign exchange contact in Kenya commercial banks examined by Nasurutia (2013) implemented the design of descriptive research. The study sample size included ten recorded commercial banks that were in operation from Jan, 2008 to Dec, 2012 during the study period. Analysis was carried out by using regression analysis method. The findings showed that usage of derivative had an adverse relationship with exposure of foreign exchange signifying that increasing the usage of derivative corresponded in decreasing the exposure of foreign exchange. Additionally, the association was found to be important as indicted by the p-value (0.0357>.05). Hence, the research settled that there existed an adverse substantial association between foreign exchange exposure and derivative usage for the NSE listed banks. Therefore, usage of derivatives was found have an impact in foreign exchange exposure management.

A study was carried out by Shen and Hartarska (2013) to determine the derivatives of financial effectiveness as a small commercial banks risk management tool. The research used data from Chicago Federal Reserve Bank for the periods 2006 to 2010 to estimate an endogenous switching model. The switching model was meant to assess how different risk factors affect profitability of derivative users and non-users of agricultural banks. This tactic lets endogenous choices of banks to use financial derivatives to be accounted for and to build counter factual analysis. The findings of the study in the sample period showed that management of risks through financial derivatives in banks of agricultural nature was active while profitability of derivatives user agricultural banks was less effective by interest risk credit risk. From the findings, it was clear that derivative activities have enhanced agricultural banks impacts which were increasing over years and also their profitability. These findings are important as they provide experiential evidence on the risk management effectiveness through financial derivatives in agricultural derivatives in agricultural banks.

Sharma and Vashishtha (2007) analysed the risk management's various issues in the agricultural and power sectors in India. Traditionally, derivative approaches have been applied to construct contracts of weather derivative with diverse underlying weather indices. The findings of the study were that an appropriate weather based derivatives contract systems may be more flexible, economical and a sustainable way of managing the volumes related to weather risk in an economy predominant for agriculture and power just like India. In respect to this thesis, the findings of the study

are important to stakeholders in the agricultural and power sectors of the economy as it will help them manage volumes related risks.

Komarek and Estahani (2012) examined how diverse policies of marketing can change the income of households growing banana in Ntungamo District, Uganda. The methodology used the partial equilibrium model and a trader profit-maximization model to examine changes in the banana market equilibrium conditions, marketing costs and market competitiveness. Based on the primary and secondary data, the paper examined how reducing marketing costs and increasing demand affected the returns of banana growers. The findings of the study indicated that by increasing the supply relative to demand reduced the returns of a grower. Further, that by reducing markets power and luring middlemen marketing costs led to higher grower returns. The study recommended that policies should be in place to lower marketing costs for traders. Moreover, those strategies which promoted processing of bananas should be put in place. This meant that the introduction of a commodity derivative market would help reduce marketing cost while increasing demand hence higher income since price movements are accessed for commodity producers.

Emm and Ince (2011) examined the extent of systematic risk and competition in over the counter (OTC) derivatives dealings by using derivative related failures during 1990s. The study used the event study methodology with crude dependence adjustment to examine the wealth effects for the involved derivatives dealers. Moreover, it used the market adjusted model to check for robustness and a multivariable regression framework to estimate the determinants of the abnormal returns. The findings of the study revealed that OTC derivatives dealers experienced a negative return when their clients announced derivative losses in contrast to when rival dealers uninvolved in the loss event exhibited positive returns. The extent of positive returns grew with new events and dealers steered clear of derivative trouble. Broader industry portfolio of security brokers, dealers and advisors were affected negatively indicating possible industry contagion. The cross-sectional analysis of the abnormal returns indicated the presences of information contagion implying that in a financial crisis involving derivatives systematic failure is not likely.

Dey and Maitra (2016) studied the questions on the efficiency and roles of commodity future markets and whether the Indian commodity future markets helped rationalize farmers' prices. The study considered pepper, coffee and rubber futures and spot markets. The efficiency of futures markets, divergence and causality between futures and spot markets was studied by employing co-integrations, error corrections and causality models. The sample data was from the inception of future trading's. The commodities were also compared on the basis of trading at the future markets verse the spot market. The findings of the study showed that coffee and rubber spot markets did process information faster while pepper future market was informational efficient in price discovery. In addition, pepper and coffee future markets showed convergence while rubbers showed a divergence. Unidirectional causality from pepper futures to spot markets was observed wherein the former was weakly exogenous to the later. On the other hand, bidirectional causality was observed in rubber and coffee. The researchers argued that further research needed to be done in other commodities to give a comprehensive view while including those commodities whose prices were fixed by the government. This finding is important to us as it helps in understanding the interaction and interrelationship between futures markets and spot markets drawings.

El-Masry (2006) did a study which sought to shed light on use of derivatives and risk management practices in the United Kingdom (UK) market. The study was conducted through questionnaires which focused on determining the reasons for either using or not using derivatives for 401 UK non-financial companies. The findings indicated that the larger firms were more likely to use derivatives than medium and smaller firms, the public companies were more likely to use derivatives than private firms and derivatives usage was greatest among international firms.

2.5 Summary of Literature Review

Local and international studies have been done on derivative trading on the cross sectional economic sectors, for instance in the banking sector, (Shen and Hartarska, 2013; Nasurutia 2013; Chege 2016 and Anyango 2016). However, very few studies in Kenya have been done on derivative trading on commodities. This in essence creates a research gap which needs to be studied. Komarek and Estahani (2012) found that for there to be higher returns on commodities then there should be policies and ways of reducing the market cost for the commodity. A research gap is created from this finding in that the study did not give the ways of reducing the market cost and managing demand and supply price volatilities. Dey and Maitra (2016) did a study on the impact of the derivative trading in India for coffee, rubber and pepper on the Indian economy. They indeed suggested that further studies needed to be done on other commodities.

Owing to these gaps, a study on the effects of derivative trading on the earnings of sorghum small holder farmers is paramount. Sorghum farming is a key income contributor to the residents of Kitui County, Kenya. As such, the research will be useful in identifying the underlying factors that influence their earning especially as regard sorghum farming. Derivative trading could be the possible answer to the research gap.

2.6 Conceptual Framework

The independent variable in the study is derivative trading which is the forward contract. The dependant variables are the commodity prices which is measured by forward prices and spot prices. Forward prices are prices that are in the contractual agreement of the EAB and sorghum farmers while spot prices are the prevailing market prices for sorghum produce.

Independent Variable

Dependent Variable



Fig 2.1 Conceptual model

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the methods and tools used in research analysis of data. These include research design, data collection and analysis with the aim of providing accurate and reliable information to the users.

3.2 Research design

Taking into account that Kenya sorghum farmers are distributed across the country and the need to ensure that the study arrived at reliable conclusions, a case study was the most appropriate to use in this research to facilitate the investigation of the dynamics involving derivative trading and commodity prices in Kitui County. Case study research design analyses a phenomenon to generate a hypothesis and to validate a method. It involves depth investigation of groups or events to generate multi-faceted understanding of complex issues in its real-life context (Yin, 1984).

Case study uses qualitative and quantitative research design. It entails collecting data which outlines, groups, events, organizing, tabulating, showing and describing the data collected. It normally employs visual aids like charts and graphs that assist a reader to easily understand the distribution of data (Glass & Hopkins, 1984). Perry (1998) elaborates the justification on use of case study design to investigate contemporary phenomena in different fields.

3.3 Data collection

The study used secondary data sourced from the reports of East African Breweries contracted farmers, National Farmers Information Service, Kenya National Bureau of Statistics, Kenya Commodities Exchange Board, Kenya Agricultural Research Organisation and Ministry of Agriculture, Kitui County. The data collected was the prices of sorghum commodity in the forward contracts and the spot prices. The research data was in reference to a period of five (5) years from 2012 to 2016. The commodity prices was categorized into two strata of sorghum prices for farmers engaged in contractual agreements with EAB (forward contract prices) and conventional markets prices (spot prices) for sorghum farmers in Kitui County. This ensured the full representation in terms of prices from farmers contracted by EAB and those trading on conventional markets prices.

3.4 Data analysis

Data collected was coded and analysed. It was validated and analysed using

Statistical Package of Social Science (SPSS) to generate quantitative reports through tabulations, percentages and a measure of central tendency. Quantitative data was presented in the form of tables, bar graphs and pie charts to give a clear picture of the research findings. Analysis of variance (ANOVA) was used to examine the difference in means of forward contracts prices and spot prices for sorghum commodity. The distribution of data was tested at 5% level of significance.

Category	Variable	Empirical studies	Measure ment	Description
Independen t variable	Derivative trading Forward contract	Scholesand Black (1973). Kathure (2011). Grosh (1994). Hull 2006).	Nominal.	The contracts between EAB and sorghum farmers in kitui to be paid an agreed future date.
Dependent	Commodity prices > Spot prices > Forward prices	Irwin et al, 2009 (Jaee, 1987).	Ratio scale (Prices per kg.)	Prices of the sorghum commodity at spot price and forward prices offered by EAB

3.4.1 Operationalization of study variables

Table 3.1 Operationalization of study variables

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter discusses the data analysis, presentation of the study findings and its interpretation. Descriptive statistic and ANOVA are also discussed and presented in forms of tables, graphs, charts and figures.

4.2 Descriptive Analysis

The descriptive statistics analyzed include the mean, standard deviation, maximum, minimum, coefficient of variation and how data is skewed.

4.2.1 Descriptive statistics

The study used two variables, that is, the contracted prices and spot prices. The descriptive characteristics of the variables are shown in Table 4.1 below.

	Ν	Minimum	Maximum	Mean	Std. Deviation
CONTRACTED	<u>(</u>)	24	22		2 220
PRICE	00	24	55	26.80	5.559
SPOT PRICE	60	15	40	23.21	6.810
Valid N (listwise)	60				

 Table 4.1 Descriptive Statistics

Source: Research Findings

From the data analysis on above table, the contracted prices for the farmers trading their sorghum to EAB sell at an average mean of, Kshs. 26.80 per kilogram while those selling in the spot market have a mean of Kshs. 23.21 per kilogram. This finding reveals that, contracted prices are higher cumulatively over the study period. From

this findings it can be concluded that, the average mean prices for the contracted farmers per unit was higher than the farmers selling spot prices. This means that, the contracted farmers enjoyed a better deal from their sorghum by margin of Kshs. 3.59 than those selling their products to the local spot market. As such the forward contract derivatives favored contracted farmers.

Standard deviation is a measure of risk on an investment return. From the data analyzed, the contracted prices have a standard deviation of 3.339, while the spot market prices have a standard deviation of 6.810. This means that, spot market prices from the standard deviation measurement is riskier as compared to the contracted price.

From the analyzed data, the maximum prices registered by spot market prices are Kshs. 40, while the contracted prices registered by the contracted market are Kshs. 33.00. The minimum prices recorded in the contracted and spot market are Kshs. 24.00 and Kshs. 15.00 respectively. This means that, in the spot market one can enjoy higher price at a given period. Lowest price can also be attained at the spot market while contracted prices by EAB remain within the median.

The data analyzed show that, the prices are normally distributed and are not skewed to either side as shown in the figure 4.1 below.

Figure 4.1



From this Normal Q-Q plot it can be observed that the dependent variable, that is, spot price is normally distributed and skewed around the mean.

Coefficient of variation for the data analyzed allow for determination of commodity prices volatility. The formula for variation coefficient is (mean/standard deviation *100) in symbols: $CV = (SD/\overline{X}) * 100$.

Mean	Std. Deviation	Coefficient of variation
26.80	3.339	0.125
23.21	6.810	0.293

The coefficient variation for the contracted prices is 0.125, while for the spot prices is 0.293. This means that, spot market prices are more volatile and riskier compared to the prices in the contracted market.

The graph in Fig.4.2 below showing the trend in the contracted prices compared with



spot prices between January 2012 and October 2016.

Fig.4.2

Source: Research Findings

It is observed that between October 2012 and January 2013 and a major part of 2014 and 2015, the spot prices were below the contracted prices. The same also happened between April and June 2016 when the spot prices were more than contracted prices. This was because of increase in taxes levied by the government on sorghum products.

The trend is that the average price for the contracted farmers is upward sloping as compared the spot prices whose trend is not constant. This means on an average the contracted farmer enjoyed better prices deal from their products as compared to those selling their products to the local markets as illustrated by the upward slope. Furthermore the graph clearly gives a good comparison between the two hence it can be concluded that contracted prices are averagely higher than spot prices at any given time.

4.3 Analysis of Variance (ANOVA)

ANOVA is "a statistical technique used to assess potential difference in a scale level dependent variable by a nominal level variable having two or more categories." The test was done based on the fact that it only requires a nominal scale for independent variable. To facilitate the comparison of the two means, the following results were obtained;

	Sum of	Df	Mean Square	F	Sig.
	Squares				
Between	1016 650	2		1 4 0 4 0	000
Groups	1216.653	3	405.551	14.943	.000
Within Groups	1519.790	56	27.139		
Total	2736.443	59			

Table 4.3 ANOVASPOTPRICE

Source: Research Findings

Table 4.3 above shows the output of ANOVA analysis. The "F" value is 14.943 while the "P" value is < 5%. P-value output is used to determine if the mean of the variables analyzed are of significant difference. If the P > 5 % then it can be concluded the there is no statistical difference between the two conditions. Where there is a difference between the conditions the same could be as a result of chances and not manipulation. If the P <5% then it can be concluded there is statistical significant difference between the mean.

As to whether there exist a significant statistical difference between our group means, it is seen that the P value <5%, therefore there is a significant statistical difference between the mean of the contracted prices and spot prices as dogged by one-way ANOVA (F =14.943, P=.000). From the analysis, a conclusion can be made that there is a significant statistical difference in the mean of the contracted prices and spot prices and spot prices and spot prices as determined by one-way ANOVA (F =14.943, P<5%).

4.4 Discussion of findings

Derivative trading in sorghum was found to positively influence the prices of sorghum as indicated by (P-value < .05). This finding is in consistence with the literature of (Kathure ,2011) which found that Kenya Airways had adopted the financial derivative (hedging strategies) in the financial management in their oil pricing. Similarly, Shen and Hartarska (2013) found that "risk management through financial derivatives in agricultural banks was effective while profitability of derivatives user agricultural banks was less effective by credit risk and interest risk among others."

The positive impact of derivative trading on sorghum could be attributed to the hedging capabilities of derivative instruments, which in the long run lead to average higher commodity prices compared to the spot market in which its prices are very volatile. From the research findings, the contracted farmers have an average price of Kshs. 26.80, while the spot market prices had a mean of Kshs. 23.21. This means that, contracted farmers enjoy a better deal derived from commodity derivative trading.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMEDATIONS

5.1 Introduction

This chapter summarizes the findings of the study, conclusion and recommendation on policies related to industry. Study limitation and suggestion for further research are also highlighted.

5.2. Summary of findings

The study was carried out with the objective of determining the effect of derivative trading on commodity prices of sorghum farmers in Kitui. To achieve this objective ANOVA test was done on the data collected in regard to a period of five (5) years from 2012 to 2016. Data sourced was contracted sorghum prices from EAB and the existing spot market prices of sorghum per kilogram for the same period.

When the analysis for the mean on contracted prices and spot prices was done, it was found that the average price for the contracted farmers per unit was higher than the spot prices. This means that, the contracted sorghum farmers enjoy better price deal from their sorghum by a margin of Kshs. 3.59 than those selling on local spot markets. Though some months spot prices were high compared to the contracted prices for instance in 2014, the same was as a result of tax increment by the government introduced on the sorghum products. This greatly affected the EAB operation due to its high cost threatening to cut off the contracts.

From the ANOVA results it is found that, there is statistical significant difference in the mean of contracted prices and spot prices. Significance value P<0.05 as determined by one-way ANOVA (F =14.943, P<5%). This means there is reasonable

price difference in trading in the two markets. The mean result clearly indicates that farmers in forward contract with EAB enjoy higher prices in average (Ksh.26.80) compared to those trading in conventional market's (Ksh. 23.21). The variance is as a result of volatility of the commodity prices in the spot market.

5.3 Conclusion

The study results indicate that derivative trading on commodity (sorghum) by farmers in Kitui county influence their prices positively. This means that farmers who are in forward contract with EAB will earn more in trading in sorghum compared to those trading in the spot market. ANOVA results indicate that there is statistically significant difference between the groups mean. This implies that the impact of the difference in the prices in the forward contract and spot market is substantial and any investor or farmer should consider derivative trading to maximize their returns.

The descriptive results of the study indicate a big margin between spot commodity prices over the study period. This suggests that commodity prices are very volatile which might be as a result of the influence from factors like weather, markets, demand and supply among other factors. Commodity forwards are derivative contracts that enable the producer (farmer) and the purchaser (EAB) to place the prices they will obtain at a given future date for a specific quantity of their harvest. These contracts might help reduce price volatility and in the long run lead to sustainable commodity income and improved production.

From the study it can be concluded that there exists a possibility of higher prices for commodities arising from engaging in derivative trading of commodity forwards. This shows that small scale farmers should be encouraged to take the forwards contracts because of the various benefits such as price discovery and risk management. This would lead to economic growth and improve farmers' income.

5.4 Recommendations

Taking into account the findings of the study, it would be prudent to recommend that, derivative trading on commodity should be embraced so as to take advantage of the profit margins which accrue from better commodities prices. The competitive prices result from producers (farmers) engaging in contractual relationship with the purchaser (EAB) who gives them a guaranteed market and hedge them against price volatility risks. As noted, investors who engage in spot market are likely to suffer from poor prices because of the volatility of commodity prices. Further, farmers in Kitui should also be sensitized on the importance of the existing contractual agreement to enable them take advantage of the better price cumulatively over time.

The Capital Markets Authority should put in place policies dealing with the development of structured exchange market for commodities. This will ensure that the investors of those commodities enjoy the full benefits of derivative trading on the derivative instruments. Moreover, since the derivate instrument is an appropriate risk management tool, the same could be used by the government by having risk management measures for farmers to ensure that they are mitigated from exploitation by middlemen.

Lastly as noted from the findings, forward derivative market are very important in price discovery and risk management. In that regard, a country like Kenya that is dominated by many small scale farmers should embrace to ensure the growth of the agricultural sector.

5.5 Limitation of the Study

The study period in context is only five years which could not be adequate for a comprehensive generalization of the findings. The period in the study could not be extended since the contractual forward for EAB with Kitui sorghum farmers started in the year 2010. A longer period on other commodities with derivative trading should be tried to check their consistence to the finding.

Further, the study also covered one strata, that is, Kitui region alone. Further research should be done on other regions with existing contracts and the same commodity (sorghum) to ascertain whether the findings correlate.

The data collected on the spot market were the average prices per month which might not be very accurate considering that a farmer might sell the commodity on a daily basis and at different prices either below or above the normal price recorded. As such, the average prices from different institutions on the spot market were noted to have a more reliable means.

The study was on derivative trading on commodities used by EAB and sorghum farmers in Kenya, that is, the forward contract. Whereas, derivative instruments include forwards, futures, swaps and options only one variable forward was the subject of the study and it cannot be generalized in terms of derivative trading. The derivative market in Kenya is also not well developed and there is no organized exchange market to trade the derivatives hence limiting the studies.

5.6 Suggestions for Further Research

Studies should be carried out on other commodities like tea, coffee, minerals among others to determine whether derivative trading affects their prices. Studies should also be conducted for a longer period of time exceeding five years for the said commodities to determine if the influence on the price mean will remain statistically significant. The findings might improve the generalization of the study on diverse settings hence strengthening the basis of the results.

This study only focused on the effect of derivative trading on commodity prices but it did not take into consideration the cost of maintaining the derivative contract which might call for further studies on cost of derivative trading and its impact.

Further the research should be done to determine the impact of other derivative instruments like swaps, options and future contracts on commodity prices. These separate studies will give results which would be important in making general conclusion on derivative trading. Studies should also be done in other regions (strata) with existing contracts to examine the derivative trading's impact on commodity prices.

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APPENDIX

APPENDIX 1.Sorghum prices

	SPOT	EAB CONTRACTED
MONTH	PRICE(KITUI)	PRICE
Jan-12	17.00	24.00
Feb-12	19.00	24.00
Mar-12	27.40	24.00
Apr-12	25.49	24.00
May-12	25.94	24.00
Jun-12	26.39	24.00
Jul-12	28.90	24.00
Aug-12	28.40	24.00
Sep-12	29.10	24.00
Oct-12	21.00	24.00
Nov-12	15.00	24.00
Dec-12	16.00	24.00
Jan-13	23.00	24.00
Feb-13	28.81	24.00
Mar-13	29.67	24.00
Apr-13	26.92	24.00
May-13	27.36	24.00
Jun-13	23.68	24.00
Jul-13	22.00	24.00
Aug-13	22.06	24.00
Sep-13	15.00	24.00
Oct-13	15.00	24.00
Nov-13	15.00	24.00
Dec-13	15.00	24.00
Ian-14	15.00	26.00
Feb-14	15.00	26.00
Mar-14	28.00	26.00
Apr-14	28.00	26.00
May-14	23.00	26.00
Iun_1/	18.00	26.00
Jul-14	15.00	26.00
Δμα-14	15.00	26.00
Aug-14		

Sep-14	15.00	26.00
Oct-14	15.00	26.00
Nov-14	15.00	26.00
Dec-14	15.00	26.00
Jan-15	17.00	27.00
Feb-15	17.00	27.00
Mar-15	17.00	27.00
Apr-15	21.97	27.00
May-15	21.30	27.00
Jun-15	25.00	27.00
Jul-15	29.00	27.00
Aug-15	27.00	27.00
Sep-15	17.81	27.00
Oct-15	18.12	27.00
Nov-15	17.39	27.00
Dec-15	25.00	27.00
Jan-16	23.00	33.00
Feb-16	25.00	33.00
Mar-16	35.00	33.00
Apr-16	35.00	33.00
May-16	40.00	33.00
Jun-16	40.00	33.00
Jul-16	35.00	33.00
Aug-16	30.00	33.00
Sep-16	28.00	33.00
Oct-16	28.00	33.00
Nov-16	30.00	33.00
Dec-16	30.00	33.00