RELATIONSHIP BETWEEN CRUDE OIL PRICES AND THE CONSUMER PRICE INDEX IN KENYA

BY

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DECLARATION

I hereby declare that this project is my own work and effort and that it has not been submitted anywhere for any award.

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DEDICATION

To my dear mother Salome, my father Jomo, my sisters Irene and Vivian and my brother

Nico for their love, support and unending encouragement.

ACKNOWLEDGEMENT

ABSTRACT

For almost half a century now global oil prices have undergone a lot of volatility. Theory predicts a close relationship between crude oil prices and consumer price index due the increased importance of oil in the production of goods and services across all sectors in world economies. The aim of this study was to establish the relationship between Crude oil prices and the Consumer Price Index in Kenya.

This study was a descriptive time series correlation study with monthly averages of CPI as the dependent variable while monthly averages of crude oil price per barrel made up the independent variable. Monthly average of crude oil prices in the United Arab Emirates at current US Dollar rates and the monthly CPI for the seven years spanning the period January 2006 to December 2012 were used for this study. The data was electronically collected from the Kenya National Bureau of Statistics and supplemented by data from the International Energy Association. Regression analysis was used to determine the relationship.

During the period before the revision of the calculation of CPI in December 2008, the constant term was 186.35 which was significant, the coefficient term was 0.76 which was significant. The regression was statistically significant though the variation in CPI was poorly explained by the variation in Crude Oil Prices. In the period after the revision, constant term was 126.78 which was statistically significant, the coefficient of Crude Oil Prices was -0.031 which was not significant. The regression was not statistically significant and the variation in CPI was not strongly explained by the variation in Crude Oil Prices. The study found that the composition of the products used in the calculation of CPI determined the relationship between CPI and crude oil prices.

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ABBREVIATIONS AND ACRONYMS

CPI   Consumer Price Index

E.U   European Union

EIA   Energy Information Administration

GDP   Gross Domestic Product

GETS   General to Specifics

KIHBS   Kenya Integrated Household Budget Survey

KIPPRA   Kenya Institute for Public Policy Research and Analysis

KSE   Karachi Stock Exchange

OPEC   Organization of the Petroleum Exporting Countries.

SVAR   Structural Vector Autoregressive

U.K   United Kingdom

US   United States (of America)

VAR   Vector autoregressive

WTI   West Texas Intermediate

CHAPTER ONE
INTRODUCTION
1.1 Background of the Study

For almost half a century now global oil prices have undergone a lot of volatility. Kilian (2009) classified the volatility into supply side volatility and demand side volatility. Supply side volatility occurred latest after the 1990 Persian Gulf War while demand side occurred between 2003 and 2008 and the latest occurred in 2009 during the global financial crisis. Historical analysis shows that global oil prices have leapt two to three times their original price during these periods. Most scholars agree that the oscillation of global oil prices contributes to domestic inflation (Chen, 2009).

The causes of oil price shocks notwithstanding, random global production disturbances predictably do affect the stability of policy all over the world. In Taiwan, for instance, inflation rate and oil price fluctuations move in the same direction. As the trend of oil prices showed signs of slowing the changes in inflation rates in Taiwan have also slowed. Researchers suspect that the level of influence oil prices have on domestic inflation is passed through exchange rate (Huang, Lan and Kuo, 2007).

An oil price increase represents a shock in the consumer price index (Hooker, 2002) which can be accompanied by second round effects, through the price-wage loop. Some studies like Barsky and Kilian (2004) argue that increases in oil prices generate high inflation though other papers like that done by LeBlanc and Chinn (2004) argue that oil prices have only a moderate impact on inflation.

Oil price increases may also negatively affect consumption, investment and unemployment. Consumption is affected through the positive relationship it has with disposable income. As a consequence, an oil price increase leads to a rise in the consumer price index (CPI), depending upon the share of oil products in the consumption basket (Ferderer, 1996).

1.1.1 Consumer Price Index

The consumer price index or CPI is a statistical estimate of price changes between two certain periods. The CPI traces the prices of a sample of items in various categories of consumer spending. The categories are usually items people buy on day-to-day basis, for instance, food, clothing, shelter, and medical services. The monthly or annual movement in the CPI results from the weighted averages of the price changes of the items in the sample. The price change for a sample item is the ratio of its current price to its price in some previous time. The weight of a sample item the CPI average is the share of total consumer spending that it represents (Pollak, 1989).

According to the Kenya National Bureau of Statistics (2010) the CPI in Kenya is as a result of a Kenya Integrated Household Budget Survey (KIHBS) in 2005/06 that was carried out to find out exactly what Kenyans spend on different commodities and upgrade the calculation of CPI from the former 1993/4 formula. It was implemented in January 2009.The results of that survey were used to select the goods and services to be included in the CPI. 234 items were selected to be priced for each income group.

The major items brought in include unpacked fresh milk, pork, arrow roots, millet flour, black grams, capsicum, camel meat, mineral water, laboratory tests, optician services,

parking charges, bicycle fares, cell phone air time, internet costs, cellular handsets, computers, and school transport (for both primary and secondary schools). Inclusion of the above commodities indicated that the consumption behaviour of households had changed since 1993/4. However, the CPI does not include: savings, insurance and pensions; loans; second-hand goods; consumption from own production and expenditure on lotteries and other forms of gambling (Kenya National Bureau of Statistics, 2010).

1.1.2 Crude Oil Prices

Crude oil is the raw oil from which petroleum products such as gasoline are derived. The price of crude oil is influenced by a number of factors that are far beyond the traditional supply and demand dynamics. The most notable influence is from geopolitics. As a result there is not one price for crude oil but many. World crude oil prices are established in accordance with three market traded benchmarks, namely, West Texas Intermediate (WTI), Brent, and Dubai, and are quoted at premiums or discounts to these benchmark prices (International Energy Agency, 2006).

WTI is a light crude oil and actually lighter than Brent Crude oil. WTI contains about 0.24% sulfur. Its properties and production site make it ideal for being refined in the United States and in the Gulf Coast regions. The price of a barrel (59 liters) of oil depends on both its grade and location. Grade is determined by its specific gravity and its sulphur content. The Energy Information Administration (EIA) uses the imported refinery acquisition cost, the weighted average cost of all oil imported into the US, as its world oil price (International Energy Agency, 2006).

1.1.3 Relationship between Crude Oil Prices and CPI

The relationship between crude oil prices and CPI is two-pronged. In one way, the Consumer Price Index the CPI tracks the price movement of refined petroleum products purchased by consumers. This refers to the actual refined petroleum products consumed by the final user of such petroleum products. As such, the prices of the refined petroleum products are weighted in basket of goods used in the calculation of CPI. In the other relationship, the uses of petroleum products as an input of production, factor the cost of the oil in the prices of the products sold to the consumer (Duly, Harris, Khatchadourian, Ulics and Wolter, 2006).

The nexus between oil prices and consumer price index is such that there is a unidirectional causality between the crude oil price and consumer price index. In short, crude oil price has a causative impact on the consumer price index. Many studies like Subhani, Hasan, Qavi and Osman (2012) have confirmed this unidirectional causality. However, the nature of the relationship is not straight forward. Huntington (2005) argues that the effects of oil price changes on CPI may be comparatively positive and tiny in the long run, but could be positive and significant over relatively short periods. The relationship between oil prices have been varying across time from a very strong positive relationship between 1970 and 1980 to a mild positive relationship between 1980 and 1991. Huang and Yang argue that the relationship between oil prices and CPI has nonlinearity.

1.1.4 Crude Oil Prices and Consumer Price Index in Kenya

According to KIPPRA (2007) one of the key problems with energy in the Kenya is the high cost associated with it. The price of petroleum products has not only been rising in the world market but also in the domestic market. At some times the domestic price has remained high despite drops in international crude oil prices coupled with an appreciating domestic shilling. The other related problem with energy is the security of its supply. The uncertainties in both price and availability surrounding continued supply of petroleum from the Middle East is detrimental to the security of energy supply in Kenya causing a great effect on oil product prices in Kenya.

The dependence on oil energy is high and the mechanisms put in place are likely to improve this dependence. The supply of oil is getting more and more efficient and penetrating deeper into the Kenyan market. All industrial activity use oil as a major source of energy. Oil is an input even in the generation of alternative sources of energy like electricity. The effect is that oil prices make a significant part of the prices of products in Kenya. A rise or a fall in the prices of crude oil from the United Arab Emirates is expected to have great impact on Consumer Price Index in Kenya (Zepeda, Chemingui, Bchir, Karingi, Onyango and Wanjala, 2009).

1.2 Research Problem

The cost push inflation model and the demand pull models predict a very close relationship between crude oil prices and the consumer price index. This is because, not only does crude oil prices affect the price of consumer products, but petroleum products

are part of the consumption baskets used to calculate the consumer price index (Majumder, 2006).

However, empirical research has mixed findings. Celik and Akgul (2011) found that there was a relationship between the consumer price index and the fuel oil price index. The relationship was both positive and one directional. A rise in fuel oil prices caused the consumer price index to rise. These findings were also realized by Cologni and Manera (2005).

On the contrary, other studies like Umar and Abdulhakeem (2010), Chou and Tseng (2011) and Ansar and Asghar (2013) found no strong relationship between crude oil prices and the consumer price indices. Here in Kenya, studies have been done focusing on consumer oil prices and inflation. Studies by Misati, Nyamongo and Mwangi (2013) and Njenga (2013) studied the relationship between fuel oil pump prices and inflation and found positive relationships. There were research gaps existing on the nature of the relationship between fuel oil prices and consumer price index .This study is different from the other studies since no study has been done in Kenya to directly relate crude oil prices to the consumer price index. This study provides answers to the question:what is the relationship between consumer price index and crude oil prices in Kenya?

1.3 Research Objectives

This study aimed at establishing the relationship between Crude oil prices and the Consumer Price Index in Kenya

1.4 Value of the Study

This study will be important through providing an update of the knowledge concerning the relationship between crude oil prices and the consumer price index. Oil has become a very important contributor to the daily lives of citizens of every country in the world and in Kenya. However, there is need to establish the nature of the effect and the relationship between the two. This research provides an insight into this relationship in Kenya and scholars will find this research as evidence to further arguments and other researches that will find the evidence relevant.

This study establishes the extent to which the oil driven economy is affecting the lives of the ordinary Kenyan citizens. This study will, therefore, provide the motivation to planners and policy makers towards deciding whether or not time has come to change the Kenyan economy to another model that is not oil driven. In fact, the study is an evaluation of the contribution of oil to the life of the ordinary Kenyan citizen.

This study establishes the sensitivity of the consumer price index to the crude oil prices. This will, therefore, provide information to those in the government with information how activities in the oil industry will indirectly affect economic growth through consumption. The consumer price index gives a picture of how expensive life has become and how general consumption is affected. Consumption is a component of GDP. Knowing the relationship that will be established by this study, it will be possible to predict how consumption will be affected by crude oil price changes and, therefore, economic performance of the country.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter discusses the theories and past studies concerning the relationship between crude oil prices and the consumer price index. The first part discusses the demand pull theory and the cost push theories. The second part discusses the empirical literature related to the relationship between crude oil prices and the consumer price index.

2.2 Review of Theories

2.2.1 Cost Push Theory of Inflation

Cost-push inflation theory is a Keynesian model that emphasizes the fact that prices rise due to the increase in the cost of production. According to this model, prices are pushed up by rising costs and these costs are passed along to the consumers through higher prices. The main culprit is wages which are pushed up by trade union's bargaining power. Powerful trade unions force employers to grant wage increases considerably in excess of increases in the productivity of labour and these wage increases lead to increase the cost of production of commodities. When producers face higher cost of production, they in turn increase the prices of their products (Majumder, 2006).

However, oligopolies and monopolies with strong market power can cause a rise in prices through their pricing policies. Every time the companies raise prices the result is an increase in the cost of living. This makes workers to agitate for higher wages to make up for the decline in their purchasing power and resultant standard of living. This gives the

corporations an excuse to raise prices again. This spiral activity leads to inflation (Ackley, 1968).

This theory is relevant to this study since it provides the cost approach to the cause of inflation through costs. The costs of production comprise of labour, inputs, taxes and the expected mark-up by the oil producers. An increase in any is usually communicated to the consumer through product prices. The increase is realized through a rise in the CPI (Ackle, 1968).

2.2.2 Demand Pull Inflation Theory

Demand-pull inflation is also known as excess demand. This model of explaining inflation is accredited to the monetarist school of thought and to the Keynesian school of thought. However, demand-pull inflation is the traditional and most common type of inflation. This type of inflation is realized when aggregate demand is rising while the available supply of goods is becoming less (Gordon, 1975).

The monetary school of thought claim that though short term inflation can be as a result of many factors, long term inflation is a monetary issue. They assert that this type of inflation arises when the money supply grows more rapidly than the output of products in an economy. Monetarists reject the idea that long run inflation can be as a result of non-monetary factors like costly fiscal actions, cost push influences or food and fuel shortages. The argument of the monetarists is that though such factors can raise prices of certain products, they have to be accompanied by excessive increase in the supply of money (Berman, 1978).

However, the Keynesian school of thought argues that inflation is caused when aggregate demand for products is more than the available supply. According to this school of thought, aggregate demand comprises of consumer spending, investments, government spending, and net exports. Inflation occurs when there is a sudden increase in the amount of money in an economy coupled with decreases in taxes on goods. This leaves consumers with more disposable income. This availability of money causes manufacturers to raise the general prices of goods and services. Another way of looking at inflation is through the feeling optimism caused by a boom in an economy. When people are more confident about their financial future, they tend to spend more, contributing to a rise in prices (Chen, 2009).

The demand pull inflation is relevant to this study since it uses consumers purchase power due to changes in their disposable income as a cause of inflation which is measured by changes in the CPI. The theory suggests that as consumers suddenly get more money to spend the suppliers of crude oil also get a cut by increasing the oil prices. This increase in the crude oil prices causes product prices to increase leading to increase in the CPI (Chen, 2009).

2.3 Empirical Literature Review

The Consumer Price Index (CPI) is a statistical indicator of changes in consumer prices experienced by citizens of a country. It is a measure of comparing the cost of a fixed basket of goods and services purchased by consumers over time. The CPI index reflects only pure price change and is a widely used indicator of the change in the general level of consumer prices or the rate of inflation (National Bureau of Statistics, 2010).

The CPI is also used to escalate a given shilling value, over time, to preserve the purchasing power of that value. In this light, the CPI is used to adjust contracted payments like wages, rents, leases, etc, to carter for erosion of value. The CPI is used as a deflator of various macroeconomic aggregates like income flows. The index is an instrument used to set and monitor the implementation of economic policy. Further, business analysts and economists use the CPI for economic analysis and research on various issues like the causes and effects of inflation and understanding regional disparities in price movements (Pollak, 1989).

Price movements of the goods and services in the CPI are weighted according to the relative importance of goods and services in the total expenditures of consumers. Each good or service is considered to be an element in a basket representative of consumer spending, and price movements are assigned a basket share with the proportion of total consumption expenditure they account for. The CPI basket composition is updated after time intervals to make them more relevant to the consumption behaviour of the citizens (National Bureau of Statistics, 2010).

Crude oil prices have maintained an upward persistence since early 2003 and set a new record price of US$120 per barrel in April 2008. Crude oil prices have remained under intense pressure and seemed boundless. It is feared that their rapid pace may turn inflationary by causing other prices to spike decelerating world economic growth. The recent upsurges in oil prices were taking place in midst of rising trends in commodity prices, instability in housing, equity, and credit markets, and depreciating exchange rates (Krichene, 2008).

Public debates cast a number of entities like speculators, OPEC, and large oil companies as culprits responsible for the oil and gasoline price increases. Others blamed it to the role of fundamental supply and demand factors. These demand and supply factors cited included: the constraints on access to resources; the continuing depletion of lower-cost resources; the increased cost of developing new resources; increasing demand driven by economic growth; and government price subsidies. Others felt the prices were varying according to geopolitical risks (King, Deng, and Metz, 2012).

Increases in oil prices in 2011 coincided with tensions in the Middle East and North Africa in. This has renewed discussions of the reasons for oil price movements. The 2011 oil price increases were originally attributed to tensions in the Middle East, including the possibility of delays in the transit of oil tankers through the Suez Canal as a result of the unrest in Egypt, the shut-off of oil from Libya and unrest in Syria, Yemen, Bahrain, as well as Saudi Arabia. OPEC members had announced their commitment to meet any shortfalls in demand the resulted from this unrest and had increased production. However, Saudi Arabia subsequently announced that, as a result of the lack of global demand, it had reduced production by 800,000 barrels per day in March, and it blamed speculative trading and security concerns for the increase in the price of oil. These oil politics have caused variations in prices to the detriment of many developing countries (King, Deng, and Metz, 2012).

LeBlanc and Chinn (2004) conducted a study to estimate the effects of oil price changes on inflation for the United States, United Kingdom, France, Germany, and Japan using an augmented Phillips curve framework. The statistical estimates of the study suggested that current oil price increases were likely to have a modest effect on inflation in the U.S,

Japan, and Europe. Oil price increases of as much as 10 percentage points would lead to direct inflationary increases of about 0.1 to 0.8 percentage points in the U.S. and the E.U. Inflation in Europe, was found unlikely to show any significant difference in sensitivity from that in the United States and in fact may be less in some countries.

Cologni and Manera (2005) did a study to find out the relationship between oil prices, inflation and interest rates in the G-7 countries. The G-7 are the world's most industrialized countries comprising of the U.S., U.K., France, Germany, Italy, Canada and Japan. Quarterly data for the period 1980(1) to 2003(4) was used for the study. The study was done at a time when sharp increases in the price of oil were generally seen as a major contributor to business cycle asymmetries. Structural cointegrated Vector autoregressive (VAR) model was used for analysis. Analysis showed that, for most of the countries considered, there seemed to be an impact of unexpected oil price shocks on interest rates. In turn, the increase in interest rates was transmitted to real economy by reducing output growth and increasing the inflation rate.

Umar and Abdulhakeem (2010) conducted a study to investigate impact of oil fluctuations on macroeconomic environment of Nigeria. The period for the study was from 1970 to 2008. The study used the Variance Autoregressive (VAR) Model to analyze the relationship between the oil price fluctuation and real GDP, money supply, unemployment and consumer price index. Though the study found that crude oil prices had significant impact on real GDP, money supply and unemployment, the impact on consumer price index was not significant.

In another study Celik and Akgul (2011) examined the relationship between the consumer price index and the fuel oil price index in Turkey. The time interval monthly

data between 2005 and 2010 was used and analyzed using Vector Error Correction Model. Before the period of study the Turkish economy had gone through a long period of hyperinflation. However, inflation had fallen to between 8% and 10% due to Turkish government price stability policy. The gradual rise in global crude oil prices had increased the expectations of inflation given that Turkey is an oil importer. The study revealed that a 1% increase in fuel oil prices caused the consumer price index to rise by 1.26%. There was a one direction Granger cause for changes in the consumer price index.

Chou and Tseng (2011) sought to estimate the short-term and long-term pass-through effects of oil prices on inflation in Taiwan. The study used monthly data from 1982 January to -2010 December. The study employed the CPI index, core index, and various other basic sub-indices for evaluation. The cointegration Vector autoregressive (VAR) model was used for analysis. The results showed that international oil prices experienced a significant and long-term pass-through effect on inflation in Taiwan, though the short-term pass-through effect was not significant. Further, even when international oil prices rose sharply, the short-term pass-through effect of international oil prices on inflation in Taiwan did not increase substantially. The study, therefore, found that oil prices did not significantly affect CPI in Taiwan.

Sharma, Singh, Sharma, Gupta (2012) conducted an empirical analysis to compare the effects of crude oil price on Indian economy because India's imports of oil were on the increase. The import dependence of India had reached 80 per cent and was seen to rise even further. The volatility of oil prices had also increased and was expected to rise in future. In short, oil price fluctuation had adverse effects on the economy. The study found that increase in oil prices resulted in increased inflation in the Indian economy.

The study by Ali, Ramzan, Razi and Bhatti (2012) examined the effect of high speed diesel oil prices on food sector prices in Pakistan. The food prices studied were those of rice, maize, wheat, chicken and cooking oil. The study was driven by the hypothesis that there is a significant relationship and a positive effect of oil prices on food inflation. The study was a time series analysis that used data for the 10 years from 2001 to 2010. The results confirmed the hypothesis and it was concluded that there was highly significant effect of oil prices on food inflation.

Ansar and Asghar (2013) conducted a study that analyzed the impact of oil prices on the Consumer Price Index (CPI) and Stock market in Pakistan. The proxy for the stock market was the KSE-100 Index. The study used secondary data on CPI and KSE-100 Index for the period 2007 to 2012. The multiple regression model was used to analyze the data. The Johansen cointegration Test was also applied. The results showed that there is a positive relationship among oil price, CPI and KSE-100 Index. However, the relationship was not strong.

Ge (2012) conducted a study to establish the major effects on China's inflation 1994-2009 using General to Specifics (GETS) modelling. The study focused on the relationship between inflation, money supply, output gap, the exchange rate and crude oil prices in China. The empirical study found results in agreement with the view that a long-term positive correlation exists between inflation and money supply. However, inflation is not an entirely a monetary issue. Other variables like oil prices also affected inflation. Similarly, there is significant correlation between output gap and inflation. In addition, we cannot overlook the impact of exchange rates on inflation.

In Kenya Njenga (2013) analyzed the impact of oil price changes on inflation in Kenya during the period starting with the first quarter of 1996 to the last quarter of 2011. This period was characterized by a world economic crisis. Oil prices had an upward trend. The paper used the Johansen Cointegration Analysis and the Vector Error Correction Model to analyze time series data. The results of the regression showed that oil prices current and lagged once were positively significantly related to inflation indicating that in the short-run increases in oil prices led to a rise in inflation. However, the study did not use crude oil prices in the study and neither did the study focus on CPI itself.

Misati, Nyamongo and Mwangi (2013) examined the linkages between commodity prices and both overall inflation and non food non fuel inflation. This was done in the context of sharp rises in food and oil prices between 2008 and 2011 period. The belief was that oil prices and food price shocks played a prominent role in the buildup of persistent inflationary pressures in Kenya. The study used Granger causality and structural vector autoregressive (SVAR) methods for analysis. The study found a significant role of oil and food prices in both measures of inflation. The study found that the effect of oil prices on inflation was more persistent than the effect of food prices. The study however did not focus on the relationship between crude oil prices and CPI. It instead used consumer oil prices and inflation.

2.4 Conclusion from the Literature Review

The theories explaining the relationship between crude oil prices and consumer price indices predict that when the prices of crude oil spike upwards, the consumer price index also has to escalate. This is due to the fact that the products of oil make up a portion of the CPI basket of goods and that most of the goods in the basket benefit from oil as a production input.

From the literature review most of the studies show a relationship between oil prices and inflation since oil has gradually become a prime component of the production processes and the consumer basket. However, the relationship between crude oil prices and CPI is not widely researched, and neither is the relationship universal but dependent on the context of study.

Some studies show that crude oil prices have a causality relationship with CPI and the relationship is positive so that a rise in crude oil prices leads to a rise in the CPI. Other studies do find results variant to this position. The studies find no relationship between CPI variation and crude oil price variation. A study relating crude oil prices to CPI has not been done in Kenya indicating that the relationship may not be known beyond what theory suggests. This study will fill up this research gap by finding out the specific relationship between crude oil prices and CPI in Kenya.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methodology that was used to conduct the study. It specifies the research design, what the target population was, how data was collected and the method of analysis.

3.2 Research design

This investigation was a descriptive time series correlation study with the values of CPI as the dependent variable while the crude oil price per barrel was the independent variable. Webb, Campbell, Schwartz, and Sechrest (1966) posit that a time series study is descriptive in nature. This descriptive nature is pertinent when a phenomenon being studied extends over a considerable time period. It is the only research design that furnishes a continuous record of fluctuations in study variables over an entire period in which the variables are being studied. This, therefore, justifies the use of the time series analysis for this study since the aim of the study was to establish the relationship between crude oil prices and the consumer price index across time. Regression analysis was used to find the relationship between CPI and crude oil prices since the relationship expected is linear.

3.3 Population

The monthly average of crude oil prices in the United Arab Emirates at current US Dollar rates and the monthly CPI for Kenya made up the population of this study.

3.4 Sample Design

The data required for this study included the monthly average of crude oil prices in the United Arab Emirates at current US Dollar rates and the monthly CPI for the seven years spanning the period January 2006 to December 2012. Only the monthly values for the seven years were used for the analysis. Monthly data for the seven years provided enough of the latest data to establish the most current statistically plausible relationship between oil prices and consumer price index in Kenya.

3.5 Data Collection

This study required the monthly values of crude oil prices and monthly consumer price index for the period 2006 to 2012. The data was electronically collected from the Kenya National Bureau of Statistics and supplemented by data from the International Energy Association.

3.6 Data Analysis

This study used regression analysis model in which the dependent variable is the monthly consumer price index. The independent variable is the monthly average of the crude oil prices per barrel at current dollar prices. Regression analysis was used to determine how the oil prices relate to monthly consumer price index. The regression analysis took the form below:

$$Y = \alpha + \beta(X) + \epsilon$$

Where,

Y	=	Monthly Consumer Price Index
X	=	Monthly average of crude oil price per barrel
α	=	The constant of regression
β	=	The sensitivity of CPI to oil prices
ϵ	=	The error term.

The $t-tests$ at 95 % confidence level was used to determine the statistical significance of the constant term, α, and the coefficient term β. The $F-tests$ was used to determine whether the regression is of statistical importance at 95 % confidence level. The coefficient of variation, R^2 and the Adjusted R^2 was used to determine how much variation in CPI is explained by variation in crude oil prices. The analysis was done using MS EXCEL 07 software.

CHAPTER FOUR
DATA ANALYSIS AND PRESENTATION OF FINDINGS

4.1 Introduction

This chapter focuses on the presentation of data and interpretation. The first part presents the analysis of the data and ends with the regression results. The second part of this section deals with the summary and the interpretation of the findings from the analysis. The data was divided into two portions based on the time when a review of the calculation of the CPI was revised. The revision of the calculation of the CPI was done and applied with the first value of monthly CPI captured in January 2009. Consequently, Period 1 covers the period from January 2006 to January 2009. Period 2 begins February 2009 to December 2012. The analysis is done separately to accommodate changes in the products used to calculate CPI.

4.2 Data Presentation

4.2.1 Summary Statistics for Period 1

Table 4.1 provides a statistical summary of the monthly CPI and the crude oil prices per barrel in the UAE from where Kenya imported the bulk of its oil. During these 37 months the mean CPI was 242.01 (standard deviation = 37.25). The highest value if CPI was 318.02 in January 2009 while the lowest was 201.25 in January 2006. The average price of crude oil per barrel was US$ 73.73 (standard deviation = 22.54). The lowest price of crude oil was US$ 41 in December 2008 while the highest price was   US$ 131.22 in July 2008.

Table 4.1: Summary statistics for Period 1

Statistic	CPI	Crude Oil Prices US Dollars)
Mean	242.01	73.73
Standard Error	6.12	3.71
Standard Deviation	37.25	22.54
Minimum	201.25	41.00
Maximum	318.02	131.22

(Source: Researcher, 2013)

4.2.2 Summary Statistics for Period 2

As shown in Table 4.3 for the 47 months the mean CPI was 124.01 (Standard Deviation = 13.46). The highest value of CPI was 141.90 in May 2009 while the minimum was 104.66 in December 2009. The mean value of the Crude Oil Prices was US$ 88.75 (Standard Deviation = 19.95). The maximum Crude Oil Price was US$ 117.79 in March 2012 while the minimum was US$ 43.14 in February 2009.

Table 4.1: Summary Statistics for Period 2

Statistic	CPI	Crude Oil Prices
Mean	124.01	88.75
Standard Error	1.96	2.91
Standard Deviation	13.46	19.95
Minimum	104.66	43.14
Maximum	141.9	117.79

(Source: Researcher, 2013)

4.2.3 Trend Analysis

Figure 4.1 shows the times series plot for the monthly CPI from 2006 to 2012. The line graph on the left hand side shows the values of CPI for Period 1 from January 2006

ending January 2009. The line graph to the right shows the CPI values for Period 2 starting February 2009 to December 2012. The CPI was on a sharp rise between January 2006 and January 2009. The rise was so steep that the cost of life in January 2009 was 1.58 times the cost of living three years earlier in January 2006. The variability in CPI was higher with a standard deviation of 37.25.

Figure 4.1: Time Series Plot of CPI
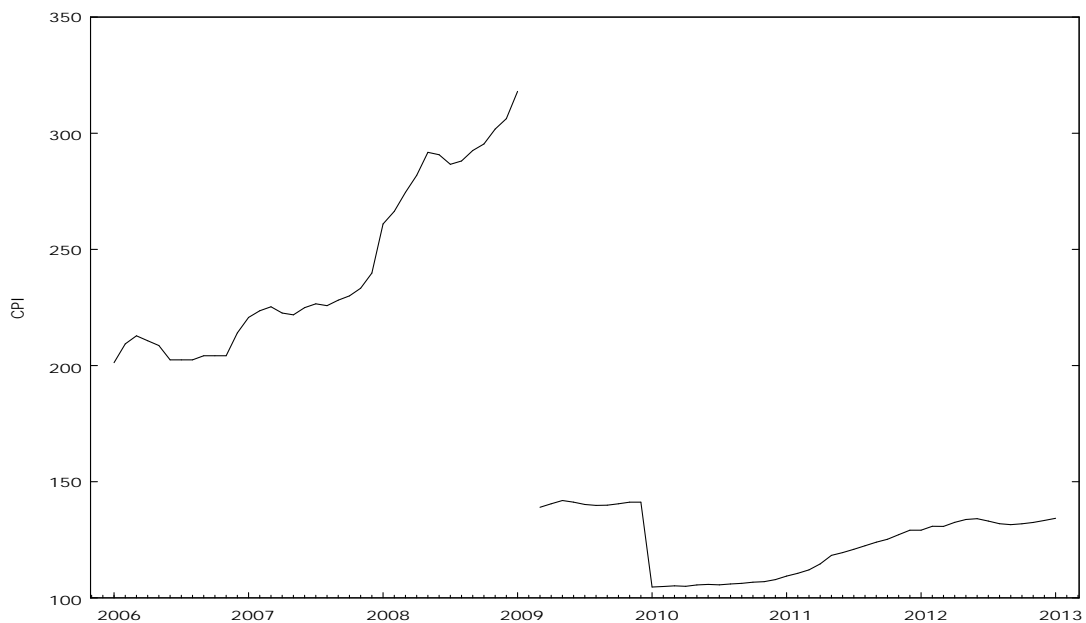
(Source: Researcher, 2013)

In Period 2, shown by the line graph to the right, the CPI dropped sharply after the revision of its calculation in 2009. The CPI values dropped to values less than 150 with the lowest being 104.66 in December 2009. However, since then, there has been a gentle rise in the CPI. The slope of rise is slower than that of Period 1 and the rates are yet to go beyond 150.

Figure 4.2 shows the line graph for monthly average crude oil prices for the period starting January 2006 to December 2012. As can be seen from the graph, crude oil prices are highly erratic. However, the rise between January 2006 and July 2008 was high

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peaking at US $ 131.22, over 2.50 times the price of January 2007. After the peak of July

2008, there was a sharp drop to US $ 41 per barrel almost a two thirds slash. However,

the sharp rise starts again reaching a peak of US $ 109.54 in January 2012.

Figure4. 1: Time Series Plot of Crude Oil Prices

(Source: Researcher, 2013)

4.2.4 Regression Analysis for Period 1

This subsection presents the results of the regression analysis of CPI and Crude oil prices

in Period 1. The correlation coefficient was 45.68 % indicating that the co-variation

between CPI and Crude Oil Prices was fairly strong during this period. Table 4.3a

indicates that the constant term was 186.35 which was significant, $t_{(37)} = 9.74, p <$

0.05. The coefficient term was 0.76 which was significant, $t_{(37)} = 3.04, p < 0.05$. As

shown in Table 4.2b, the regression was statistically significant though the variation in

CPI was poorly explained by the variation in Crude Oil Prices, $F_{(1,35)} = 9.23, p < 0.05, R^2 = 0.21$.

Table 4.3a: Regression Results

	Coefficient	Std. error	t-ratio	p-value
Constant	186.35	19.14	9.74	1.70 exp (-11)
Crude Oil Price	0.76	0.25	3.04	0.0045

(Source: Researcher, 2013)

The model is, therefore, as below:

$$CPI = 186.35 + 0.76 \,(Crude\ Oil\ Prices)$$

Table 4.3b: Regression Statistics

Regression Statistic	
R-squared	0.21
Adjusted R-squared	0.19
F(1, 35)	9.23
P-value(F)	0.004

(Source: Researcher, 2013)

4.2.5 Regression Analysis for Period 2

As shown in Table 4.4a the constant term was 126.78 which was statistically significant, $t_{(47)} = 13.87, p < 0.05$. the coefficient of Crude Oil Prices was -0.031 which was not significant, $t_{(47)} = -0.31, p > 0.05$. As shown in Table 4.4b the regression was not statistically significant and the variation in CPI was not strongly explained by the variation in Crude Oil Prices, $R^2 = 0.0021, F_{(1,\ 45)} = 0.096, p(F) > 0.05$.

Table 4.4a: Regression Results

	Coefficient	Std. error	t-ratio	p-value
Constant	126.78	9.14	13.87	7.33 exp-18
Crude Oil Price	-0.031	0.10	-0.31	0.76

(Source: Researcher, 2013)

The model is, therefore, as below:

$$CPI = 126.78 - 0.31 \, (Crude \, Oil \, Prices)$$

Table 4.4b :Regression Statistics

Regressions stats	
R-squared	0.0021
Adjusted R-squared	-0.02
F(1, 45)	0.096
P-value(F)	0.76

(Source: Researcher, 2013)

4.3 Summary and Interpretation of Findings

In Period 1 of the sample period covering January 2006 to January 2009 the study finds a close relationship between crude oil prices and CPI. The constant term was positive and significant indicating that there are other factors not captured by the regression model that affected CPI. The coefficient of Crude Oil Prices was positive and statistically significant indicating that there was a positive relationship between CPI and Crude Oil Prices in the period between January 2006 and January 2009.

The finding support the results of a study by Ansar and Asghar (2013) which analyzed the impact of oil prices on the Consumer Price Index (CPI) in Pakistan for the period 2007 to 2012. The results showed that there is a positive relationship between oil price and CPI, though, the relationship was not strong. The study also supports the findings of Ali, Ramzan, Razi and Bhatti (2012) who examined the effect of high speed diesel oil

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prices consumer prices in Pakistan covering the period of 10 years from 2001 to 2010. The study by Ali, Ramzan, Razi and Bhatti (2012) focused on the effect of diesel oil prices on food sector prices in Pakistan. The food prices used rice, maize, wheat, chicken and cooking oil. The study was based on the belief that there is a significant positive relationship between oil prices and food inflation. The study was a time series analysis covering 2001 to 2010. It was concluded that there was highly significant effect of oil prices on food inflation.

Similar findings were established by Sharma, Singh, Sharma, Gupta (2012) in India. In India the analysis compared the effects of crude oil price on Indian economy because at that time imports of oil were on the increase hitting 80 %. The volatility of oil prices had also increased. The oil price fluctuation had adversely affected the Indian economy. The study found that the increase in oil prices resulted in increased inflation in the Indian economy. This therefore established a strong relationship between oil prices and the consumer price index.

The findings, however, do not agree with those of Filis (2009) who found that for the period from 1996:1 to 2008:6, using a VAR, CPI exercised a significant negative influence on Greek CPI. The findings also do not agree with the findings of Umar and Abdulhakeem (2010) who did not find any significant relationship between crude oil prices and CPI in Nigeria.

In Period 2 of the sample period for this study, that is, between February 2009 and December 2012, the constant term was significant. However the coefficient of Crude Oil Prices was not statistically significant. The relationship was not significant, the variation

in CPI was poorly explained by variation in Crude Oil Prices and the covariation was poor. This indicates there was no relationship between CPI and Crude Oil Prices.

The findings of the period after the revision of the composition of the CPI basket in Kenya support the findings of Umar and Abdulhakeem (2010) who did not find any significant relationship between crude oil prices and CPI in Nigeria. The findings also support those of Chang, Jha, Fernandez and Jam'an (2012) who found no clear relationships between oil price fluctuations and CPI in the Asian-Oceanic region and South Asia.

The findings are similar to those of Chou and Tseng (2011) sought to estimate the effects of oil prices on inflation in Taiwan. The study employed monthly data from 1982 January to 2010 December. It was found that international oil prices experienced a significant and long-term effect on inflation in Taiwan. In the short run, the effect was not significant.

The findings for Period 2 seem to disagree with those of Njenga (2013) focusing on the impact of oil price changes on inflation in Kenya covering the period 1996 to the last quarter of 2011. Using the Johansen Cointegration Analysis and the Vector Error Correction Model, it was found that oil prices current and lagged once were positively significantly related to inflation indicating that in the short-run increases in oil prices led to a rise in inflation.

The findings in Period 2 also do not agree with those of Misati, Nyamongo and Mwangi (2013). The study by Misati, Nyamongo and Mwangi (2013) focused on the linkages between commodity prices and inflation. The study was done at a time when there was sharp rises in food and oil prices between 2008 and 2011. The Granger causality and

structural vector autoregressive was used and found that oil had a significant effect on inflation.

CHAPTER FIVE
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

Theoretical prediction is that there is close connection between the consumer price index CPI and crude oil prices due to the fact that in many economies, oil is a major input is the production processes. Oil contributes to the consumer price index directly as consumers used oil products like petrol, diesel, jet fuel and liquid petroleum gas. Oil also contributes to the consumer price index through the use of oil products as part of the cost of production. Out of this, there is an expected strong and positive relationship between crude oil prices and the consumer price index in any economy where oil is a major input of production.

This paper set forth to find out whether there is a strong, positive and statistically significant relationship between consumer price index and crude oil prices in Kenya. In this study the consumer price index was the dependent variable while crude oil prices were the independent variable. To establish the relation between them, a regression analysis was done. Given that the sample period contained the time when the calculation of the CPI was reviewed and effected as with the first measure of monthly CPI being recorded in January 2009 the analysis was split into the period up to January 2009 and the period after January 2009.

In Period 1 the relationship between CPI was positive, statistically significant and the constant and the coefficient terms were both statistically significant. In Period 2 the relationship between CPI was negative, statistically insignificant and the constant and the coefficient terms were both statistically insignificant.

5.2 Conclusions

The coefficient of Crude Oil Prices was positive, but statistically significant for Period 1 of the study. However, the coefficient was not significant for Period 2 of the study. This indicates that the relationship between CPI and crude oil prices depends on the composition of the CPI basket. In the first period possibly the goods in the basket were those closely related to oil prices and the adjustment made in period 2 lessened the relationship.

The constant term in both Period 1 and Period 2 were significant. This indicates that in both periods there are factors affecting CPI and not captured by the model effectively. It is therefore, concluded that there are other factors, other that Crude Oil that affect CPI. These are the factors whose net effect is expressed in the statistically significant constant term in the regression.

The whole regression was statistically significant in Period 1 but not significant in Period 2. The variation in CPI was not fully explained by the variation in Crude Oil Prices. This bolsters the opinion that CPI is better explained by inclusion of other factors separate from Crude Oil Prices. The study indicates that it is possible to lessen the effect of crude oil price fluctuation on consumers in a country.

5.3 Policy Recommendations

Consequent upon the significance of the constant term in both Period 1 and Period 2, the study recommends that these other factors that affect CPI in Kenya whose net effect is captured by the constant term are established. Once the factors are established, policy makers can manipulate these factors in order to cushion the consumer against their effect.

In Period 2 of this study, the coefficient of Crude Oil Prices was not statistically significant. Based on the assumption that it is good to hedge the consumer against the effect of the oil prices, the steps taken that brought about this result should be maintained. If more can be done to reduce the relationship even further, let the more be done.

The controls taken to reduce the effect of oil on the CPI can be applied on the other inflation causing factors. This can be done after discovering which other factors, apart from Crude Oil Prices affect the CPI in Kenya and how they relate to the variation in CPI. Every time the factors become significant drivers of the CPI, measures are taken to mitigate their effect. Such measures will go further to stabilize the value of the Kenyan shilling while improving the standards of lives of Kenyan citizens. Keeping variation of the CPI moderated will be beneficial to the business community for they will reap profits without hurting the value of the shilling.

5.4 Limitations of the Study

The data covers a few years, precisely seven. The findings may not be applicable across all times in Kenya. The results given by this study are therefore limited to the years that were studied. The findings may, therefore, not be applicable across all years since as

evidenced by the data itself variations in the relationship may vary from time to time dependent upon the policies concerning CPI in Kenya.

The research has not provided an indication as to why the independent variable , the Crude Oil Prices are not strongly explaining the variation in the CPI in the period after the revision of the components in the standard consumer basket in Kenya in January 2009. The best it has done is to show that the explanation is weak, but the source of the weakness has not been explained. This is because the study has fallen short of determining whether or not there is a causal relationship between CPI and Crude Oil Prices.

The study has focused on Kenya alone. Currently Kenya is active in the endeavor to unite the East African countries into a single and united economic union. The results would be stronger if the study considered all the countries in the East African Community. Such a study would be more useful due to the higher relevance of the results to countries outside Kenya.

The study does not provide a universal argument concerning the relationship between crude oil prices and consumer price index. Just like the many other studies, the relationship is based on a country at a time. However, globalization requires finding that can explain phenomena on a world level. This study falls short of that.

5.5 Suggestions for Further Research

The findings of this study can be improved if the study is expanded to cover a period of time as long as possible. Also given that Kenya is a key player in the East African

community the study can be expanded to cover other pension funds within the East African community in order to provide result that will be useful in that context.

A future research can be carried out on the same topic, but using data across a longer period of time. This is with the assumption that the data for a longer time will provide results that are better than those provided by the seven year data used in this study. The possible higher objectivity that arises based on the sample period may be settled covering a longer period.

A future researcher can conduct the research with the aim of determining whether there is a causal relationship between the dependent variable (Consumer Price Index) and the independent variable (Crude Oil Prices). This will help provide an explanation of why the coefficient of determination is low especially after the review of the CPI in January 2009. Further, such a study will provide solution as to which other factors are to be considered to make the relationship stronger.

Oil is a major input in the production processes of the majority, if not all, of the countries. Due to the increasing interconnectivity of the countries in the world, oil prices affect all of the citizens irrespective of their nationality. A study can be done to establish the kind of relationship that exists between crude oil prices and the consumer price index on a world scale.

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APPENDIX I
Monthly Values of CPI and Crude Oil Prices Period 1

YEAR	MONTH	CPI	CRUDE OIL PRICE
2006	Jan	201.25	58.31
2006	Feb	209.33	57.58
2006	Mar	212.80	57.65
2006	Apr	210.69	64.06
2006	May	208.62	64.91
2006	Jun	202.45	65.08
2006	Jul	202.45	69.05
2006	Aug	202.45	68.78
2006	Sep	204.22	59.77
2006	Oct	204.22	56.5
2006	Nov	204.22	56.82
2006	Dec	214.05	58.67
2007	Jan	220.72	52.01
2007	Feb	223.59	55.68
2007	Mar	225.30	59.05
2007	Apr	222.61	63.84
2007	May	221.83	64.54
2007	Jun	224.93	65.76
2007	Jul	226.57	69.46
2007	Aug	225.79	67.21
2007	Sep	228.15	73.25
2007	Oct	229.99	77.14
2007	Nov	233.28	86.73
2007	Dec	239.81	85.75
2008	Jan	260.94	87.17
2008	Feb	266.37	89.96
2008	Mar	274.55	96.78
2008	Apr	281.88	103.47
2008	May	291.79	118.95
2008	Jun	290.75	127.59
2008	Jul	286.62	131.22
2008	Aug	288.06	113.21
2008	Sep	292.57	95.97
2008	Oct	295.38	68.62
2008	Nov	301.79	51.38
2008	Dec	306.28	41.00
2009	Jan	318.02	44.97

APPENDIX II
Monthly Values of CPI and Crude Oil Prices for Period 2

YEAR	MONTH	CPI	CRUDE OIL PRICE
2009	Feb	139.00	43.14
2009	Mar	140.50	45.58
2009	Apr	141.90	50.18
2009	May	141.20	57.40
2009	Jun	140.20	69.21
2009	Jul	139.80	64.97
2009	Aug	139.90	71.32
2009	Sep	140.50	67.91
2009	Oct	141.20	73.28
2009	Nov	141.20	77.63
2009	Dec	104.66	75.49
2010	Jan	104.89	76.64
2010	Feb	105.18	73.56
2010	Mar	104.97	77.37
2010	Apr	105.56	83.09
2010	May	105.79	76.87
2010	Jun	105.61	73.98
2010	Jul	105.98	72.65
2010	Aug	106.25	74.19
2010	Sep	106.74	75.27
2010	Oct	106.97	80.34
2010	Nov	107.86	83.70
2010	Dec	109.38	89.08
2011	Jan	110.57	92.19
2011	Feb	112.05	99.88
2011	Mar	114.62	108.58
2011	Apr	118.29	115.77
2011	May	119.48	108.84
2011	Jun	120.91	107.52
2011	Jul	122.44	109.99
2011	Aug	123.97	104.96
2011	Sep	125.23	106.01
2011	Oct	127.20	103.89
2011	Nov	129.13	108.51
2011	Dec	129.13	106.20
2012	Jan	130.82	109.54
2012	Feb	130.76	116.16
2012	Mar	132.51	117.79
2012	Apr	133.74	113.75
2012	May	134.09	104.16
2012	Jun	133.06	90.73
2012	Jul	131.92	96.75

2012	Aug	131.51	105.28
2012	Sep	131.89	106.32
2012	Oct	132.46	103.39
2012	Nov	133.33	101.17
2012	Dec	134.25	101.17