

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,  
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**COLLEGE OF ART AND SOCIAL SCIENCES  
FACULTY OF SOCIAL SCIENCES  
DEPARTMENT OF ECONOMICS**

**THE EFFECT OF INTEREST RATE ON DEPOSIT ON HOUSEHOLD  
CONSUMPTION IN GHANA (1970 – 2009)**

**A THESIS SUBMITTED TO THE DEPARTMENT OF ECONOMICS, KWAME  
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MASTER OF PHILOSOPHY DEGREE IN ECONOMICS**

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## DECLARATION

I hereby declare that this submission is my own work towards the Mphil Economics and that to the best of my knowledge; it contains no material previously published by another person or material which has been accepted for the award of any degree of the University, except where acknowledgement has been made in the text.

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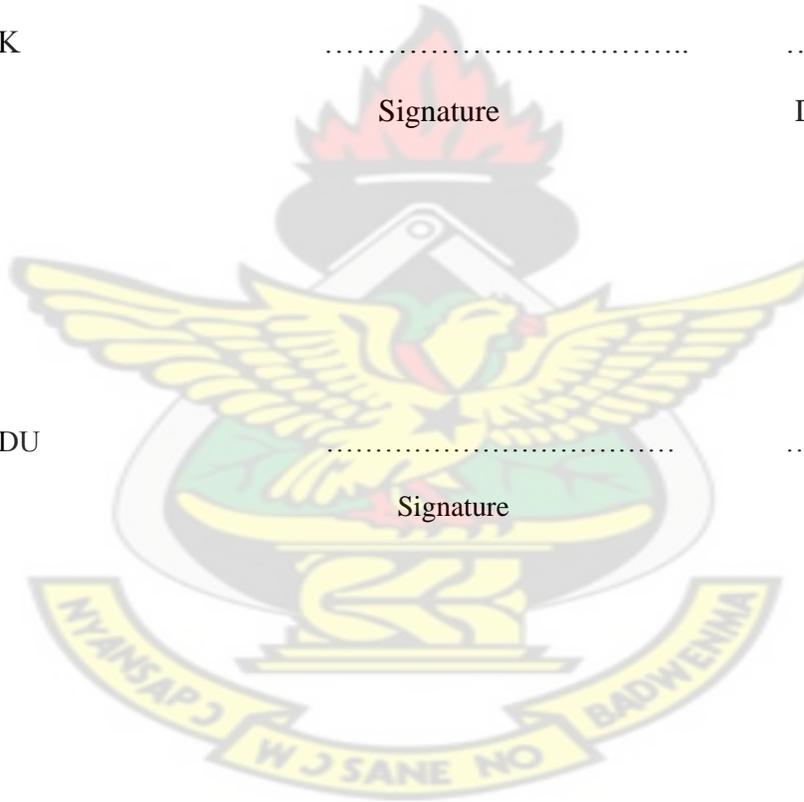
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## ABSTRACT

This paper presents an econometric model for household consumption in Ghana with the aim of highlighting the effect of interest rate on deposit on household consumption; the paper also looks at others macroeconomics variables like inflation rate and GDP per Capita effect on household consumption. This research is based on annual data covering period from 1970 to 2009 which was a secondary data. Phillips-Perron (PP) test was employed to find the stationarity status of the variables using Stata. Bound test was used to test for cointegration existence among these variables with the use of Microfit 5.1.

The long-run model estimates the relationship between household consumption and interest rate on deposit, inflation rate and GDP per Capita, results show that inflation rate has strong influence on household consumption in the long run and the only variable significant in the long run. In the short-run model, household consumption in Ghana seems to adjust slowly to equilibrium levels in the current period, from disequilibrium experienced in the previous period. The long run and short run coefficients were obtained with the help of Microfit 5.1. The model was also forecast to find its predictive power and the result showed was good. Base on the findings of the study appropriate policy recommendations were made.

**Keywords:** Household Consumption, GDP per Capita, interest rate on deposit, cointegration analysis and inflation rate.

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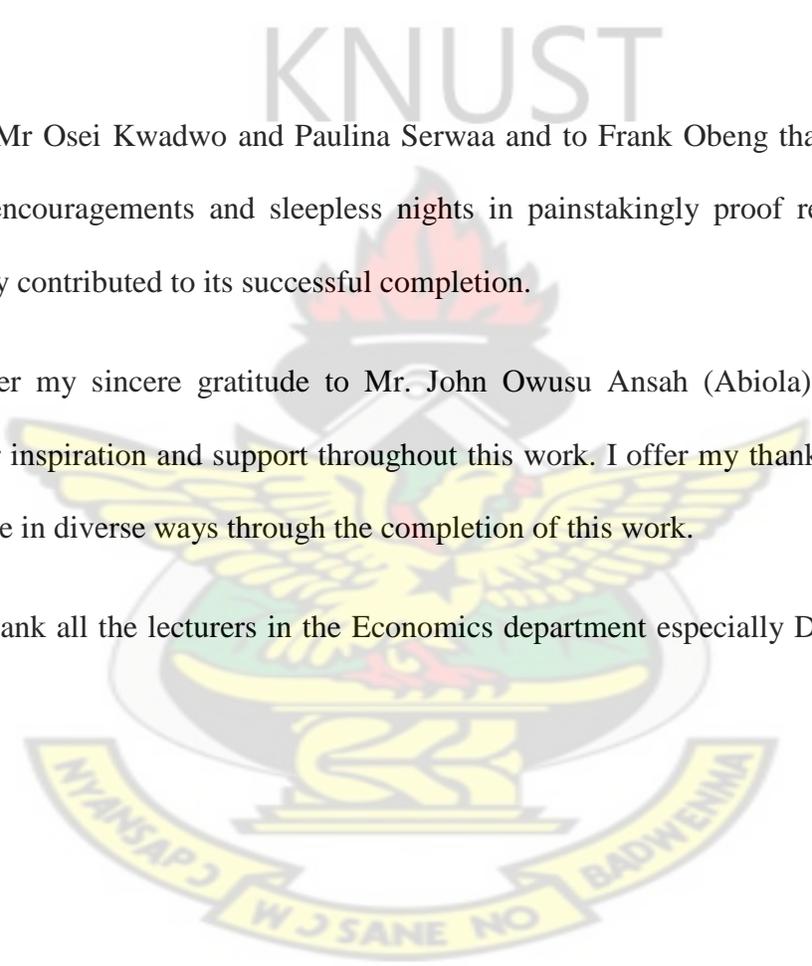
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## ACRONYMS

GDP - Gross Domestic Product

ERP - Economic Recovery Programme

SAP – Structural Adjustment Programme

HIPC – Highly Indebted Poor Country

MDG – Millennium Development Goals

ARDL – Autoregressive Distributed Lag

MPC – Marginal Propensity to Consume

APC – Average Propensity to Consume

LCH – Life Cycle Hypothesis

PDV – Present Discounted Value

NSS – National Sample Survey

ABS – Australia Bureau Service

ISSER – Institute of Statistical, Social and Economic Research

INT – Interest rate of deposit

INF – Inflation rate

GDPGR – Gross Domestic Product Growth

CPI – Consumer Price Index

PP – Phillips Perron

ADF– Augmented Dicky Fuller

OLS – Ordinary Least Square

VECM – Vector Error Correction Model

ECM – Error Correction Model

RMSS– Root Mean Sum of Squares

VAR – Vector Autoregressive Model



# CHAPTER ONE

## INTRODUCTION

### 1.0 Background of the study

Under the Permanent Income Hypothesis, the elasticities of consumption and saving to interest rate depend on the model parameters such as the intertemporal elasticity of substitution. These elasticities have wide ranging implications for monetary policy, business cycles [Plosser and Rebelo 1988], and tax incentives for saving. Most studies have found small effects of interest rates on consumption and saving [Hall 1988]. However, it remains unclear whether interest rate elasticities are truly small or these findings are spurious due to endogeneity of interest rate [Summers 1982, Hall 1988 and Balassa 1989] or measurement problems like the difficulty of observing household specific interest rate [Browning and Lusardi 1996; Mishkin 1995]. Understanding the response of personal saving to changes in interest rates is central to many issues in economic policy. For example, a reduction in the budget deficit would probably cause interest rates to decline. Alternatively, contractionary monetary policy generally causes interest rates to rise. If personal saving increases as a result, the corresponding fall in consumer spending slows the economy. As a final example, changes in the tax code can raise or lower the net-of-tax return to saving.

The interest elasticity of consumption is defined as the percent change in consumption that results from a one-percent change in the interest rate. There is disagreement among economists about both the sign and magnitude of this elasticity, as existing theory and empirical evidence do not appear to offer any clear conclusions. Economists' standard model of consumer behaviour is the lifecycle model, which assumes that people determine their consumption and saving at each point in their lives by looking forward to their future income and desires, rather than considering

only their current income and desired spending. Basic economic courses use a stylized version of this model to show that the interest elasticity of consumption can be decomposed into a "substitution" effect and an "income" effect, which work in opposite directions.

Although this characterisation of the lifecycle model appears in most casual writing on the topic, it is appropriate only for individuals in very specific situations. In particular, this characterisation is incomplete because it ignores the way in which interest rate changes induce revaluations of existing wealth that affect saving. This additional "wealth" effect contributes positively to the interest elasticity of saving, thus reinforcing the substitution effect, although it does not resolve the theoretical ambiguity about its sign. Alternative models of consumer behaviour lead to different analysis of the interest elasticity of consumption. While lifecycle consumers consider all of their lifetime resources in Campbell and Mankiw (1989), Carroll and Summers (1991), Poterba (1994), and Bernheim (1996) all emphasis the importance of considering a variety of models of saving behaviour. Choosing their current consumption and saving, one alternative model of behaviour posits that individuals have short planning horizons and use a "rule of thumb" for choosing consumption and saving.

Consumers have planning horizons that extend beyond their own lives and choose their consumption and saving to allow for bequests for their children. Yet a third alternative is that, consumers are forward-looking as the lifecycle model assumes, but that they save just enough to reach some "target" level of wealth that is independent of the interest rate. The uncertainty

surrounding these issues compound the ambiguity of the lifecycle model, and makes it clear that theory alone cannot explain.

Economists have tried to estimate the elasticity using data on total personal saving and interest rates, but these estimates suffer from problems. In the end, the estimates are simply too sensitive to small changes in estimation technique to be very useful. As a consequence, the most compelling approach for determining the interest elasticity of consumption is probably an indirect one. This indirect approach combines models of people's behaviour with estimates of certain features of their preferences and economic environment. The estimates of these features are more reliable than estimates of the interest elasticity of consumption (for reasons explained below), so if the models capture the crucial elements of people's actual decision-making, this indirect approach can generate useful information about the interest elasticity of consumption. Part of private saving was retained earnings by businesses and contributions to defined-benefit pension plans by businesses and governments. Under certain conditions, this other half of private saving can be described as simply one form of household saving.

The Household final consumption expenditure; etc. (% of GDP) in Ghana was last reported at 77.18 in 2011, according to a World Bank report published in 2012. Household final consumption expenditure (formerly private consumption) is the market value of all goods and services, including durable products (such as cars, washing machines, and home computers), purchased by households. It excludes purchases of dwellings but includes imputed rent for owner-occupied dwellings. It also includes payments and fees to governments to obtain permits

and licenses. Here, household consumption expenditure in Ghana is highly influence by a lot of factors which includes interest rate on deposit, income, consumer credit, inflation rate, wealth and others which heavily affect household consumption.

Interest rate on deposit has impact on household consumption in Ghana. It is recognised that the extent of the impact differs among countries due to structural and economic peculiarities. The dominant economic issue however, is to what extent does changes in interest rate on deposit affects household consumption.

### **1.1 Statement of problem**

Economists postulate that whenever there is an increase in interest rate on deposit consumers tends to increase their savings thereby reducing their consumption to take advantage of the increase in interest rate on deposit. Some are of the view that, income exerts greater influence on consumption than even interest rate on deposit. Theories on consumption also confirm this assertion. Firstly, a conceptual breakthrough by Keynes in 1936 after which it was fairly obvious that a key relationship in macroeconomics analysis was the relationship between income and consumer expenditure; the ratio of consumer expenditure to income varies with the level of income both cyclically and across families at any given time.

A different theory was suggested by Duesenberry in 1949. In his analysis, Duesenberry posited that, current consumption is not influence merely by present level of absolute and relative

income but also by levels of consumption attain in previous period. Milton Friedman in 1957, in his work came out to postulate that consumption does not only depend on current income but also permanent income and series of papers written on consumption by Ando, Brunberg and Modigliani beginning in the early 1950s. These theories have their similarities and differences in their implications for stabilization policy. Basically, one dominant similarity in these theorists work is that, consumption is most importantly depends on income either current income or permanent income or lifetime income.

The central question of this study is, can income alone explain bulk of the fluctuations in household consumption or there is a role for interest rate movement. By what magnitude does interest rate on deposit changes affect household consumption in Ghana if such an effect exists? Of what relevance is this to economic policies in Ghana?

This study therefore seeks to answer the question, to what extent does interest rate on deposits affects household consumption in Ghana.

## **1.2 Objective of the Study**

The general objective of this study is to analysis the effect of interest rate on deposit on household consumption in Ghana from 1970 to 2009.

The specific objectives of the study are:

- ❖ To examine the effect of other key macroeconomic and policy variables (GDP per Capita and inflation) on household consumption in Ghana.

- ❖ To forecast the consumption model to know its level of predictive power.

### **1.3 Study Hypothesis**

The study seeks to test the following empirical hypothesis:

H0: Interest rate on deposits has no effect on household consumption.

H1: Interest rate on deposits has effect on household consumption.

### **1.4 Justification for the Study**

It is an indisputable fact that the target of every economy is to attain the highest possible level of growth. A rise in growth implies a rise in the aggregate welfare of the people. For this reason, governments of developing countries over the years have been pursuing policies that would lead to economic growth. Obviously, the role of economic variables (such as interest rate on deposits, GDP per Capita and inflation rate) effect on household consumption in achieving growth cannot be overemphasised.

The research is relevant on the basis that, it will serve as an imperial foundation for further research work into this area of study applicable to different locations or regions elsewhere. It will also help the government or authorities responsible for implementing policies to know the effect interest rate on deposits have on household consumption, knowing this effect will help them to draw policies to control changes in interest rate on deposits.

To scholars and researchers in macroeconomics, this work will unveil to them the extent to which interest rate on deposits effect on household consumption as compared to other variables like GDP per Capita and inflation. Last but not least, this study will also contribute existing literatures on consumption.

### **1.5 Scope of the Study**

Conceptually, this study finds out the effect of interest rate on deposits on household consumption in Ghana. It includes theoretical and empirical discussions and explanations of how interest rate on deposits effect on household consumption and other economic variables like GDP per Capita and inflation rate.

The study was limited to the period 1970 – 2009. Due to 1970`s economic crises, the economy of Ghana went through a lot of economic reforms (Economic Recovery Programme, Structural Adjustment Programmes) and to attain higher economic growth, policies were implemented (Highly Indebted Poor Country Initiative and Millennium Development Goals) which some of them were monetary policies which in one way or other influence interest rate on deposit, I want to know the extent to which it affected household consumption thereby affecting aggregate demand hence economic growth. All these policies were geared towards stimulating economic growth; therefore I want to know the extent to which interest rate on deposits affect economic growth through household consumption with regards to these policies and programmes. For this reason the study chose this period 1970-2009.

## 1.6 Organisation of the Study

The study was organised into five main chapters with each chapter further divided into sections and sub-sections. The first chapter deals with the general introduction to the study. Chapter two reviews both the theoretical and empirical literature on effect of interest rate on deposits on household consumption. Chapter three focuses on the specification of the empirical model used for the study. The results of the data collected for the study were analysed and discussed in fourth chapter. The final chapter presents the summary of findings, policy implications, recommendations and conclusion of the study.



## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.0 Introduction**

This chapter focuses on the review of relevant literatures on effect of interest rate on deposits on household consumption. The chapter consists of two broad sections. The first section reviews the theories that have been developed to explain consumption, as well as how current income or permanent income or lifetime income or interest rate affects consumption at different stages in life of the consumer. Section two deals with the review of empirical works that have been done by scholars to explain how interest rate impact on household consumption.

#### **2.1 Review of theories on consumption**

Consumption theories have been developed over the years to explain consumption starting from 1936, Keynesian absolute income hypothesis followed by James Duesenberry`s(1949) relative income hypothesis, Permanent Income hypothesis(1957) by Milton Friedman and life cycle hypothesis by Albert Ando and Franco Modigliani. This section of the study reviews these theories:

Before the publication of Keynes` General Theory, a number of economists had recognised the relationship between consumption expenditures and household income. J.M. Keynes was the first economist, however, to point out the importance of the consumption- income relationship and to use it as the major building block in macroeconomic analysis. Keynes specified a simple linear consumption with consumption being a positive function of disposable income in his book titled

“The General theory of money, interest rate and employment (1936)”. Thus, consumption expenditure increases as disposable income increases. Though consumption depends on disposable income, there is a part of consumption which does not depend on disposable income and this is called the autonomous consumption. In the equation form, consumption function is:

$$C = a + \beta Y, (a > 0, 0 < \beta < 1) \dots \dots \dots (1)$$

Where C is consumption, a is autonomous consumption (that is the minimum amount of consumption when disposable income is zero),  $\beta$  is the marginal propensity to consume and Y is disposable income. The portion of consumption function which depends on disposable income (that is,  $\beta Y$ ) is called induced consumption.

Keynes` absolute income hypothesis has following properties: First, the value of the marginal propensity to consume is constant and it is less than one. From the Keynes` fundamental psychological law, consumers increase their consumption as their income increases but not as much as the increase in their income. This implies that individuals save part of their income as their income increases. From the consumption function the marginal propensity to consume is constant and lies between zero and one.

Secondly, the average propensity to consume which is the ratio of total consumption to total income falls as the level of income increases. This principle implied that the consumption function is nonproportional, meaning that the marginal propensity to consume is less than the average propensity to consume ( $MPC < APC$ ). According to Keynes, individuals see saving as a

luxury and they would like to save more as their income increases. This explains why the rich saves a higher proportion of their income than the poor. Additionally, overtime, as income increases aggregate consumption as fraction of income falls. The third deduction from the Keynes` consumption function is that disposable income is the primary determinant of consumption and not interest rate as postulated by Classical economists. This therefore implies that consumption changes anytime the consumer experiences a change in income.

Keynes deemed other variables such as interest rates to be of little or no significance in their influence on household consumption. His notion that consumption depends basically on disposable income and regarded other variables like interest rate has little or no significant impact on consumption came under serious criticism simply because variables like consumer credit, wealth and interest rate on deposit do impact significantly on household consumption both in developed and developing countries.

Despite these criticisms, numerical consumption functions were estimated from two kinds of data: first, time series on consumption, savings, income, prices, and similar variables available mostly for the period after World War 1; second, budget data on the consumption, savings, and income of individuals and families available from numerous sample surveys made during the past century and a half. Both sources of data seemed to confirm Keynes's hypothesis.

The Keynesian theory gives a static explanation of the household behaviour since it does not capture the tradeoffs` between present consumption and future consumption and gives to savings

a status of mere residue. However, the Keynesian model proved to be a good first approximation when the economy is stable. A second alternative based on neoclassical theory and proposed by Irving Fisher assumes that the purpose of household consumption is utility maximisation over a period that covers the entire life. In other words, a household would sacrifice a certain amount of consumption at present in order to have a higher amount in the future and vice versa. This is what is called inter-temporal choice. Hence, consumption depends on more than current income and expectations of income and interest rate play an important role in the consumption.

One of the economists to offer a major challenge to the absolute income hypothesis was James Duesenberry. In his book “Income, Saving and the theory of Consumer Behaviour (1949)”, Duesenberry proposed an alternative theory, called the relative income hypothesis for reconciling the nonproportional (short run) and proportional (long run) consumption functions. Duesenberry’s theory was based on the rejection of two implicit assumptions underlying the micro foundations of the absolute income hypothesis. He believed (1) that household preferences for goods and services were interdependent and (2) that household consumption expenditures were irreversible overtime.

According to Duesenberry (1949), the absolute income hypothesis failed to consider the influence that the psychological-social environment had on the consumption and saving decisions of households. The focus of his relative income hypothesis was on the psychological behaviour of the household and on how the household attempts to emulate or imitate the consumption behaviour of households whose income is just above its own. The preferences of households for certain types of goods and services are affected by what neighbours buy. That is,

when households observe the market basket of their neighbours, the preferences of the neighbouring households' consumption are interdependent. Duesenberry also points out that when households in their everyday living come into frequent contact with superior goods, the result is a "demonstration effect". This effect causes households to spend more since they desire superior goods for status. For example, if a household lived in a poor neighborhood (say with an average income level of 5,000 cedis) and received 60,000 cedis a year as income, he would consume less and save more since his income would be relatively high as compared to the average income of his neighbours. But if household received the same income 60,000 cedis per year and lived in a rich neighborhood, he would consume more and save less since his income would be relatively low as compared to the average income of his neighbours. This example shows that the amount of consumption and saving is not determined by the household's absolute income but by the household's level of income relative to the income of neighbouring households.

Duesenberry's second basic assumption, was that consumption expenditures were irreversible over time. Households form their habits and expectations on the basis of their previous peak income, that is, the highest income level they have been able to obtain so far. Their consumption pattern, which implies a certain market basket of goods and services, is based on this income, and households do not want to give it up. When recession occurs in the economy, there is a fall in household income. But when this fall occurs, households do not want to lower their consumption expenditures. They try to maintain their same standard of living- consumption pattern- by reducing their saving. That is, they begin to dissave. Consumption expenditures are not reversible in time, meaning that with a decline in income, consumption expenditures change

but not by the same absolute magnitude as they change with an increase in income. The hypothesis postulated that households will not reduce their consumption even when they experience a fall in disposable income but rather reduce savings. This assumption has been criticised by economists simply because almost all households alter their consumption when they experience a decline in disposable income while few others do not, and therefore the theory does not conform to reality.

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The permanent income hypothesis is associated with the name of Milton Friedman and has received more attention from economists than Duesenberry's relative income hypothesis. In "A Theory of the Consumption Function (1957)", Friedman expressed his concern with the proper definition and measurement of income. Both the absolute income hypothesis and relative income hypothesis were based on the concept of current income. Friedman rejects the notion that household consumption expenditures are dependent on current income since for him a year is too short a time span in which to make meaningful household spending decisions. Friedman's hypothesis is that household consumption is based on permanent income. Thus, a household's current measured income can either be greater or less than a household's permanent income. Permanent income is the income that a household anticipates or expects to receive over a number of years in the future, possibly a lifetime. Permanent income, therefore, was defined in terms of concept which it was measured. Friedman breaks measured income into two components permanent income and transitory income.

$$Y = Y_p + Y_T \dots \dots \dots (2)$$

Where Y, Y<sub>p</sub> and Y<sub>T</sub> are current, permanent and transitory income respectively.

The household's total wealth is composed of two parts: nonhuman and human wealth. The human wealth is the real physical and financial assets owned by the household. Real physical assets are items such as real estate and consumer durables (for example: television sets, washers, dryers and etc). Physical assets generate a flow of income or services to the household. Financial assets are items such stocks and bonds which also reduce a flow of income to the household. The human wealth part of total wealth, which is called human capital, is the skill and educational training of the household applied in a certain occupation within a specific location to produce a flow of income. Both human and nonhuman factors, therefore, are involved in household wealth. Wealth is defined as the present value of all future expected income stream.

Friedman assumes that transitory income is not related to permanent income. The correlation between the two is zero. Transitory income results from all those factors that the household considers pure chance or unexpected. The value of transitory can be either positive or negative, depending on whether the household has good luck or bad luck. If it has good luck, it experiences a windfall gain and if it has bad luck, it experiences, of course, a loss. Friedman assumes that all positive transitory income is saved. For example, if at the end of the year a household received an unexpected bonus, this would be positive transitory income that the household would save. Moreover, the household's measured income for the current year would be greater than its permanent income because of positive transitory income. On the other hand, negative income is dissaving (negative saving) for example, if a household had an unanticipated

illness and therefore is out of work for several months, the household would have negative transitory income therefore it would have to dissave.

Consumption on like income can be group into two permanent and transitory consumption.

$$C = C_p + C_T \dots \dots \dots (3)$$

Permanent consumption is the planned consumption of the household. Transitory consumption is the householder`s unanticipated consumption. While permanent consumption is determined by permanent income, transitory consumption may be interpreted as unanticipated consumption such as unexpected medical bills, usually high or low transport expenses and the like. Friedman assumes that transitory consumption is not related to permanent consumption, permanent income or to transitory income. Thus the correlation between transitory consumption and permanent consumption and between transitory consumption and transitory income are all zero. Permanent consumption is proportional to permanent income.

$$C_p = kY_p \dots \dots \dots (4)$$

Permanent consumption is a fraction of permanent income which is consumed. *K* is called the marginal propensity to consume out of permanent income. It does not depend only on the level of permanent income but also on the interest rate and on households` tastes and age.

Friedman`s permanent income hypothesis has been subjected to criticism. The main attack has focused on his hypothesis that, the marginal propensity to consume out of transitory income is zero, that is, the household saves all windfall gains. The impact of changes in measured income on the short run consumption function depends on how households visualise these changes. The more transitory they conceive these changes to be, the smaller would be the marginal propensity

to consume out of such changes in measured income. As measured income changes overtime, the household's perception of these changes as either permanent or transitory could vary and thus render the MPC out of measured income unstable but to Keynesians this function is stable. Therefore the marginal propensity to consume out of transitory income is not zero as postulated by the theory. In addition, the computation of permanent income cannot be easily done by individual household to determine their consumption; this therefore renders the application of the theory difficult for the individual household.

At the same time that, Friedman was developing his permanent income hypothesis, Albert Ando and Franco Modigliani were formulating a similar theory called the life cycle hypothesis of consumption. The basic difference between the two theories is that, in the life cycle hypothesis consumption depends on the present value of wealth rather than permanent income. While Fisher assumes that consumption depends on lifetime income and households try to achieve smooth consumption, the LCH stipulates that income changes systematically over the phases of the household's life-cycle, who attempts to achieve smooth consumption through savings. Thus, Modigliani's contribution is manifested by the assumption that household consumption depends in part on current income, but also depends on wealth. Households in the LCH model take the whole life-span into consideration when planning consumption because they plan their expenditures not on the basis of current income but rather on the basis of expected income during their lifetime.

According to this hypothesis, the typical individual has an income stream that is relatively low at the beginning and end of his/ her life. On the other hand, the individual might be expected to

maintain a more or less constant or perhaps slightly increasing level of consumption. This model suggests that in the early years of a person's life the person is a net borrower. In the middle years, she saves to repay debt and provide for retirement. In the late years, the consumer dissaves. The consumer saves in the middle years to pay off his debts in the early stages of life and use some of his savings to smoothen his consumption towards his retirement. The life cycle hypothesis is not without its shortcomings. First, there is problem associated with the estimate of expected future labour income as proportion of current labour income.

This formulation is hard to use because it assumes that changes in current labour income are permanent when in reality such changes may be temporary. A change in current labour income may generate a change in future labour income that is in the opposite direction rather than in the same direction. The second shortcoming of the life cycle hypothesis is its assumption that old households are dissavers, when, in fact, they may be savers. This tend to reduce the ability of the hypothesis to explain the estimated nonproportional consumption function using cross sectional data from budget studies.

Despite these the differences each of these theories have, one major dormant similarity among them is that all these theories lay emphasis on income but not interest rate as major determinant of consumption.

## 2.2 Review of theories on Interest rate

The study also looks at theories of interest rate since the aim of the study was to found out how interest rate on deposit affects household consumption.

In the study of economics and finance there are several theories that attempt to explain how interest rates affect economies and how they can be used to forecast future changes. These theories include classical, liquidity preference, loanable funds and rational expectations theories. Each of these theories makes assumptions regarding the behaviour of aspects of the economy and focuses on the behaviour of other aspects as determinants of the prevailing interest rates.

The classical theory of interest rates applies the classical theory of economics to determining interest rates. Classical theory of interest rates compares the supply of savings with the demand for borrowing. Using supply and demand curves the equilibrium rate is calculated by determining the curves intersection point. Thus if savings are greater than investments the interest rate drops until they reach equilibrium and vice versa, if savings are less than investment the interest rate increases until the reward for savings encourages increased savings rates causing the market to again reach equilibrium. However the classical theory of interest rates fails to account for factors besides supply and demand that may affect interest rates such as the creation of funds, the importance of income and wealth and changes in the primary borrowers in an economy.

A second method of determining interest rates is the liquidity preference theory. Liquidity preference theory asserts that economic units have a preference for liquidity over investing.

Applying this theory explains the premium offered in forward rates in comparison to expected future spot rates. This premium is used as payment for the use of scarce liquid resources. The preference for liquidity can be accounted for by the fact that economic units need to hold certain levels of liquid assets for purchase of goods and services and the fact that these near term future expenditures can be difficult to predict. Liquidity theory is limited by its short-term nature, the assumptions that income remains stable, and, like classical theory, only supply and demand for money are considered.

Loanable funds theory assumes that interest rates are determined by supply of loanable funds and demand for credit. In loanable funds theory the demand of loanable funds originates from domestic business, consumers, governments and foreign borrowers. While the supply is generated by domestic savings, dispersion of money balances money creation in the banking system and foreign lending. With these factors determining long-term interest rates, short term interest rates are decided by financial and monetary conditions in the economy. The many factors considered in loanable funds theory mean that equilibrium will be reached only when each of the factors is in equilibrium.

The rational expectations theory of interest rates is based on the idea that people formulate expectations based on all the information that is available in the market. Rational expectation theory holds that the best estimation for future interest rates is the current spot rate and that changes in interest rates are primarily due to unexpected information or changes in economic factors. The rational expectations theory can be incorporated with the loanable funds theory in

order to better consider the available information with the economy. The limiting factors of rational expectation theory are mostly related to the difficulty in gathering information and understanding how the public uses its information to form its expectations.

All of the described theories have shortcomings in some aspect. These limitations are based on the theories' various assumptions which are necessary to understand the diverse aspects of economic influence and change. The most inclusive of these theories is the loanable funds theory and as such it is the choice of financial practitioners. The loanable funds theory includes many of the various factors that influence our markets. Because of the variety of influences included in the theory, any failure can be attributed to imbalances in the equilibrium of savings and investment, money supply and demand, the supply of loanable funds, or net foreign demand and exports.

### **2.3 Empirical review**

A number of empirical studies have been done on effect of interest rate on deposit on household consumption; this section of the study therefore reviews these empirical literatures.

Elmendorf (1996) did a work on, the effect of interest rate changes on household savings and consumption for United States of America. The main objective of the study was to find out the effect of interest rate changes on the household consumption and saving. In order to analysis the effect of interest rate changes on consumption and savings, he decomposed the study into three

pieces in order to analysis the inter-temporal elasticity of substitution and rate of time preference. The first piece focus on the effects in the short run, the second piece focuses on the effect on the long run and finally evaluates the study using the life cycle model. The study used cross-sectional data on interest rates to estimate the inter-temporal elasticity of substitution.

The research found out that, the effect of an interest rate increases is that it reduces household consumption by forgoing a dollar consumption through substitution effect whiles the individuals savings increases as a result of the reduction in consumption. Secondly, increase in interest rate lowers the present discounted value (PDV) of people`s future consumption in other words, higher interest rate implies that fewer current dollars are needed to fund a given amount of future consumption. Lastly, an increase in interest rate may either increase or lower the saving of a life cycle consumer depending on his or her preferences and economic environment.

Does a Decrease in the Real Interest Rate Actually Stimulate Personal Consumption? Was carried out by Nakagawa and Oshima (2000). As a remedy for Japan`s distressed economy, Professor Paul Krugman of Massachusetts Institute of Technology suggested that a reduction in real interest rates caused by inflation expectations would stimulate personal consumption. Although there was a controversy whether inflation causing policy is effective or feasible, this paper therefore finds out whether a decrease in real interest rates actually stimulated personal consumption in Japan.

The representative nominal interest rate that a consumer faces was used, due to constraints on the cross-section data on selected household consumption; they actually used the deposit rate (weighted average over each maturity) in Japan and France. They also substituted the quarter-to-quarter change rate in the seasonally adjusted CPI for the expected inflation rate, assuming that inflation expectations were formed by individual forecasts of future inflation rates based on today's inflation. Personal consumption was also calculated with a quarter- to-quarter change rate. The research find out that, indeed a decrease in real interest rates stimulated personal consumption, which was what Professor Krugman pointed out.

Kapoor and Shamika (2009) did a study on, the effect of interest rate on household consumption; evidence from a natural experiment in India. As of April 2001, the Reserve Bank of India permitted and actively encouraged banks to offer higher interest rate on deposits of any size to senior citizens, defined as people over 60years of age. Basically, the aim of the study was to find out how this new Indian banking legislation (increase in interest rate on deposits) affected the consumption of this age group. The research used the regression discontinuity approach to estimate the precise causal effect that the interest rate has on consumption of households. They estimated the change in household consumption expenditure to a higher interest rate by comparing the expenditures of households that are eligible for higher interest rate earnings on their deposits to households that are not eligible.

The study used time series data from 61<sup>st</sup> round (2005-06) and the 56<sup>th</sup> round (2000-01) of Indian National Sample Survey (NSS). This is a good aggregated dataset of the entire household consumption expenditure in India and is a commonly used dataset in the economics literature.

They first analysis the 2005-06 data which was collected four years after the legislation was passed. This was compared to analysis on 2000-01 which was collected before the legislation was passed. The main results suggested that households do change their consumption expenditure significantly in response to the predictable change in interest rate on deposits. More specifically, when one compare 59 year old households with 60 year old households; one would found out that an increase of 50 basis points in the interest rate leads to a decline in consumption expenditure of 12 percent.

Elder and Halvorsen (2009) carried a study on the effect of a cut in the interest rate on consumption and saving in Norway. The research aimed to examine how different Norwegian consumers react to a sharp drop in the interest rates by observing their change in saving rates and also to find out how young households with negative net financial wealth, act as current-income consumers, and react differently to a drop in the interest rate than older households. The paper used panel data to examine how entire household consumers react to a sharp drop in the interest rates by observing the change in financial saving. It looks at two recession periods that spurred substantial cuts in the interest rate, i.e. around 1992 and 2003, and a period of quick interest rate increases in 1998. The paper used theoretical foundation for the analysis which included modified version of the life-cycle/permanent income model that includes liquidity constraints and/or impatience and income risk. In the first approach they used traditional panel data method, and extend the analysis to deal with endogeneity methods such as the Arrelano-Bond estimator. The results found that a reduction in interest rate on deposit really decreases household savings since Norwegians save less as against increasing their personal consumption especially in the northern and central regions of Norway, this is so because a rise in the interest rate would

correspondingly give substitution in direction of more savings since the constraint on consumption is less binding.

Smith and Lei (2005) carried a study on the response of consumption to income, credit and interest rates in Australia. The paper sought to find out the response of consumption to income, interest rates and credit growth in Australia and to identify the long-run relationship between consumption and permanent income, and estimate the short run response of consumption to income, interest rates and credit variables. The cross sectional data series on consumption and income which were quarterly and from the chain volume measure series in the Australia Bureau Service (ABS) National Accounts were used. Real per capita measures was computed by using the total population series from the ABS. The empirical analysis uses three measures of per capita household consumption: total, non-durables and durables excluding housing services. The study identified labour income in consumption equations with total disposable income, such as in Tan and Voss (2003).

This paper, therefore, constructed labour income as wages and salaries (compensation of employees) plus transfers minus personal social contributions. The credit variables used were housing and other personal credit measures in per capita terms and were deflated by the private consumption deflator. All the data series were seasonally adjusted, except for the nominal interest rate. Other variables used as instruments, such as unemployment and inflation, were also obtained from the ABS. Results of the paper revealed that, instrumental variable estimation of Euler equation with fixed coefficients suggested that consumption growth exhibits excess sensitivity to income growth than interest rate and credit. The estimation with credit variables,

however, yields smaller coefficients on income growth. As a proxy for liquidity constraints and wealth, credit aggregates have a substantial positive impact on consumption in Australia. Finally, the real interest rate increase leads to decrease in consumption but not credit.

In revealing, I identified these as the limitation to the research in that, the paper basically find out how credit facilities and interest rate affects consumption in Australia but fail to elaborate on how these variables can be influence by government and policymakers to help stimulate aggregate demand, as aggregate demand increases it also helps to increase investment in the country. Moreover, the paper failed to analysis the effect of interest rate on household consumption expenditure in the long run compared to the short run response. In the study, the paper try to find out how household consumption responds to changes in interest rate on deposits in the short run but failed to do that of the long run, this should have be done in order to help us know which effects is stronger.

Campbell and Mankiw (1986) also carried a research on Consumption, Income, and Interest Rates: Reinterpreting the Time Series Evidence. The research aimed to re-examine the evidence that consumption follow random walk using permanent income hypothesis. In order to test the evidence that consumption follows random walk, the permanent income hypothesis was formulated. Thus, according to this formulation of the permanent income hypothesis, the change in consumption was unforecastable. In evaluating how well this model fits the data, it was useful to keep an explicit alternative hypothesis. Under this alternative hypothesis, the change in consumption was a weighted average of the change in current income and the unforecastable innovation in permanent income.

The second approach to testing the permanent income hypothesis used by Hall (1978) and in most of the subsequent literature-was to regress the change on consumption on lagged variables to see whether the change in consumption is forecastable. The study found out that, it difficult for household consumers to plan their consumption following the permanent income hypothesis in reality hence consumption does not follow random walk, the computation of the permanent income itself is difficult for household to go by. One of the findings of the research was that, if current income plays as central role in consumption as our alternative model suggests, economists should not turn so readily to the permanent income hypothesis for policy analysis but rather turn to other theories for policy analysis.

Mullineux (2008) did a work on asymmetric effects of interest rate changes: the role of the consumption-wealth channel. The paper sought to examine the role of consumption-wealth channel in explaining asymmetric effects of interest rate changes. The data used for the analysis was from the Office of National Statistics where recent time-series data on macroeconomic variables and financial wealth were available. Quarterly data from 1991:Q1 to 2006:Q2 were considered for the following variables: consumption (on non-durables and services), income (household's net labour income), financial wealth (household's net worth) and non-financial wealth (gross housing wealth), inflation and interest rate (Bank of England's official base rate).

To test whether interest rate changes have asymmetric effects and whether such asymmetry can be attributed to the consumption-wealth channel, they developed an empirical framework in order to test the hypothesis. The results suggested that consumption expenditure responds

asymmetrically to changes in interest rates, part of which can be attributed to the role of wealth changes in determining consumption. This indicates that the consumption-wealth channel can be a possible reason behind the asymmetric effects of monetary policy. In other words, while interest rate cuts help to increase wealth and consumption, tighter monetary policy does not.

Breeden (1985) did a study on consumption, production, inflation and interest rates in United States of America. The purpose of the study was to find out equilibrium relations among real and nominal interest rates and the expected growth, variance and covariance parameters of optimally chosen paths for aggregate real consumption and aggregate production. The paper utilised two standard economic models to examine consumption, production, inflation and interest rates. A discrete-time, multi-period state preference model was first used to develop the relations of consumption growth and production opportunities to the term structure of interest rates in a single-good economy. This also provides the corresponding continuous-time relation between consumption and interest rates, and also provides a synthesis of the consumption and production results in a single-good economy.

The research found out that there is negative relationship between inflation rate, interest rate and consumption growth. Lastly, investment has a positive correlation with aggregate output at each instant and also has a positive correlation with aggregate wealth over a discrete interval, but consumption withdrawals are positively related to aggregate output, which implies that the wealth variable is a smoothed version of the returns to a rolled-over portfolio of investments in the economy.

The output, employment and interest rate effect on government consumption was a research carried out by Aiyagari, Christiano and Eichenbaum (1990). The paper sought to investigate the impact of these aggregate variables (output, employment and interest rate) on changes in government consumption. They developed a model which assumes that more open economies are more efficient at absorbing an increase in government consumption. To test the hypothesis, a conventional growth equation was used relating the growth of per capita income of countries to their investment ratio; their initial level of per capita income as a proxy for technological backwardness, and a measure of trade distortion. The paper found out that persistent changes in employment and output always have contemporaneous effect on government consumption which is always large than transitory changes. In addition, from the specific parametric model found that both temporary and persistent increases in interest rate increases government consumption. However persistent increase in interest rate actually has a larger effect on the government consumption than a transitory increase.

The role of interest rate and inflation on consumption function was a study undertaken by Poole (1972); the paper basically was to find out the significant role interest rate and inflation play in the consumption function. Consumption function was formulated laying emphasis on interest rate and inflation, time series data was used for the analysis. Consumption was found to be stronger over this period (1972) than would have been expected from the (1954-67) this was due to the inherent difficulties of measuring the expected rate of inflation by a distributed lag on past inflation. This finding appears to suggest that the both rate of interest rate and inflation play a role in reducing consumption. The findings portray the significant role inflation and interest rate play in the consumption function.

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## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.0 Introduction**

This chapter presents the conceptual framework of the model specified for the study. The chapter consists of four subsections. Section 3.1 provides the type and sources of data used for the study. The section 3.2 focuses on the specification of the model used for the study. Section 3.3 discusses how the variables used for the study were defined and measured as well as the expected impact of the determinants. The section 3.4 looks at the estimation technique with emphasis on the autoregressive distributed lag (ARDL) model, otherwise called the Bounds Test which was used to estimate the model specified for the study.

#### **3.1 Data Type and Sources**

The study used annual time series data for the period 1970 – 2009 obtained from published sources. The major sources of data included World Bank's World Development Indicators, 2011 CD-ROM, IMF International Financial Statistics, 2006 and African Development Indicators. Other sources included annual reports of Bank of Ghana, State of the Ghanaian Economy (various issues) by Institute of Statistical, Social and Economic Research (ISSER). All estimations as well as the various econometric tests were carried out using Stata, gretl and Microfit 5.1 econometric software.

### 3.2 Model Specification

The Keynesian absolute income hypothesis specified a consumption function as:

$$C = a + \beta Y, \quad C_t = f(Y) \dots \dots \dots (1)$$

Where consumption depends largely on income, for the purposes of this study, two more relevant variables were included namely interest rate on deposits and inflation rate.

Therefore the consumption function for the study is specified as:

$$C_t = f(INT, INF, Y) \dots \dots \dots (2)$$

Where;

$C_t$  is household consumption at time  $t$ ,  $INT$  is the interest rate on deposits while  $INF$  is the inflation rate and  $Y$  is GDP per Capita. All values used for these variables are annually.

Equation (2) can be expressed as

$$C_t = \beta_0 INT^{\beta_1} INF^{\beta_2} Y^{\beta_3} e^{\mu_t} \dots \dots \dots (3)$$

Where  $\mu_t$  is the error term. From equation (3), the specific model for consumption for the Ghanaian economy in log-linear form is given as:

$$\ln C_t = \beta_0 + \beta_1 \ln INT_t + \beta_2 \ln INF_t + \beta_3 \ln Y_t + \mu_t \dots \dots \dots (4)$$

Where the  $\beta_i$  represent the elasticity coefficients.

Equation (4) above shows the long-run equilibrium relationship.

The choice of the log-linear model was because of the following reasons:

Firstly, to find the percentage change in the dependent variable resulting from percentage changes in the independent variable. Thus, the study sought to find the responsiveness of a change in Household consumption to changes in interest rate on deposit, inflation and GDP per Capita (that is, elasticities of these variables), hence the need to use the log-linear model.

Secondly, while the values for some of the variables such, interest rate on deposit and inflation were small, others such as GDP per Capita and household consumption were very large (in thousands & millions). There was therefore, the need to use the log form to bring the values for all the variables to the same unit or level.

Lastly, the use of log transformation is necessary because it reduces the scale of the variables from a tenfold to a twofold, thus reducing the possibility of heteroskedasticity in the model (Gujarati, 1995).

### **3.3 Definition and Measurement of Variables in the Model**

- **GDP per Capita**

GDP is the total value of goods and services produced within the borders of an economy or a country during a given period of time measured in market prices as defined by United Nations Development Programme. It is calculated without making deductions for depreciation. GDP per Capita therefore is the measure of the total output of a country that takes the gross domestic product (GDP) and divides it by the number of people in the country. The per capita GDP is

especially useful when comparing one country to another because it shows the relative performance of the country. It is calculated either by using the income or product or expenditure approach. A rise in per capita GDP signals growth in the economy and tends to translate as an increase in productivity. Gross Domestic Product growth (GDPGR) is the annual percentage change in GDP.

- **Inflation (INFL) rate**

Inflation is the general increase in price levels of goods and services in a country according to World Bank definition. Keynes defined inflation as a phenomenon of full employment. According to him, inflation is the result of excess aggregate demand over the available aggregate supply and true inflation starts only after full employment. So as long as, there is unemployment, employment will change in the same proportion as the quantity of money and when there is full employment, prices will change in the same proportion as the quantity of money. The inflation rate as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a fixed basket of goods and services that may be fixed or changed at specified intervals, such as yearly. Inflation rate is a reflection of macroeconomic instability. Put simply, if the basket costs \$100 in year 1 and \$104 in year 2, the inflation rate is 4%. Perhaps the most common measure of the inflation rate is the Consumer Price Index (CPI). Other important measures of the inflation rate are the Producer Price Index and the GDP Price Deflator.

- **Household Consumption**

According to investopedia, consumption is the process in which the substance (goods and services) is completely destroyed, used up, or incorporated or transformed into something else by individual household. Consumption of goods and services is the amount of them used in a particular time period. According to mainstream economists, only the final purchase of goods and services by individuals constitutes consumption, while other types of expenditure — in particular, fixed investment, intermediate consumption and government spending — are placed in separate categories.

- **Interest rate on deposits**

Economics dictionary defines it as the interest rate paid by financial institutions to deposit account holders. Deposit accounts include certificates of deposit, savings accounts and self-directed deposit retirement accounts. For example, a deposit interest rate will often be paid for cash deposited into savings and money market accounts. Savings accounts earn a rather low rate of interest, but cash deposited in certain other account types are also paid a deposit rate by banks and financial institutions. In essence, the Deposit Rate is the interest rate that a bank pays the depositor for the use of their money for the time period that the money is on deposit. Deposit interest rates can be either fixed for a certain period of time with a minimum amount of money on deposit, or it can also vary, which is not usually subject to early withdrawal penalties.

The expected impacts of the determinants (i.e. independent variables) are as follows:

As interest rate on deposit tells us what households receive, when they save their monies at the bank. Therefore as interest rate on deposit increases, households will like to earn more on savings therefore they cut down consumption in order to save more. When interest rate on

deposit falls they would increase consumption by saving less. Thus, it is expected that interest rate on deposit will have inverse relationship with household consumption. Therefore,  $B_1 < 0$ .

Inflation rate is a reflection of macroeconomic instability. A high rate of inflation is generally reduce consumption because it raises the cost of living and thus lowers the rate of consumption. At low levels of inflation, cost of living falls therefore household consumption increases. Thus, inflation is expected to have a negative relationship with household consumption. Thus, its coefficient  $\beta_2 < 0$ .

Gross domestic Production per Capita measures the standard of living in the country; therefore an increase in GDP per Capita raises the standard of living of the individual therefore household consumption increases. A fall in GDP per Capita result in the fall in household consumption, all things being equal. Thus, the expected sign  $\beta_3 > 0$ .

### **3.4 Data Analysis**

This section essentially looks at time series analysis adopted for the study. Under this section, unit root test would be conducted to ascertain the order of integration of the series used in the model in order to avoid the spurious regression problem.

### **3.4.1 Phillips-Perron (PP) Test**

One major problem often associated with empirical analysis is non-stationarity of time series data. When variables being used for analysis are non-stationary, it usually leads to spurious regression results. In such a case, the t-statistic, DW statistic as well as the  $R^2$  values are not accurate and invalid for inference. As part of pre-estimation investigations, the study conducts unit root tests to determine the order of integration of the relevant variables.

The unit root tests in this study are based on the test procedures proposed by Phillips and Perron (1988). The Phillip and Perron (herein after PP) test was used to test the stationary status of the variables used in the equation. The PP test is preferred to the traditional Augmented Dickey-Fuller (ADF) test because of its use of non-parametric methods to adjust for serial correlation and endogeneity of regressors thereby preventing the loss of observations implied by the ADF test. The presence of unit root in the series indicates that the variable is non-stationary, hence the degree or order of integration is one or higher. The absence of unit root however, implies that the variables are stationary and the order of integration is zero.

### **3.4.2 Cointegration Test**

The Autoregressive Distributed Lag (ARDL) Cointegration Test, otherwise called the Bounds Test developed by Pesaran et al (2001) was used to test for the cointegration relationships among the series in the model. Two or more series are said to be cointegrated if each of the series taken individually is non-stationary with  $I(1)$ , while their linear combination are stationary with  $I(0)$ . In a multiple non-stationary time series, it is possible that there is more than one linear relationship

to form a cointegration. This is called the cointegration rank. The study therefore applies the ARDL cointegration technique developed by Pesaran et al (2001) to the system of the four variables in the equation to investigate the existence or otherwise of long-run equilibrium relationships among the variables.

### **3.5 Estimation Technique**

#### **3.5.1 Autoregressive Distributed Lag (ARDL) Model**

As already stated, equation (4) shows the long-run equilibrium relationship. In order to be able to analysis the long-run relationships as well as the dynamic interactions among the various variables of interest empirically, the autoregressive distributed lag cointegration procedure developed by Pesaran *et al* (2001) was used.

The choice of ARDL to estimate the model was informed by the following reasons:

The ARDL cointegration procedure is relatively more efficient in small sample data sizes as is the case in this study. This study covers the period 1970–2009. Thus, the total observation for the study is 40 which are relatively small. More also, The ARDL enables the cointegration to be estimated by the ordinary least square (OLS) method once the lag of the model is identified. This is however, not the case of other multivariate cointegration techniques such as the Johansen Cointegration Test developed by Johansen (1990). This makes the ARDL procedure very simple. Lastly, The ARDL procedure does not require the pretesting of the variables included in the model for unit roots compared with other techniques such as the Johansen approach. It is

applicable regardless of whether the regressors in the model are purely I(0), purely I(1) or mutually cointegrated.

Following Pesaran *et al* (2001) as summarized in Chong *et al* (2005), the ARDL is applied by modelling the long-run equation (4) as a general vector autoregressive (VAR) model of order  $p$  in  $z_t$ .

$$z_t = \beta_0 + \alpha_t + \sum_{i=1}^p \phi_i z_{t-i} + \mu_t, \quad t = 1, 2, 3, 4, \dots, T \quad (5)$$

Where

$\beta_0$  represents  $(k + 1)$  – a vector of intercept (drift)

$\alpha$  represents  $(k + 1)$  – a vector of trend coefficients.

Pesaran *et al* (2001) further derived the following vector equilibrium correction model (VECM) corresponding to (5).

$$\Delta z_t = \beta_0 + \alpha_t + \pi z_{t-1} + \sum_{i=1}^p \tau_i \Delta z_{t-i} + \mu_t, \quad t = 1, 2, 3, 4, \dots, T \quad (6)$$

Where

$(k + 1) \times (k + 1)$  – matrices

$\pi = I_{k+1} + \sum_{i=1}^p \psi_i$  and  $\tau_i = - \sum_{j=i+1}^p \psi_j$   $i = 1, 2, \dots, p - 1$  contain the long-run multiplier and

short-term dynamic coefficients of the VECM.

$z_t$  is the vector of variables  $c_t$  and  $x_t$  respectively;  $C_t$  is an I(1) dependent variable defined as  $\ln C_t$  (in this case *ln Household Consumption*);  $x_t$  (Interest rate on deposits<sub>t</sub>, Inflation<sub>t</sub>, GDP per Capita<sub>t</sub>) is a vector matrix of ‘forcing’ I(0) and I(1) regressors.

Assuming further that there is unique long run relationship among the variables, the conditional VECM becomes:

$$\Delta C_t = \beta_{y0} + \alpha_t + \theta_{cc}C_{t-1} + \theta_{xx}x_{t-1} + \sum_{i=1}^{p-1} \lambda_i \Delta C_{t-i} + \sum_{i=0}^{p-1} \theta \Delta x_{t-1} + \mu_{yt} \dots \dots \dots (7)$$

*From the equation above, the conditional VECM can be specified as*

$$\Delta \ln C_t = \beta_0 + \alpha_t + \theta_1 \ln C_{t-1} + \theta_2 \ln INT_{t-1} + \theta_3 \ln INF_{t-1} + \theta_4 \ln Y_{t-1} + \sum_{i=1}^p \beta_{1i} \Delta \ln C_{t-i} + \sum_{j=1}^q \beta_{2j} \Delta \ln INT_{t-j} + \sum_{k=1}^q \beta_{3k} \Delta \ln INF_{t-k} + \sum_{m=1}^q \beta_{4m} \Delta \ln Y_{t-m} + \mu_t \dots \dots \dots (8)$$

### 3.5.2 ARDL Bounds Testing Procedure

The ARDL Bounds testing procedure basically involves three steps. The first step in the ARDL bounds testing approach is to estimate equation (8) by ordinary least square (OLS) in order to test for the existence or otherwise of a long-run relationship among the variables. This is done by conducting F-test for the joint significance of the coefficients of the variables.

The hypothesis is:

$$H_0: \theta_1 = \theta_2 = \theta_3 = \theta_4 = 0$$

$$H_1: \theta_1 \neq \theta_2 \neq \theta_3 \neq \theta_4 \neq 0$$

The test which normalises on C is denoted by

$$F_C (C | INT, INF, Y)$$

Two asymptotic critical values bounds provide a test for cointegration when the independent variables are  $I(d)$  (where  $0 \leq d \leq 1$ ): a lower value assuming the regressors are  $I(0)$  and an upper value assuming purely  $I(1)$  regressors.

Suppose the F-statistic is above the upper critical value, the null hypothesis of no long-run relationship is rejected regardless of the orders of integration for the time series meaning that there is long run relationship among the series. On the other hand, if the F-statistic falls below the lower critical value, the null hypothesis is accepted, implying that there is no long-run relationship among the series. Lastly, if the F-statistic falls between the lower and the upper critical values, the result is inconclusive.

In the second stage of the ARDL bounds approach, once cointegration is established the conditional ARDL  $(p, q_1, q_2, q_3, q_4)$ , the long-run model for  $C_t$  can be estimated as:

$$\ln C_t = \beta_0 + \sum_{i=1}^p \theta_1 \ln C_{t-1} + \sum_{l=0}^{q_1} \theta_2 \ln INT_{t-1} + \sum_{i=0}^{q_2} \theta_3 \ln INF_{t-1} + \sum_{i=0}^{q_3} \theta_4 \ln Y_{t-1} + \mu_t \dots\dots\dots(9)$$

This involves selecting the orders of the ARDL  $(p, q_1, q_2, q_3)$  model in the four variables using Akaike Information Criterion (Akaike, 1973).

The third and the last step in the ARDL bound approach was used to estimate an Error Correction Model (ECM) to capture short-run dynamics of the system. The ECM generally provides the means of reconciling the short-run behaviour of an economic variable with its long-run behaviour.

The ECM is specified as follows:

$$\Delta \ln C_t = \gamma + \sum_{i=1}^p \beta_{1i} \Delta \ln C_{t-i} + \sum_{j=1}^q \beta_{2j} \Delta \ln INT_{t-j} + \sum_{k=1}^q \beta_{3k} \Delta \ln INF_{t-k} + \sum_{l=1}^q \beta_{4l} \Delta \ln Y_{t-1} + \rho ECM_{t-1} + \mu_t$$

.....(10)

From equation (9),  $\beta_i$  represent the short-run dynamics coefficients of the model's convergence to equilibrium.  $ECM_{t-1}$  is the Error Correction Model. The coefficient of the Error Correction Model,  $\rho$  measures the speed of adjustment to obtain equilibrium in the event of shocks to the system.



## CHAPTER FOUR

### ANALYSIS AND DISCUSSION OF EMPIRICAL RESULTS

#### 4.0 Introduction

This chapter presents a thorough analysis and discussion of the results of the study. The chapter is divided into four sections. Section 4.1 examines the time series properties of the data. It presents the unit root test, correlation results and the bound test for cointegration. Section 4.2 presents and discusses the results of the estimated long run equation using the ARDL approach. The results of the Error Correction Model for the selected ARDL model were presented and analysed in section 4.3. The last section of the chapter analyses the static (long-run) dynamic (short-run) forecast results.

#### 4.1 Discussion of Time Series Properties

##### 4.1.1 Results of the Unit Root Test

In order to examine the effect of interest rate on deposits on household consumption in Ghana, the stationarity status of all the variables (that is, Household Consumption , Interest rate on deposits, inflation rate and GDP per Capita) in the model specified for the study were determined. The presence of unit root in macroeconomic time series has an important economic implication that a shock to the variable tends to have a permanent effect. On the contrary, shocks to stationary macroeconomic time series process only have temporary effect; over time, the effect of the shock dies out. Thus, stationary macroeconomic time series are characterised by mean reverting mechanism. More importantly, the presence of unit roots in macroeconomic data poses an estimation challenge to macro econometricians. Regressions with non-stationary data have high potential of leading spurious relationship and hence wrong inference between/among

macroeconomic variables. It is therefore a necessary first-step to examine the order of integration of the relevant variables used in this study. The results of this investigation are presented in Table 4.1.

Ouattara (2004) indicates that the computed F-statistics provided by Pesaran *et al* (2001) are not valid in the presence of I(2) variables. This is so because the bounds test is based on the assumption that the variables are integrated of order zero (that is, I(0)) or integrated of order one (that is, I(1)). The stationarity test is based on the Phillip-Perron test. The results of the unit root test are presented in the table below.

**Table 4.1 The results of the Unit root test**

	Phillip- Perron Test statistics			
	Test Statistics Value	Critical t value 5%	Critical t value 10%	P-value
$\ln INT$	-1.608	-2.961	-2.613	0.4794
$\Delta \ln INT$	-6.221**	-2.964	-2.614	0.0000
$\ln INF$	-5.267**	-2.961	-2.614	0.0000
$\ln C$	7.597	-2.961	-2.613	1.000
$\Delta \ln C$	-3.515**	-2.964	-2.614	0.0120
$\ln Y$	-0.275	-2.961	-2.613	0.9290
$\Delta \ln Y$	-4.488**	-2.964	-2.614	0.0002

Unit root tests were performed in Stata 12. \*\*\*, \*\*, \* indicates the rejection on the null hypothesis of unit root at 1%, 5% and 10% level of statistical significance.

As shown from the first table 4.1, interest rate on deposit was not stationary, looking at its critical value at 5% (-2.961) compare with its t-value (-1.608) in absolute terms, the critical value

is greater than the t-value which means that the null hypothesis which means non-stationarity is accepted. Moreover, the probability value (0.4794) is greater than 0.05 which confirms the non-stationarity status of the variable. However, after the first difference of the variable, is now stationary as seen from the table, now the critical value (-2.964) is less than the t-value (-6.221) in absolute terms and also the probability value is (0.000). With regards to inflation rate, it was stationary at its levels as its critical value (-2.961) is less than the t-value(-5.267) in absolute terms, more also its probability value (0.000) less than 0.05 proving that the variable is stationary at its levels therefore there was no need for the first difference.

From the table, household consumption was non-stationary, looking at its critical value at 5% (-2.961) compare with its computed t-value (7.597) , the critical value is less than the t-value which means the t-value is lying in non- rejection region which implies the null hypothesis is accepted meaning the variable is non-stationarity. Moreover, the probability value (1.000) is greater than 0.05 which confirms the non-stationarity status of the variable. After the first difference is now stationary, the critical value (-2.964) is less than the t-value (-3.515) in absolute terms and also the probability value is (0.0120).

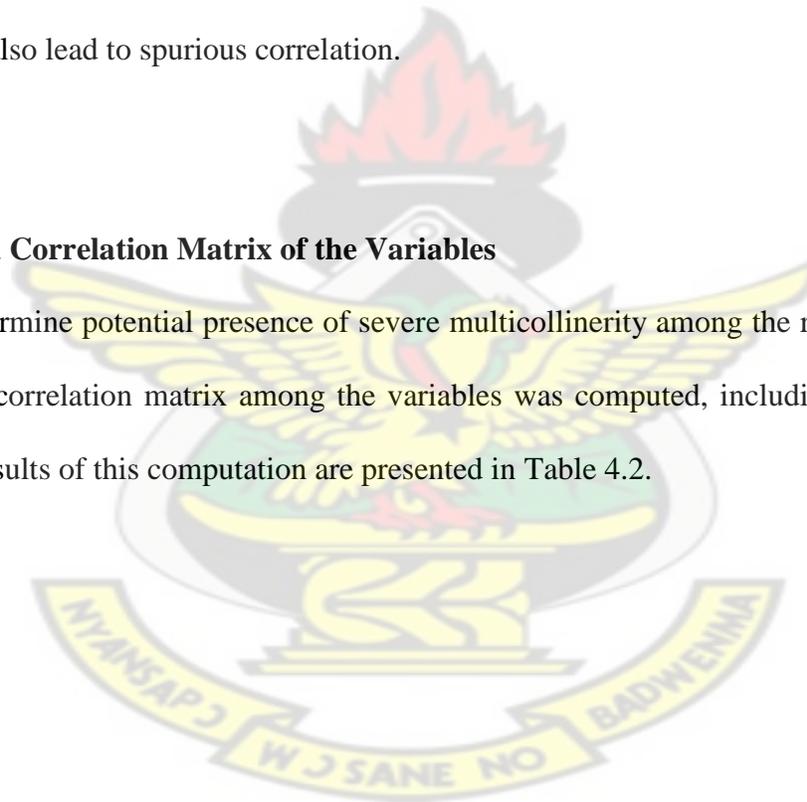
GDP per Capita was non-stationary, looking at its critical value at 5% (-2.961) compare with its t-value (-0.275) in absolute terms, the critical value is greater than the t-value which means that the null hypothesis which means non-stationarity is accepted. Moreover, the probability value (0.9290) is greater than 0.05 which confirms the non-stationarity status of the variable. After the

first difference of GDP per Capita is now stationary, the critical value (-2.964) is less than the t-value (-4.488) in absolute terms and also the probability value is (0.002).

The results of the PP test suggests that these variables(GDP per Capita, interest rate and Household Consumption) with the exception of inflation rate are I(1) at their levels but I(0) at the first difference, demonstrating the existence of unit root in the data for these variables used. The implication of this is that shocks to any of the non-stationarity variables will have permanent effect and can also lead to spurious correlation.

#### **4.1.2 Estimated Correlation Matrix of the Variables**

In order to determine potential presence of severe multicollinearity among the regressors prior to estimation, the correlation matrix among the variables was computed, including the dependent variable. The results of this computation are presented in Table 4.2.



**Table 4.2: Correlation results**

Correlation coefficients, using the observations 1970 - 2009  
5% critical value (two-tailed) = 0.3120 for n = 40

	C	INT	INF	Y
C	1.0000	-0.2187	-0.1217	0.1971
INT	-0.2187	1.0000	-0.1997	0.0796
INF	-0.1217	-0.1997	1.0000	-0.2800
Y	0.1917	0.0796	-0.2800	1.0000

Results were obtained from gretl.

The results indicate that there is a negative correlation between household consumption and interest rate on deposit. The reported correlation coefficient between household Consumption and interest rate on deposit is -0.21807. The negative relationship between household consumption and interest rate on deposit is consistent with the findings obtained from the long run and short run equations to be presented later. The correlation matrix measures the extent of correlation between variables whether strong or not strong. From the value obtained, the correlation between household consumption and interest rate on deposits is not strong or high, the value is far below 0.5. Comparing interest rate to the other variables, interest rate on deposit is more correlated to household consumption than the other two variables. Given the small values of the correlation coefficients among the regressors, the problem of multicollinearity

among the regressors and its effects on the precision of the estimates from the regression analysis can comfortably be ruled out.

The correlation between household consumption and inflation rate is also negative. An estimated correlation coefficient of  $-0.1217$  between Consumption and Inflation provides the evidence that higher inflation rate indeed reduces household consumption as it raises the cost of living. This contradicts the results obtained from both the long-run and short-run equations but rather conforms to theory. The level of correlation between the two variables is not strong, it is below 0.5.

Household Consumption(C) and GDP per Capita(Y) are positively correlated with a correlation coefficient of 0.1917, the result confirms the findings of the long-run and short-run equations. From economic theory, we expect that there should be positive correlation between the two variables. Once again the correlation between two variables is not strong.

The relationship between independent variables and other variables have been displayed above. In all these analyses, a great deal of caution was exercised in comparing the correlation coefficients with the regression coefficients since the former does not express causal relationship between the variables under consideration.

#### **4.1.3 Results of the Bounds Test for Cointegration**

The initial step of the ARDL approach is to estimate the conditional VECM by ordinary least square in order to test for the presence of long run relationship among the variables. This is done

by conducting an F-test for the joint significance of the coefficients of the variables. Household consumption is taken as the dependent variable and it is regressed on the other variables.

Pesaran *et al* (1997) indicates that “this OLS regression in the first differences are of no direct interest” to the bounds cointegration test. It is however, the F-statistic values of all the regressions when each of the variables is normalised on the others are of great importance. This F-statistic tests the joint null hypothesis that the coefficients of the variables are zero. In other words, there is no long-run relationship between them. The essence of the F-test is to determine the existence or otherwise of cointegrating relationship among the variables. The results of the computed F-statistic when each variable is normalised (that is, considered as a dependent variable) in the ARDL–OLS regressions are presented in Table 4.3

**Table 4.3 Testing for existence of cointegration among the variables in the ARDL model**

F- statistic/ W-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
8.8430	3.5744	4.8169	2.9211	4.0680
35.37109	14.2978	19.2677	11.6844	16.2718

Results were obtained from Microfit 5.1

From Table 4.3, the computed F-statistic (8.8430) is higher than the upper bound critical value of 4.8169 at 5 percent significant level and 4.0680 at 10 percent significant level. This implies that the null hypothesis of no cointegration is rejected meaning that there exists long-run cointegration relationships among the variables. Hence we can estimate the equilibrium/level relationship between consumption expenditure by households and its potential determinants

without fear of nonsensical relationships, though the underlying variables some are non-stationary. The significance of the long-run relationship will solely be judged by the existence of cointegration among the variables used in the study, when the equation is normalised on household consumption.

#### 4.2 Results of the Estimated Long Run Equation using the ARDL Approach

The results of the bounds test in section 4.1.3 clearly shows that long-run cointegration relationships exist among the variables, hence equation (10) is estimated using ARDL (3,0,3,2) selected based on Akaike Information Criterion (AIC).

**Table 4.4: Estimated Long Run Coefficients using the ARDL Approach**

---

ARDL(3,0,3,2) selected based on Akaike Information Criterion

Dependent variable is LNC, 37 observations used for estimation from 1973 to 2009

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Regressor	Coefficient	Standard Error	T-Ratio	Prob
LnINT	-.0017784	3.0583	-0.581500	1.000
LnINF	17.9444	8.1490	2.2020***	0.037
LnY	7.0647	9.7660	0.72340	0.476
CONSTANT	-65.3094	72.6050	-0.89952	0.377

---

\*\*\* (\*\*) denote the rejection of the null hypotheses at (5%) level of significance. Results were obtained from Microfit 5.1

A coefficient of 17.9444 for inflation rate indicates that all things being equal, a 1 percent increase in inflation rate raises household consumption by approximately 17.9444%. This means that inflation rate (a general increase in price level) exerts a sort of influence on household consumption. This positive relationship between inflation rate and household consumption is not consistent with economic theory, it is also not consistent with the empirical studies of Elmendorf (1996), Kapoor and Shamika (2009). The results of the regression is suggesting that as the general price level of goods and services are increasing in the country, Ghanaians still increase their household consumption in Ghana which in reality is not true because as the general price levels increases, holding nominal income unchanged, real income falls therefore household consumption will fall but not increase.

This result will only hold in reality if government and employers are able to compensate Ghanaian workers with an increase in salary higher than the increase in inflation rate which will help consumers to maintain or increase their consumption, then this result can hold otherwise it does not reflect reality. Inflation rate is significant at 5% as it computed t-value (2.2020) is greater than its critical value (1.690) and more also its probability value (0.037) is less than 0.05. Among the variables include in the model ( interest rate on deposits, inflation rate and GDP per Capita) inflation rate has strong impact on household consumption than the other variables in the long run as the results is shown above.

Interest rate on deposit has a coefficient of negative of -0.00178. A coefficient of -0.00178 for interest rate indicates that all things being equal, a 1 percent increase in interest rate reduces

household consumption by approximately 0.00178%. This negative relationship between interest rate and household consumption is consistent with economic theory; it is also consistent with the empirical studies of Elmendorf (1996) and Mishkin (1995). The results of the regression is suggesting that, as the interest rate on deposits is increasing households cut down their consumption expenditure, and save most of their disposable income in order to take advantage of the increase in the interest rate on deposit. One way the government of Ghana can accumulate money for investment through savings from households is by increasing interest rate on deposit. The primary focus of the research was to establish to what extent does interest rate on deposit affect household consumption, the above analysis has revealed that its effect on household consumption is negative in the long run; however the effect is too small. Interest rate on deposit is not significant at 5% as it computed t-value (-0.581500) is less than its critical value (1.690) and more also its probability value (1.000) is greater than 0.05

Gross Domestic Product (GDP) per Capita has a coefficient of 7.0647 which has positive impact on household consumption. The results in Table 4.4 indicate that when GDP per Capita goes up by 1 percent, household consumption also goes up by approximately 7.0647%. Obviously, it is expected that as country's GDP per Capita increases it means that the standard of living of the citizens are being improve all things being equal, the individuals can increase their consumption level higher than before and save part of their disposable income. The positive relationship between GDP per Capita and household consumption obtained in this study is consistent with the structuralist believe that growth in Gross Domestic Product plays a key role in household consumption and hence aggregate output. It is also consistent with the findings of Orazio and Guglielmo(1993) who also found a similar long run positive relationship between

Gross Domestic Product per Capita and household consumption in four Asian countries namely, Bangladesh, India, Pakistan and Sri Lanka. GDP per Capita is not significant at 5% as its computed t-value (0.72340) is less than its critical value (1.690) and more also its probability value (0.476) is greater than 0.05

The constant represents the value of the intercept of household consumption. Thus, it is the estimated value of household consumption when all the independent variables are zero. In the estimated long run equation, the constant is -65.3094 which represents the estimated value of household consumption when all the parameters or coefficients of the independent variables are zero. According to long run results estimated for household consumption in Ghana, it was found out that inflation rate impact more on household consumption than the other two variables and the only variable which is significant implying that in the long run inflation rate has influence on household consumption in Ghana than any other economic variable.

**Table 4.5 The results of Diagnostic Tests**

Test Statistics	LM Version	F Version
A:Serial Correlation	CHSQ(1) = 0.4853[.106]	F(1,24) = 0.2919[.319]
B:Functional Form	CHSQ(1) = .16867[.681]	F(1,24) = .10991[.743]
C:Normality	CHSQ(2) = 3.7127[.156]	Not applicable
D:Heteroscedasticity	CHSQ(1) = .037195[.847]	F(1,35) = .035219[.852]

A: Lagrange multiplier test of residual serial correlation

B: Ramsey's RESET test using the square of the fitted values

C: Based on a test of skewness and kurtosis of residuals

D: Based on the regression of squared residuals on squared fitted values

The regression for the underlying ARDL model passed the diagnostic tests. From the results, the first order serial correlation problem is eliminated as can be seen from the DW statistic of 2.1291 and LM statistic of 0.4853 with probability value of 0.106 which is an indication of the acceptance of the null hypothesis of no serial correlation in the residuals. The model also has a high R-squared (74.033%) implying a high predictive power of the determinants. The high R-squared and high F-statistic shows a tight fit for the model.

The Ramsey's RESET test also revealed that the model was correctly specified while the normality test indicates that the residuals are normally distributed. Heteroskedasticity does not exist in model, evidence is shown clearly from its probability value(0.847) for LM statistics and 0.852 for F statistics as it is above 0.05, therefore do not reject  $H_0$  meaning no heteroskedasticity.

#### **4.3 Results of the Error Correction Model for the selected ARDL Model**

Generally, the Error Correction Model (ECM) provides the means of reconciling the short run behaviour of an economic variable with its long-run behaviour. The existence of cointegration relationships among the variables implies the estimation of Error Correction Model to determine the dynamic behaviour of the equation. The Error Correction Model captures the short run dynamics of the system and its coefficient measures the speed of adjustment to obtain equilibrium in the event of shocks to the system. Table 4.6 reports the results of the short-run dynamic equation.

**Table 4.6 Error Correction Model for the Selected ARDL Model**

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ARDL(3,0,3,2) selected based on Akaike Information Criterion

Dependent variable is  $dLnC$  , 37 observations used for estimation from 1973 to 2009

---

<b>Regressor</b>	<b>Coefficient</b>	<b>Standard Error</b>	<b>T-Ratio</b>	<b>Prob</b>
$dLnINT$	-0.448600	0.277142	-4.581600***	0.03
$dLnINF$	0.11299	0.050990	2.2159***	0.035
$dLn Y$	2.8481	0.65238	4.3656***	0.000
$ecm(-1)$	-0.25227	0.011121	-2.2684	0.032

---

$ecm = LOGC + 0.017784*LNINT - 17.9444*LNINT - 7.0647*LNY + 65.3094*C$

---

R-Squared = 0.74033	R-Bar-Squared = 0.62608
S.E. of Regression = 0.13847	F-stat. F(6, 22) = 7.9196[.000]
Mean of Dependent Variable = 0.31919	S.D. of Dependent Variable = 0.22644
Residual Sum of Squares = 0.47934	Equation Log-likelihood = -27.9050
Akaike Info. Criterion = 15.9050	Schwarz Bayesian Criterion = 6.2395
DW-statistic = 2.1291	

---

\*\* (\*\*\*) denote the rejection of the null hypotheses at 1% (5%) level of significance.

Results were obtained from Microfit 5.1

The results from the table indicate that the model passed the diagnostic tests. A DW-statistic of 2.1291 indicates that there is no strong serial correlation in the residuals. The overall regression is significant at both 5% and 1% as can be seen from the R-squared and the F-statistic. R-squared value of 0.74033 indicates that 74.03% change in the dependent variable (Consumption) is explained by changes in the independent variables.

The coefficient of inflation rate (INF) was found to be 0.11299, it is significant at 5% as it computed t-value (2.2159) is greater than its critical value (1.690) and more also its probability value (0.035) is less than 0.05. Thus, a percentage increase in inflation rate, results in a percentage increase in household consumption by approximately 0.11299% in the short run. This is quite implausible since it is expected that inflation rate will reduce real income, thereby resulting in reduction of household consumption. However, this result is not consistent with economic theory and empirical studies results obtained by Browning and Lusardi (1996). The effects of inflation rate on household consumption in long run (7.0647) is stronger than in the short run (0.11299). The reason for this result may be that, in the short period Ghanaians workers have not been compensated for the rise in general price level therefore an increase consumption as a result of inflation is low but in the long period they are able to agitate for wages and salaries increase therefore consumption increases in the long run higher than in the short run.

The coefficient of interest rate on deposits (-0.44860) shows that interest rate on deposit has negative effect on household consumption. It is significant at 5% as it computed t-value (4.58160) is greater than its critical value (1.690) and more also its probability value (0.03) is less than 0.05. Thus, a percentage increase in interest rate on deposits, results in a percentage reduction in household consumption by approximately 0.44860% in the short run. Which further implies that in the short run, as interest rate on deposits increases Ghanaians reduce consumption as they desire to earn more by saving, which is consistent with economic theory and empirical studies results of Summers and Lawrence (1984). The effects of interest rate on household

consumption in short run (0.44860) is stronger than in the long run (0.017784), implying that in the short period Ghanaians save more as a result of increase in interest rate on deposit and cut down consumption but in the long run they prefer to spend more because they have already enjoyed interest on the money they saved and will not like to save more as interest rate increases but rather spend.

The sign of the coefficient of the Gross Domestic Product Per Capita variable is still positive (2.8481) which highlight its positive impact on household consumption. It is also significant at 5% level of significance since its probability value (0.00) is less than 0.05. The results in Table 4.6 indicate that when GDP per Capita goes up by 1 percent, household consumption also goes up by approximately 2.8481% in the short run. Obviously, it is expected that as the country's GDP per Capita increases it means that the standard of living of the citizens have been improved all things being equal the individuals can increase it consumption level higher than before and save part of the disposable income. However the impact in the long run (7.0647) is greater than that in the short run (2.8481), which implies Ghanaians prefer to save more in short run than in the long run as the country's Per Capita Income increases.

The positive relationship between GDP per Capita and household consumption in the short run in Ghana obtained in the study is consistent with the structuralist believe that growth in Gross Domestic Product plays a key role in household consumption. It is also consistent with the findings of Kotlikoff and summers (2001) who also found a similar short run positive relationship between Gross Domestic Product per Capita and household consumption. Among

the three independent variables, GDP per Capita influence on household consumption is higher than inflation rate and interest rate on deposit in the short run.

The estimated coefficient of the error correction model (ecm) is significant at 5% level of significance and also has the appropriate negative sign. This is an indication of joint significance of the long-run coefficients. From the results in Table 4.6, the estimated coefficient of the error correction model is  $-0.025227$ . This reflects a very low speed of adjustment to long run equilibrium after a shock. This is because approximately 2.5227% of disequilibria from the previous year's shock converges back to the long-run equilibrium in the current year, which in need is very low.



#### 4.4 Forecasting Consumption Model

In order to know how good the predictive power of the consumption model, an in-sampling forecasting was done both in the long run and short run, the results are shown below:

**Table 4.7: Long run forecast results**

### Dynamic forecasts for the level of LNCON Based on ARDL Regression

\*\*\*\*\*  
Based on 28 observations from 1973 to 2000.  
ARDL(3,3,3,2) selected using Akaike Information Criterion.  
\*\*\*\*\*

Observation	Actual	Prediction	Error
2001	21.8769	21.7738	.10306
2002	22.1195	21.8953	.22428
2003	22.4077	22.1906	.21706
2004	22.5846	22.6127	-.028170
2005	22.7869	22.3139	.47297
2006	23.4609	22.4781	.98280
2007	23.6648	23.1483	.51651
2008	23.9709	22.7991	1.1717
2009	24.0679	23.0484	1.0195

\*\*\*\*\*

### Summary Statistics for Residuals and Forecast Errors

	Estimation Period 1973 to 2000	Forecast Period 2001 to 2009
Mean	.2812E-9	.51997
Mean Absolute	.063992	.52623
Mean Sum Squares	.0062939	.44194
Root Mean Sum Squares	.079334	.66479

\*\*\*\*\*

In order to know how good predictive power of the model, I forecast the model with 1973-2000 as the estimation period and 2001-2009 as the forecast period which indicate in-sampling forecasting method. This method was chosen because data was not available on years beyond 2010 for these variables therefore in-sampling method was chosen with 1973-2000 as the estimation period and 2001-2009 as the forecast period. The results of the forecast for these variables, shown above were at their levels.

Comparing the results of the actual values with the predicted values, the actual values are higher than the predicted values with the exception of 2004 where the reverse is the situation. The errors ranges from -0.028170 to 1.1717 since the errors levels are not too higher the model has a good predictive power. In addition, the low value of root mean sum of squares of estimation period (1973 to 2000) and the forecast period (2001 to 2009) of 0.079334 and 0.66479 respectively also indicate the good fit of the model.

**Table 4.8: Short run forecast results**

**Dynamic forecasts for the change in LNCON**

\*\*\*\*\*

Based on 28 observations from 1973 to 2000.

ARDL(3,3,3,2) selected using Akaike Information Criterion.

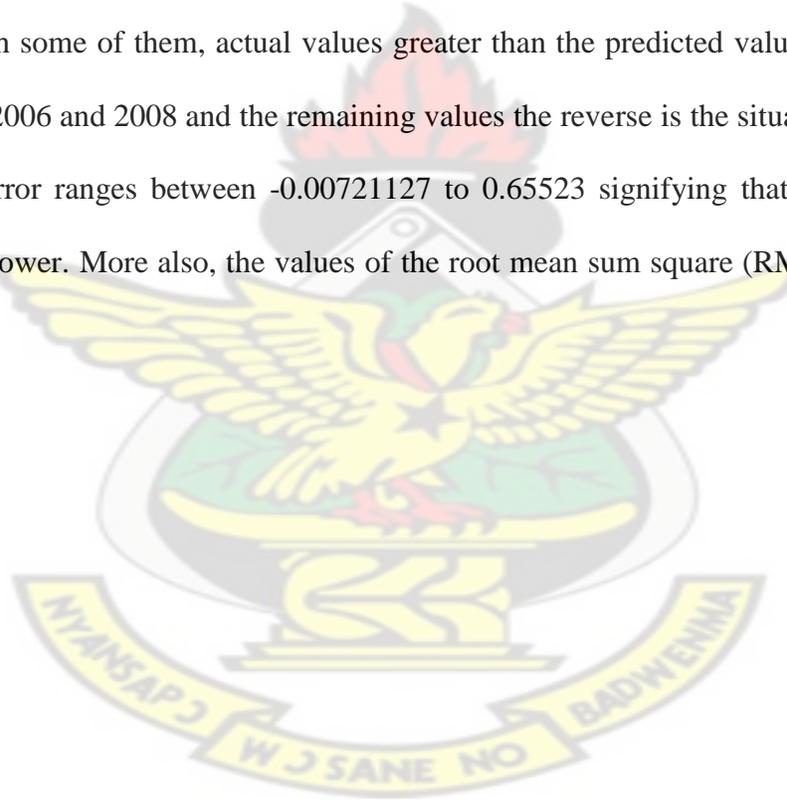
\*\*\*\*\*

Observation	Actual	Prediction	Error
2001	.32585	.22279	.10306
2002	.24264	.12142	.12122
2003	.28811	.29533	-.0072127
2004	.17691	.42214	-.24523
2005	.20234	-.29880	.50114
2006	.67398	.16415	.50983
2007	.20391	.67020	-.46629
2008	.30608	-.34915	.65523
2009	.096989	.24928	-.1522

## Summary Statistics for Residuals and Forecast Errors

	Estimation Period 1973 to 2000	Forecast Period 2001 to 2009
Mean	.2812E-9	.11327
Mean Absolute	.063992	.30683
Mean Sum Squares	.0062939	.14072
Root Mean Sum Squares	.079334	.37513

The results shown above represent the forecast values of the variables at their differences. Looking at the values of the actual and predicted, they are now all in decimals due to the differencing. With some of them, actual values greater than the predicted values for these years 2001,2002,2005,2006 and 2008 and the remaining values the reverse is the situation. Once again, the margins of error ranges between -0.00721127 to 0.65523 signifying that the model has a good predictive power. More also, the values of the root mean sum square (RMSS) confirm this result.



## CHAPTER FIVE

### FINDINGS, RECOMMENDATIONS AND CONCLUSION

#### 5.0 Introduction

This chapter concludes the entire study. It summaries the major findings obtained from the study as well as their policy implications. It further provides recommendations based on the findings of the study.

#### 5.1 Summary of Findings

After applying both economic and econometric tools to thoroughly analysis the effect of interest rate on deposits on household consumption in Ghana, the following summarised findings were obtained from the study.

It was found in the study that there exists a negative relationship between interest rate on deposits and household consumption in the long run. The results of the long run revealed that, a 1 percent increase in interest rate on deposit leads to approximately 0.0017784% reduction in household consumption. The results obtained in the short run revealed that a percentage increase in interest rate on deposits results in approximately 0.44860% fall in household consumption. Thus, the study found that the increase in interest rate on deposits reduces household consumption both in long run and short run in the Ghanaian context. However, Interest rate on deposit was found not be significant in the long run but rather in the short run.

The study also revealed an interesting finding about inflation rate on household consumption in Ghana. The positive relationship between household consumption and inflation in both the long

run and short run is a clear indication that inflation rate in Ghana does not affect household consumption negatively in the economy. Thus, a percentage rise in inflation rate increases household consumption by 17.9444% in the long run and 0.11299% in the short run. It was expected that inflation rate will reduce real income of consumers and thereby affect household consumption adversely but this was not so in the study. This finding will only hold in reality if consumers are compensated by salary by government or private entrepreneurs more than increase in general price level. Inflation rate was found to be significant both in the long run and short run at 5% level of significance.

The study also was found out that GDP per Capita enhance household consumption both in the short run and long run situations. Thus, a percentage rise in GDP per Capita increases household consumption by 7.0647% in the long run and 2.8481% in the short run. The positive relationship established between the two variables really conforms to economic theory, for a fact that as the GDP per Capita increases in Ghana; we expect that Ghanaians will be able to increase their household consumption because their welfare has improved all things being equal. However, GDP per Capita was found not be significant in the long run but rather in the short run at 5% level of significance.

From the forecast values, in the long run the error ranges from -0.028170 to 1.1717 with the root mean sum square (RMSS) for forecast period as 0.66479 and in the short run the error level ranges from -0.0072127 to 0.65523 with the RMSS for forecast period as 0.37513 all signifying the good predictive power of the model.

## 5.2 Policy implications and Recommendations

The findings outlined in section 5.1 have some policy implications. The results discussed in the previous chapter have actually thrown light on some policy-related variables that have significant impact on household consumption for the period under consideration. In view of this, recommendations have also been made to help achieve higher consumption levels enhance sustained GDP growth in Ghana.

Interest rate on deposit has a negative impact on household consumption in the long run and short run. The implication is that, increase in interest rate on deposit with the aim of ensuring that consumers will save more to make funds available for investment in Ghana will be effective in the long run and short run but the effect is not so much. Since interest rate on deposit cannot help to create enough funds through savings for investment, when a period arise in the country where private investors finds it to get funds for investment the government can solicit for funds from foreign donors to make it available for private firms for investment but cannot rely on increase in interest deposit. In 2000, the then NPP government came out with a policy of helping promote private sector as the engine of growth made funds available at selected banks which was lend out to investors at relatively lower interest rate to promote economic growth, this step can be emulated by policy makers to ensure that funds are available for investment in times of need in addition to that of savings.

One way of mortivating Ghanaians to save is by increasing the interest rate on deposit. If you look at the banking sector in the country very well, one will find out that lending rate is very high

evolving around 35% - 45% but interest rate on deposit is very small 6% -8% which really is not motivating Ghanaians to save at these banks. The banks operate with these rates for their own profit seek but not because of the interest of customers. I really believe that, it is time for the Bank of Ghana to force these banks to operate by the rates they give them and improve the deposit rate. Most at times, these banks fail to go by these rates they give them, and it is the duty of Bank of Ghana to make ensure that these banks face punishment or charges for that. In the literature view, a study done by Kapoor and Shamika (2009) on the effect of interest rate on household consumption; evidence from a natural experiment in India, found out that when there was an increase of 50 basis points in the interest rate in India for people of over 60 years it led to a decline in consumption expenditure by 12 percent while savings increased. In the same way, we can also do likewise to help foster savings and investment in the country.

The study also showed a positive relationship between GDP per Capita and household consumption. This implies that as a country, measures should be put in place and be implemented to ensure that the economy develops; as the economy develops unemployment rate is reduced as a lot of people secure jobs they are able to increase consumption therefore stimulating aggregate demand and enhance investment in the country. Policies promoting private sector development, reducing corruption in the country, adequate educational facilities, diversifying our exports, promoting domestic consumption of goods produced domestically, adequate health infrastructure could reduce morbidity and mortality rates and increase life expectancy, and improvement in technology all help to increase GDP per Capita and also comes back to increase household consumption. Therefore the government of Ghana should seek proper implementation of such policies.

The study found a positive and significant relationship between inflation and household consumption both in the short run and long run. Increase in inflation resulting in household consumption means that it enhances economic growth. The implication is that some level of inflation is required for GDP growth in Ghana. Simply because a general increase in price level will cause increase in household consumption as the study has shown, this help to reduce the level of unemployment and boost production. Looking at the other side of inflation, if it is too high it depreciates the local currency which in tend affect consumption and production levels in the country. The challenge for the government and policy makers is to be able to identify the level of inflation which is consistent with the level of economic growth than to beat inflation rate down heavily to affect household consumption adversely.

### **5.3 Practical Limitations of the Study**

Various limitations were encountered in the course of the study. The study was hampered by financial and material constraints as well as time. There was virtually no funding for the study apart from the government bursary give to students of GH¢600.00 which is not only woefully inadequate but also paid at the time the study has been completed. All the funding for the study came from the researcher's already weak financial background. Secondary data was needed on variables like wealth and consumer credit but were not available; these would have helped in the analysis.

## 5.4 Conclusion

The objective of this study was to find out the effect of the interest rate on deposit on the household consumption in Ghana. The study used a set of annual data from 1970 – 2009 as well as time series analysis and also employed the autoregressive distributed lag (ARDL) approach for estimation to achieve the above objective.

As a country, household consumption plays major role in economic growth. As household consumption increases aggregate demand and therefore investment also increase. This calls for the need to give maximum attention to these policies recommended in the research by policy makers to set up household consumption in the country.



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**APPENDIX**

Autoregressive Distributed Lag Estimates

ARDL(3,0,3,2) selected based on Akaike Information Criterion

\*\*\*\*\*

Dependent variable is LNCON

37 observations used for estimation from 1973 to 2009

\*\*\*\*\*

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
LNCON(-1)	.38967	.17580	2.2166[.036]
LNCON(-2)	.29696	.16559	1.7934[.085]
LNCON(-3)	.28814	.13360	2.1567[.041]
LNINT	-.4486E-4	.077142	-.5816E-3[1.00]
LNINF	.11299	.050990	2.2159[.036]
LNINF(-1)	.21880	.052672	4.1541[.000]
LNINF(-2)	.043121	.057666	.74777[.462]
LNINF(-3)	.077765	.046167	1.6844[.105]
LN Y	2.8481	.65238	4.3656[.000]
LN Y(-1)	-1.5743	1.0921	-1.4415[.162]
LN Y(-2)	-1.0956	.79502	-1.3781[.180]
C	-1.6475	2.0025	-.82275[.418]

\*\*\*\*\*

R-Squared	.99893	R-Bar-Squared	.99846
S.E. of Regression	.13847	F-Stat. F(11,25)	2127.5[.000]
Mean of Dependent Variable	18.7057	S.D. of Dependent Variable	3.5324
Residual Sum of Squares	.47934	Equation Log-likelihood	27.9050
Akaike Info. Criterion	15.9050	Schwarz Bayesian Criterion	6.2395
DW-statistic	2.1291		

.....

Error Correction Representation for the Selected ARDL Model

ARDL(3,0,3,2) selected based on Akaike Information Criterion

\*\*\*\*\*

Dependent variable is dLNCON

37 observations used for estimation from 1973 to 2009

\*\*\*\*\*

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dLNCON1	-.58510	.17447	-3.3537[.002]
dLNCON2	-.28814	.13360	-2.1567[.040]
dLNINT	-.4486E-4	.077142	-.5816E-3[1.00]
dLNINF	.11299	.050990	2.2159[.035]
dLNINF1	-.12089	.067330	-1.7954[.084]
dLNINF2	-.077765	.046167	-1.6844[.104]
dLNY	2.8481	.65238	4.3656[.000]
dLNY1	1.0956	.79502	1.3781[.180]
ecm(-1)	-.025227	.011121	-2.2684[.032]

List of additional temporary variables created:

$$dLNCON = LNCON - LNCON(-1)$$

$$dLNCON1 = LNCON(-1) - LNCON(-2)$$

$$dLNCON2 = LNCON(-2) - LNCON(-3)$$

$$dLNINT = LNINT - LNINT(-1)$$

$$dLNINF = LNINF - LNINF(-1)$$

$$dLNINF1 = LNINF(-1) - LNINF(-2)$$

$$dLNINF2 = LNINF(-2) - LNINF(-3)$$

$$dLNY = LNY - LNY(-1)$$

$$dLNY1 = LNY(-1) - LNY(-2)$$

$$ecm = LNCON + .0017784 * LNINT - 17.9444 * LNINF - 7.0647 * LNY + 65.3094 * C$$

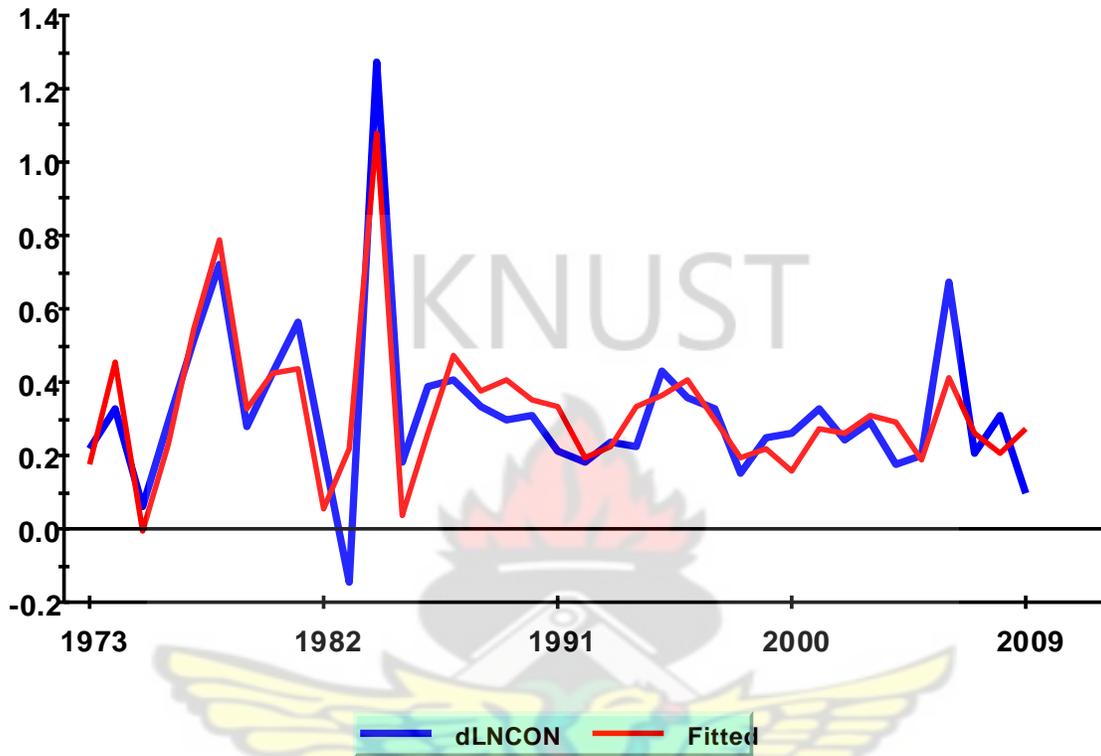
\*\*\*\*\*

R-Squared	.74033	R-Bar-Squared	.62608
S.E. of Regression	.13847	F-Stat. F(9,27)	7.9196[.000]
Mean of Dependent Variable	.31919	S.D. of Dependent Variable	.22644
Residual Sum of Squares	.47934	Equation Log-likelihood	27.9050
Akaike Info. Criterion	15.9050	Schwarz Bayesian Criterion	6.2395
DW-statistic	2.1291		

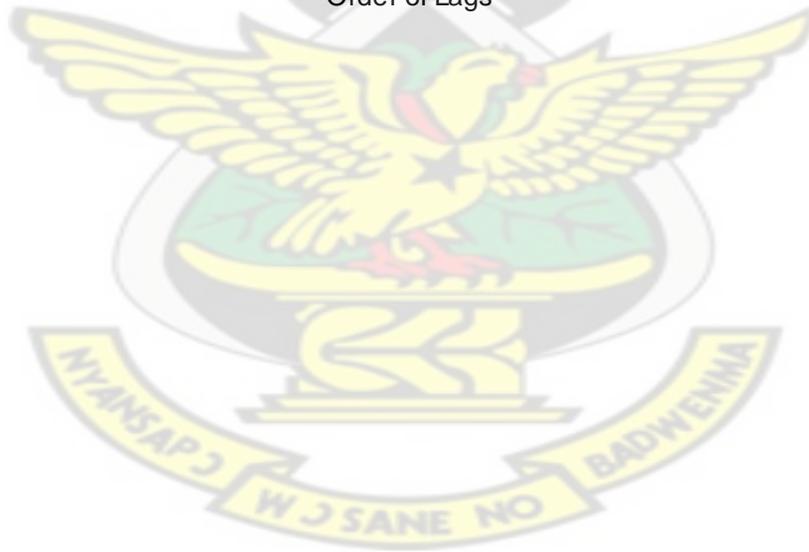
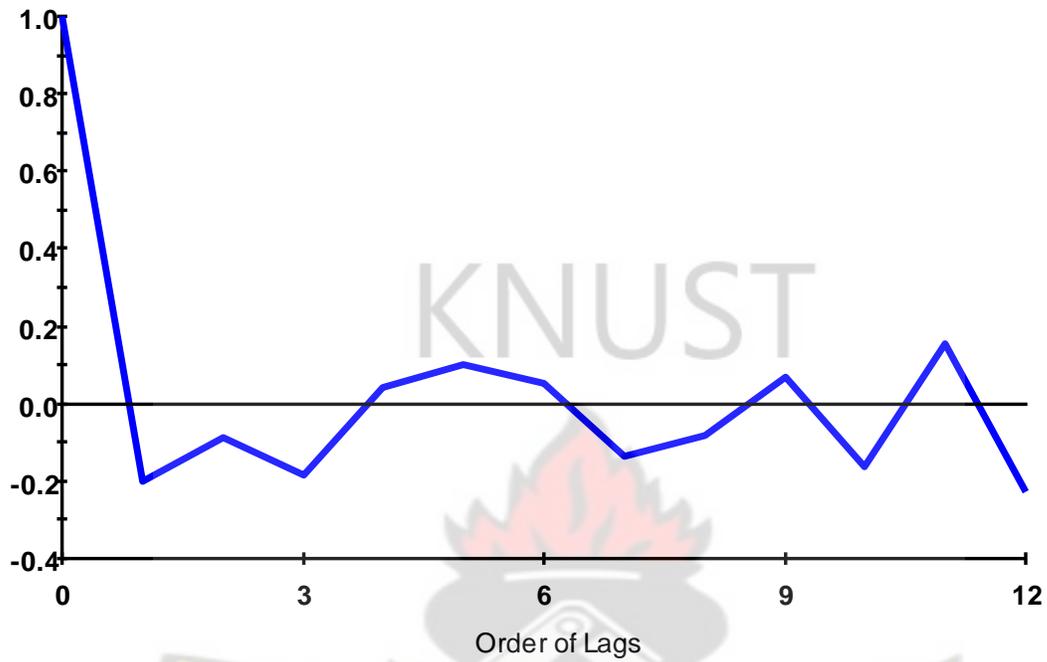
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R-Squared and R-Bar-Squared measures refer to the dependent variable dLNCON and in cases where the error correction model is highly restricted, these measures could become negative.

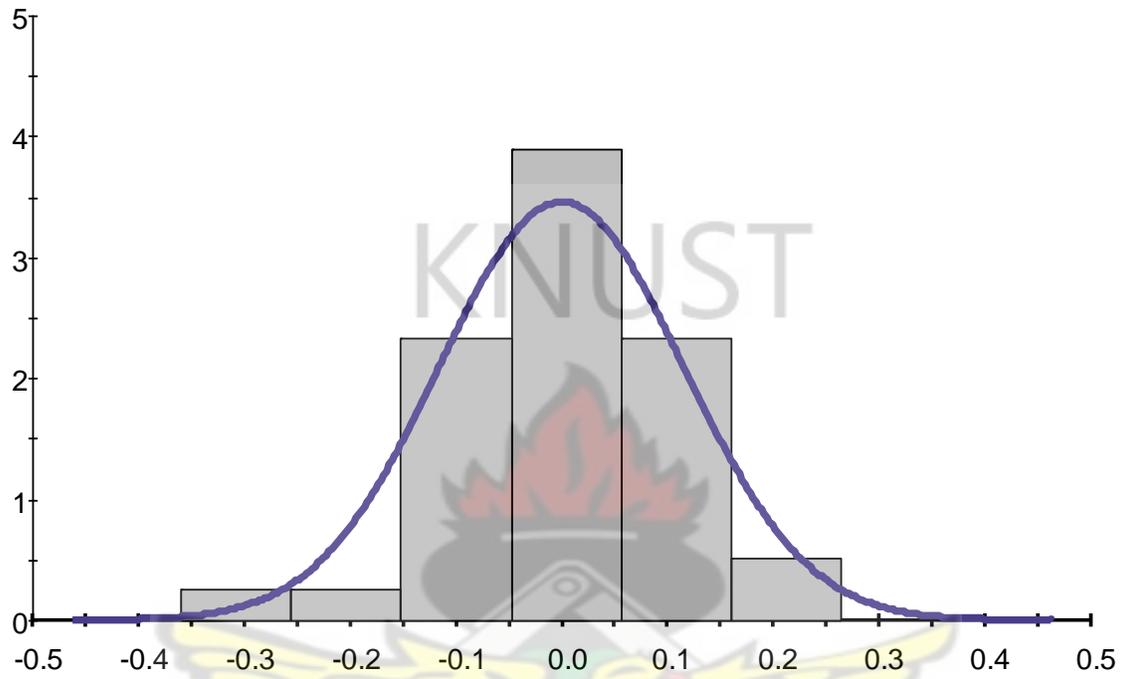
Plot of Actual and Fitted Values of dLNCON



## Autocorrelation function of residuals, sample from 1973 to 2009



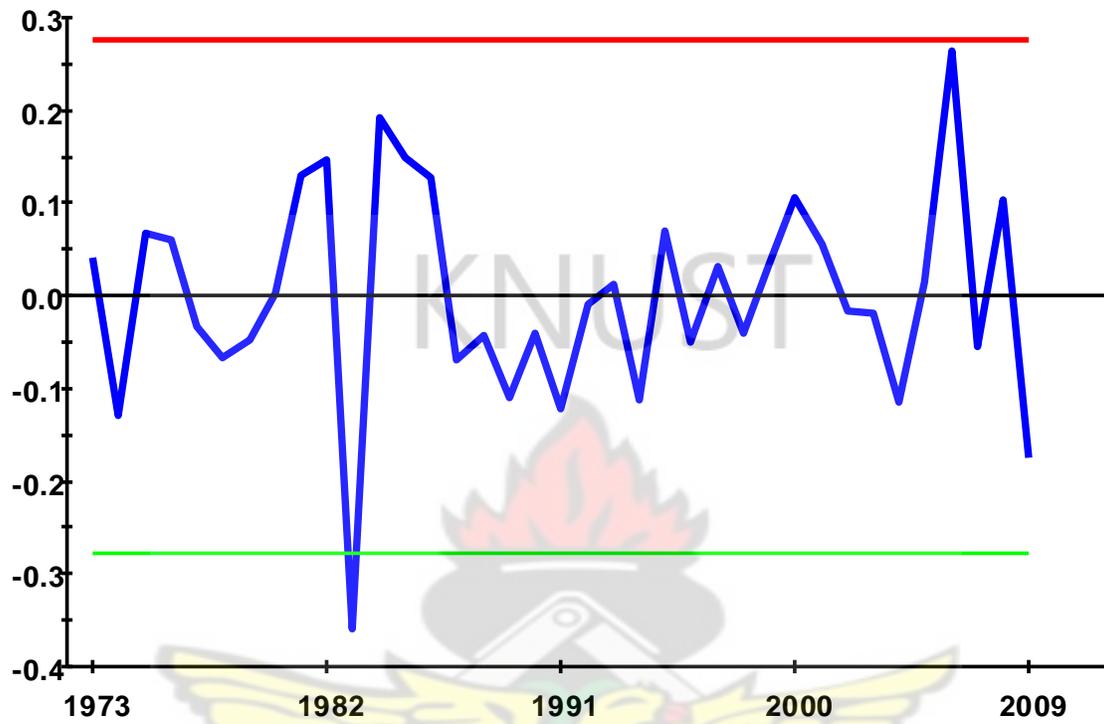
## Histogram of Residuals and the Normal Density



Sample from 1973 to 2009



## Plot of Residuals and Two Standard Error Bands



Error Correction Representation for the Selected ARDL Model

ARDL(3,3,3,2) selected based on Akaike Information Criterion

\*\*\*\*\*

Dependent variable is dLNCON

28 observations used for estimation from 1973 to 2000

\*\*\*\*\*

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dLNCON1	-.38878	.19263	-2.0183[.061]
dLNCON2	-.32210	.12696	-2.5370[.022]
dLNINT	.037529	.17356	.21623[.832]
dLNINT1	-.18137	.25886	-.70067[.494]
dLNINT2	.30122	.21944	1.3727[.189]
dLNINF	-.011481	.057630	-.19923[.845]
dLNINF1	-.085072	.079728	-1.0670[.302]
dLNINF2	-.14172	.056086	-2.5268[.022]
dLNY	2.4211	.69229	3.4972[.003]
dLNY1	.84828	.84491	1.0040[.330]
ecm(-1)	-.050557	.041859	-1.2078[.245]

\*\*\*\*\*

List of additional temporary variables created:

$$dLNCON = LNCON - LNCON(-1)$$

$$dLNCON1 = LNCON(-1) - LNCON(-2)$$

$$dLNCON2 = LNCON(-2) - LNCON(-3)$$

$$dLNINT = LNINT - LNINT(-1)$$

$$dLNINT1 = LNINT(-1) - LNINT(-2)$$

$$dLNINT2 = LNINT(-2) - LNINT(-3)$$

$$dLNINF = LNINF - LNINF(-1)$$

$$dLNINF1 = LNINF(-1) - LNINF(-2)$$

$$dLNINF2 = LNINF(-2) - LNINF(-3)$$

$$dLNY = LNY - LNY(-1)$$

$$dLNY1 = LNY(-1) - LNY(-2)$$

$$ecm = LNCON - 2.7517 * LNINT - 7.3788 * LNINF - 1.2650 * LNY + 12.7538 * C$$

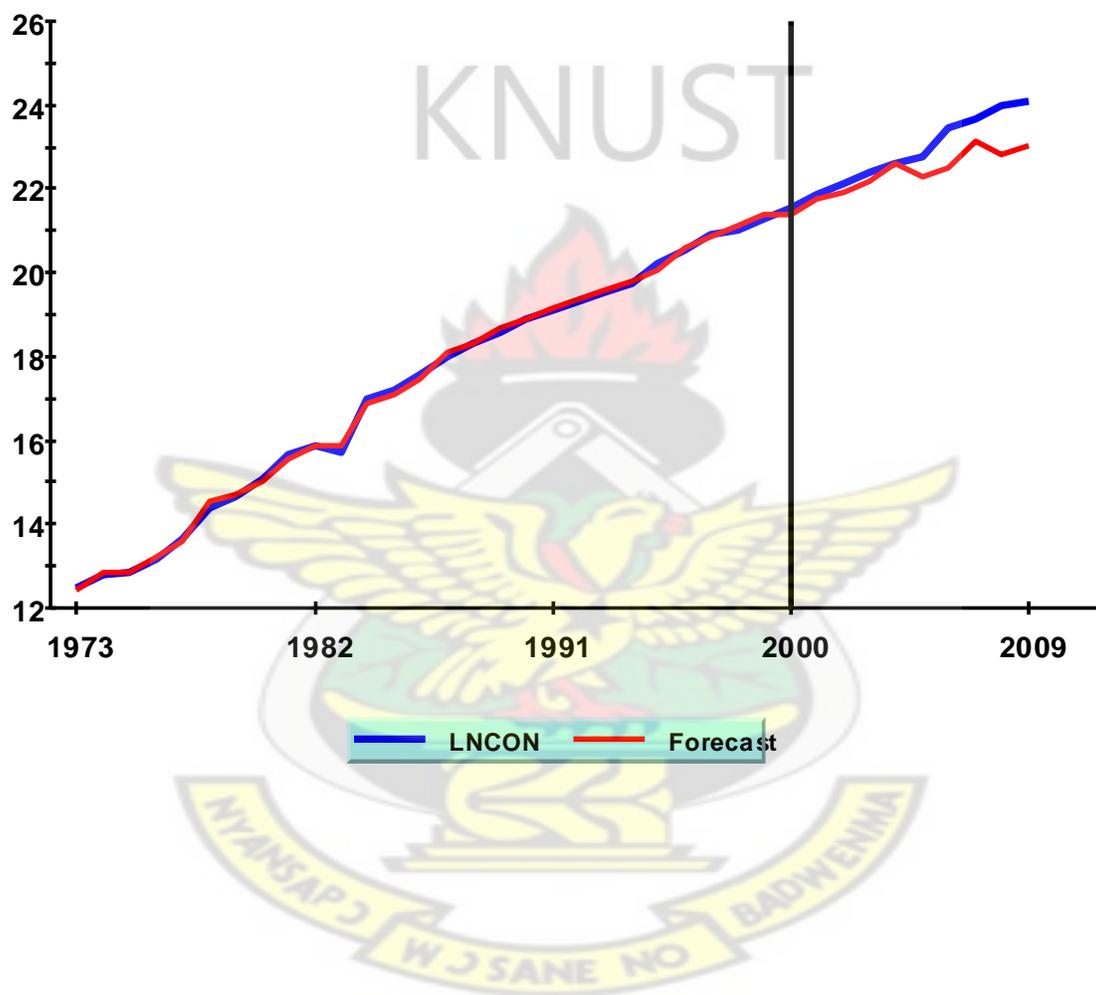
\*\*\*\*\*

R-Squared	.89068	R-Bar-Squared	.77294
S.E. of Regression	.11643	F-Stat. F(11,16)	9.6283[.000]
Mean of Dependent Variable	.33190	S.D. of Dependent Variable	.24434
Residual Sum of Squares	.17623	Equation Log-likelihood	31.2243
Akaike Info. Criterion	16.2243	Schwarz Bayesian Criterion	6.2327
DW-statistic	2.1537		

.....

R-Squared and R-Bar-Squared measures refer to the dependent variable  $dLNCON$  and in cases where the error correction model is highly restricted, these measures could become negative.

### Dynamic forecasts for the level of LNCON



## Dynamic forecasts for the change in LNCON

