THE IMPACT OF EXCHANGE RATE MOVEMENTS ON IMPORT DEMAND BEHAVIOUR OF GHANA

BY

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DECLARATION

I hereby declare that this thesis herein submitted in partial fulfilment of the requirements for the award of the Master of Philosophy (Economics) degree is my own production and has not been accepted for the award of any other degree of the University, except where due acknowledgment has been made in the text.

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ABSTRACT

Persistent fluctuations in the exchange rate create uncertainties which increase the risk level of traders which eventually has an effect on imports. The aim of this paper is to empirically investigate the impact of exchange rate movement and other important covariates on import demand of Ghana using Annual data from 1980 to 2013.The Generalized Autoregressive Conditional Heteroscedasticity model was used to calculate the real exchange rate movement.By employing the ARDL methodology, the study found the existence of both short run dynamics and long run relationship between import demand, real income, relative price of imports, real effective exchange rate and exchange rate movements. The results show an insignificant and negative impact of exchange rate movement on the import demand of Ghana. The study again found that relative price of import has statistically negative impact on import demand in Ghana and also reveals that the income elasticity of imports is positive and significant.

DEDICATION

This work is dedicated to my pretty wife, Mrs. Jennifer Korankye – Boateng. Your love and sacrifice for me is priceless!!

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LIST OF ACRONYMS AND ABBREVIATIONS

ADF `	Augmented Dicker-Fuller
AIC	Akaike Information Criterion
ARDL	Autoregressive Distributed Lag
CPI	Consumer Price Index
CUSUM	Cumulative Sum
CUSUMSQ	Cumulative Sum of Squares
ECM	Error Correction Model
ECOWAS	Economic Community of West African States
ERP	Economic Recovery Programme
ERM	Exchange Rate Movements
GDP	Gross Domestic Product

IMF	International Monetary Fund
INTERIAS	International Institute for the Advanced Study of Cultures, Institutions, and Economic Enterprise
OLS	Ordinary Least Squares
REER	Real Effective Exchange Rate
SAP	Structural Adjustment Program
SBC	Schwarz Bayesian Criterion
PP	Phillips Perron
UNCTAD	United Nations Conference on Trade and Development
UVIM	Unit Value Index of Imports
VAR	Vector Autoregression
VDC	Variance Decompositions
VECM	Vector Error Correction Model
WACB	West African Currency Board
WDI	World Development Indicators

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Trade is a key component of economic growth; as such imports are crucial components in stimulating economic growth. Developing economies such as Ghana continuously rely heavily on trade because of its limited productive capacity. Most developing countries import increasing amounts of industrial supplies, raw materials, manufacturing machinery, capital, goods and consumable products (foodstuffs) to expand their industries and meet the ever growing demands of their people. Goods that Ghana cannot produce are imported to supplement its demand. Developing countries also require technology to drive their development machinery. As such, to transform their economies from a traditional production relying only on the production of basically raw materials to an industrial manufacturing stage, they continue to import technology to transform their economies into an industrial sector.

Many economists have advocated the need to allow the market forces that is demand and supply to fix prices of commodities in international trade theory. However, allowing these market forces to fix the exchange rate which generally reflects the purchasing power of one currency relative to another becomes problematic between the two countries involved. This is because, persistent fluctuations in the exchange rate creates uncertainties which increases the risk level of traders which eventually has an effect on international trade.

This however, depends on traders‟ attitude to risk and how the trader incorporates the risk into the trade decision. Traders who are risk neutral often benefit from the uncertainties in

the exchange rate. It gives them enough scope to increase their profitability level thereby promoting overall trade growth. However, the uncertainties in the exchange rate impose additional cost to risk averse traders. Risk averse traders fear the loss that may be created by the uncertainties so they try to avoid any risk associated with it which eventually affect overall trade by depressing the overall trade flows.

Again, the movements in the exchange rate creates uncertainties which makes price and profit outlook uncertain, which will ultimately affect the volume of trade.

Lastly, the movement also exposes the importer to greater risks. As a result, traders especially domestic producers may substitute domestic products for foreign products.

It is often argued that trade is vital in the economic development of the country. However, the extent to which trade may contribute to economic development in Ghana will greatly depend on various key factors affecting it. One key variable that is known from monetary policy perspective to largely impact trade is the exchange rate.

The exchange rate system has been relatively stable in some periods while in other periods it has been highly unstable. Foreign-exchange rates has been highly unstable for economies such as developed and developing countries since March 1973 when there was the abandonment of fixed exchange rates resulting from the dollar devaluation in in US in February 1973 (Arize et al, 2009).

Imports are a major component of trade and as such import is greatly affected whenever there is instability in the exchange rates. The impact of such high exchange rate movements on import demand is crucial and has been of great interest to many researchers. It is particularly essential to appreciate the impact of exchange rate movements and the speed with which such impacts are exerted on the demand for imports in order to formulate appropriate policy reaction to exchange rate movements.

It is argued that persistent movements in exchange rate could influence import demand either positively or negatively. While some economists think the movements in the exchange rate adversely affect import demand as postulated by Jiranyakul (2013), Samima et al (2012), Alam and Ahmed (2010) etc, others researchers including the works of Mohammedi et al (2011) Agolli (2003), Doyel (2001) etc found evidence of a significant positive effects on import demand and trade volumes in developing and developed countries. Other studies such as Aristolelous (2001); Alam and Ahmad (2010) found no significant relationship existing between exchange rate movements and import demand.

1.2 Problem statement

There has been persistent rise and fall in Ghana‟s exchange rate and this is largely driven by the continuous exchange rate depreciation.

The cedi exchange rate experienced major depreciations among the various major currencies since Ghana adopted the Exchange rate regime.

In 1957, the cedi was 73 pesewas to US$1. By 1983, the cedi was ¢52.6 to US$1. By the year 1992, the exchange rate had moved to ¢520 to US$1. By 2000, the exchange rate was ¢7047/$.In 2007, Ghana redenominated her currency and traded the exchange rate at 93 pesewas to US$1. By December 2013, the US$ was exchanged for ¢2.20.

The problem is that any fluctuation in the exchange rate introduces uncertainty which could have detrimental effect on trade flows.

Firstly, it creates uncertainties which increase the risk level of traders particularly risk averse traders.

Again, the depreciation of the cedi creates uncertainty for the traders to make their own decisions, because it makes price and profit anticipation more uncertain.

Therefore to formulate very effective, appropriate and highly efficient exchange rate and trade policies, it is important to have in-depth knowledge and understand the degree to which exchange rate movements impact on imports demand behaviour of Ghana.

1.3 Objectives of the study

The study generally analyses the impact of exchange rate movements on import demand behaviour in Ghana by using annual data from 1980 – 2014.

The specific objectives are as follows:

- ❖ assess the long run and the short run relationships that exist between exchange rate movements and import demand
- ❖ to assess the elasticity of innovations in exchange rate on import demand

1.4 Hypothesis testing

This study seeks to empirically test the following hypotheses:

H_o: There is no relationship between exchange rate movement and import demand

H_1: There is relationship between exchange rate movement and import demand

H_o: There is no elasticity of innovations in exchange rate and import demand

H_1: There is elasticity of innovations in exchange rate and import demand

1.5 Significance of the study

There is plethora of literature providing significant information on the impact of exchange rate fluctuations on exports but sparse in regards to impact on import demand especially in Ghana.

Again, economists argue that economic theories alone cannot adequately tell the relationship that exists between import demand and exchange rate uncertainties. Therefore, the need for me to empirically investigate the impact of the fluctuations in the exchange rate on imports in order to inform policy since Ghana is known to be an import dominating country.

Lastly, this study also creates the platform for the formulation of trade policy coordination both domestically and internationally as well as serves as a useful input for macroeconomic modelling of the Ghanaian economy.

1.6 Scope of the study

The effect of exchange rates on import demand is so complex and needs much attention. Because of limited time, space and resources, the study is limited to cover data from 1980 – 2014, that is 34 observations using annual data and is estimated empirically using macro econometric methods.

1.7 Organisation of the study

This study is grouped into five chapters. The first chapter looks at the general introduction comprising the background to the study, problems statement, objectives of the study, statement of hypotheses, justification of the study, scope of the study, limitations and the organization of the study. Chapter two takes an overview and history of exchange rate policies in Ghana, determinants of exchange rates in Ghana, trends and rates of depreciation in the exchange rates as well as the review of theoretical and empirical of relevant literature. The third chapter focuses on the methodology used in the study. It assesses the time series properties of the variables, model specification, data sources and methods used in analyzing the data. Chapter four analyzes the empirical data and estimates the models of the study. It concentrates on the presentation of results and discussion. The last chapter provides short account of the main findings of the study, conclusions and recommendations for policy consideration.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The chapter reviews the literature on the subject matter. The chapter is divided into two sections. The first section gives the overview and history of exchange rate Regimes in Ghana, the determinants of exchange rate movements in Ghana, trends and rates of deprecation in the exchange rates. The second section explores the theoretical literature and empirical literature

2.1 Overview and History of Exchange Rate Regimes in Ghana

Countries normally have to choose between two types of exchange rate regimes. They include the fixed exchange rate regime and the floating exchange rate regime or sometimes variations in between). Abdalla (2012) is of the view that the basis for the classification of the exchange rate depends largely on the flexibility that the monetary authorities show towards the fluctuations in the exchange rates.

Under the fixed exchange rate framework, the rate is administratively determined by the government or monetary authority which adopts fiscal and monetary policy tools to keep up the rate. Here, the government or monetary authorities intervene to set the exchange rate of the domestic currency against other foreign currencies. At this period, the cedi was fixed to the main convertible currency that is the British pound and the American dollar. Fixed

exchange rate is usually a political decision. Under this framework, the currency is revalued or devalued according to the economic fundamentals of the country.

The other framework is what is called the floating exchange rate regime. Under this regime, the market forces-demand and supply interact to fix the exchange rate.

Under the colonial international economic arrangements, Ghana adopted a fixed exchange rate regime. The British West African Currency Board (WACB) was responsible for controlling the availability of currencies to the British West African Colonies. During that period, there was no independent monetary policy in Ghana. Government did not have the freedom to print its currency at will. The exchange rate was fixed. There was no need to think about exchange rate depreciation against the pound sterling.

In 1965, Ghana introduced the cedi after it had withdrawn from the WACB arrangement in 1963.This is as a result of strict requirements of fiscal discipline WACB imposed on her. Though Ghana consistently operated a fixed exchange rate regime, the rate of exchange at that time was ¢1.04/$.

Prior to Economic Recovery Programme in 1983, Successive governments after Nkrumah operated and maintained a fixed exchange regime for the cedi with occasional devaluation, and exchange rationing. Because Ghana could not strictly adhere to the fiscal and monetary discipline, this regime did not work. This led to persistent increase in general price levels,

insufficient foreign exchange, application of exchange controls, and the introduction of a vigorous black market for foreign currency (Bawumia, 2014).

Prior to 1983, Ghana maintained a highly restrictive exchange rate regime for many years and started to adopt certain reforms in April 1983. Ghana chose the flexible exchange rate regime in 1983 under the Structural Adjustment Program (SAP). One of the principal aims of the SAP was to allow a stepwise liberalization of foreign exchange market. In order to officially absorb the black market, foreign exchange bureaus were set up in February 1988, to merge the black market and official exchange rates. The cedi exchange rate therefore became market accepted rate resulting in a rise in demand for foreign currency which led to depreciation of the currency while the increment in supply of foreign currency resulted in cedi appreciation, ceteris paribus.

Between 1983 and 1990, the government formulated and implemented several trade and payment policies with the aim of moving away from direct government intervention and controls and to move towards the dependence of market outcomes (Jebuni, 2006).

Sowa (1999) gave six distinct phases of foreign exchange liberalization in Ghana as follows:

1. Bonuses and Surcharges
2. The Two - Window System
3. The Unified System
4. The Foreign Exchange Bureaux
5. The Wholesale Dutch Auction
6. The Interbank Market

Ghana adopted a dual exchange rate system in 1986.Ghana introduced a two-window system of exchange rate determination basically to accelerate the movement of the exchange rate towards an `equilibrium rate'.

Window One kept a fixed but adjustable exchange rate. The rate in Window I rate was fixed at ¢90 to the US dollar for a year and it was applicable to government transactions, pharmaceutical products, petroleum imports, basic foodstuffs, capital goods, cocoa and other traditional export receipts as well as government debt contracted prior to January 1986. The Bank of Ghana has the sole responsibility for setting the rates for window one, which was intended for official transactions.

The second window, known as window two applied to all other transactions and was mainly fixed by the market forces in a weekly auction supervised by the Bank of Ghana.

Sowa (1999) opines that the bank of Ghana was the official supplier of foreign exchange. The Central bank‟s relied mainly on traditional export earnings, grants and loans from foreign donors as its official source of foreign exchange. It occasionally purchased the exchange rate from the (international) foreign exchange markets. In 1987, Window 1 was abolished and only the auction system maintained.

In 1992, an interbank wholesale system was introduced to merge the two-window auction systems. In this arrangement, a weekly wholesale auction is used to determine the interbank rate. Banks were the principal agents allowed to partake in this wholesale auction.

In 1988, in an attempt to merge the parallel market into a more formal foreign exchange market, the foreign exchange bureaux system was introduced. These foreign exchange bureaux were fully licensed entities that were operated and managed by individuals, groups or institutions. The forex bureau were directly not allowed to actively participate in the interbank market, banks cannot retail to the forex bureau. The two markets – are highly segmented such that Bank of Ghana intervenes in the forex bureau by selling foreign exchange to them (Jebuni, 2006).

In March 1990, the country introduced the wholesale auction system. This replaced the weekly retail auction, which resulted in the operation of the inter-bank and a wholesale system. However, the wholesale auction system was ended in April 1992 and by the interbank market was introduced.

2.1.1 Determinants of Exchange Rate Movements in Ghana

The fluctuations in exchange rate has gained much attention in literature owing to it‟s effect on developed, emerging and developing economies and on macroeconomic variables (see: Belke and Kaas, 2004;Wang and Barrett, 2007; Alam and Ahmed, 2011; Samimi et al., 2012; Jiranyakul, 2013; Danjuma et al., 2013; Adewuyi and Akpokodje,

2013; Alagidede and Ibrahim, 2016).

Although the instability in the exchange rate is mostly linked to macroeconomic instability, other studies have subjected the determinants of the fluctuations in the exchange rate to empirical and theoretical reviews.

Stančík (2007) investigated the determinants of exchange rate movements for EU countries and found different factors explaining the source of exchange rate fluctuation. These factors include inflation, supply of money, the exchange rate framework adopted, level of output, interest rates, central bank freedom and the openness of an economy.

Ajao and Igbekoya (2013), used an error correction model to study the determinants of real exchange rate volatility in Nigeria. They found that, government spending, fluctuations in interest rate, lag of the exchange rate and level of openness of the economy were significant factors contributing to real exchange rate volatility in Nigeria.

Tsen (2014) is of the view that the sources of fluctuations in the exchange rate can be linked to monetary and (or) the real side policies adopted in the economy.

However, the flexible exchange rate policies pursued by the government of Ghana over the years have resulted in persistent fluctuations in the foreign exchange. The exchange rate system has been relatively stable in some periods while in other periods it has been highly unstable. Although, the Ghana Cedi has depreciated against major currencies especially the US Dollar (US$), it recorded a modicum of stability between 2002 and 2007 and since there has been instability in the currency. Insah (2013) is of the view that there exist exchange rate fluctuations in Ghana‟s economy. The ultimate question then is: what drives these exchange rate movements in Ghana?

According to INTERIAS (2009), many reasons and factors account for the instability in the exchange rate. They are of the view that the instability largely results from the demand for and the supply of foreign currencies, high reliance on imports and the exports of primary commodities, high fiscal deficits and failure of the monetary authorities especially the central bank to formulate exchange rate intervention policies.

Alagidede and Ibrahim (2016) opines that output is the most important driver of exchange rate fluctuations in the short run while government expenditure and money supply growth and terms of trade shocks drives the exchange rate in the long run in Ghana.

Insah (2013) investigated the sources of the exchange rate volatility in the economy of Ghana and found out that government expenditure is a key factor influencing the fluctuations in the exchange rate in Ghana. He again found that current external debt and domestic debt are major drivers of the instability in the exchange rate.

2.1.2 Stylised Facts: Trends and Rates of Deprecation in the Exchange Rates

The cedi has depreciated in value against the major trading currencies particularly, the US dollar since Ghana adopted the flexible exchange rate regime April 1983 under the economic reform program.

The Ghana cedi has been experiencing persistent declining in value, albeit, experiencing a modicum of stability between 2002 and 2007. The stability was as a result of the multilateral debt relief and increased foreign exchange inflows that followed the adoption of HIPC

together with the execution of prudent fiscal and monetary measures helped to stabilize the domestic currency between 2001 and 2006.

At independence, the exchange rate was 73 pesewas to the US $1. By the year 1983, the exchange rate was ¢52.6 to US$1. By the year 1992, the exchange rate had moved to ¢520.8 to US$1. By 2000, the exchange rate was ¢7047/$. Ghana successfully redenominated her currency on 1st July 2007. At that time, the exchange rate was 93 pesewas to US$. In 2008, the exchange rate was GH¢1.19/$ (¢11,900/$). At the end of

July 2009, the US$ was exchanged for GH¢1.49. However, between August 2009 to March 2010, the Cedi marginally appreciated by 3% and was consequently exchanged for US$= GH¢1.49 in April 2010. In December 2013, the rate of exchange was GH¢2.20 to US$1that is (¢22,000/$). At the beginning of January 2014, a US$ was exchanged for GH¢2.21 and by the end of September 2014, the Cedi–Dollar exchange rate stood at

GH¢3.20 – denoting about 44.65% depreciation. Bawumia (2014) postulated that cumulatively, the Ghana cedi had depreciated by 99.9999% between 1965 and March 2014. In 1965, the cedi was ¢1.04 to the US$1 and by 2014, it was GH¢ 2.63 (¢26,326) to the US$1.While the lowest rate of depreciation that Ghana has experience annually is 0.9% in 2005, Ghana recorded the highest rate of 49.8% in the year 2000 since 1984. In 2003, the cedi depreciated by 4.5%, 2.2% in 2004, 0.9% in 2005, 1.1% in 2006 and 4.8% in 2007.However, on average, the rate of depreciation between 2004 and 2007 is 2.25%, 3.1% in the year2010 and 4.9% in 2011 against the US dollar.

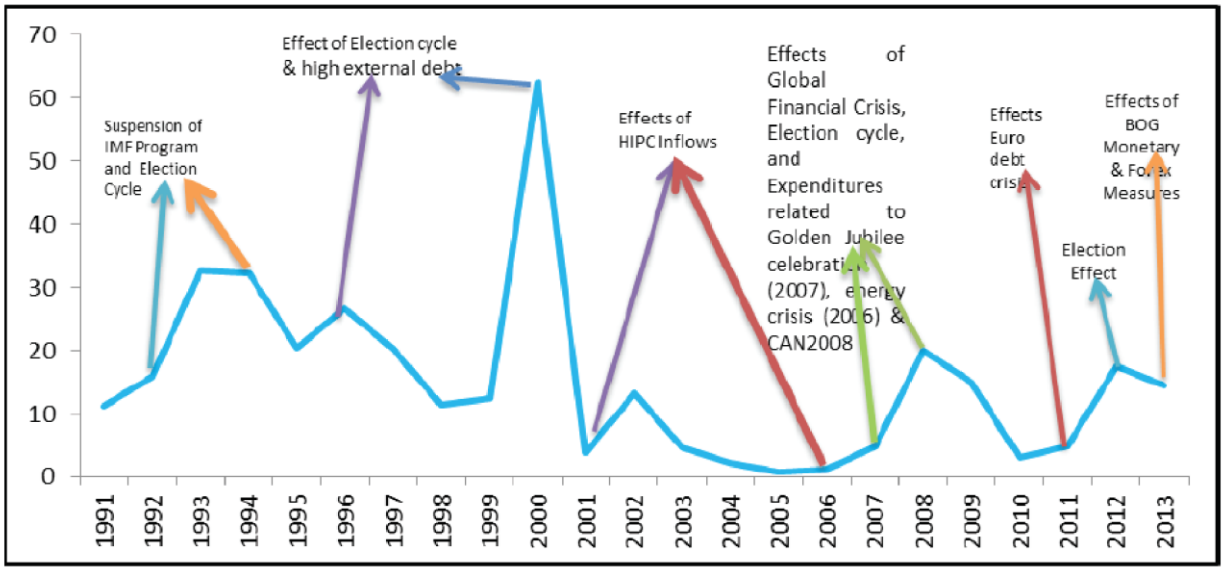

Figure 1: Year-on-year Changes in nominal Exchange rate

Source: Akosah, Research Department, Bank of Ghana (2014)

2.2 Theoretical Reviews

2.2.1 Standard Import Demand

The standard import demand is mostly adopted to assess the impact of exchange rate fluctuations on imports. The standard imports model is expressed by using imports as a determinant and exchange rate, domestic income and exchange rate volatility as independent variables (Tsen 2014).

However, Caves et al. (1999) is of the view that imports are decreasing in the exchange rate and also import prices. He further opines that import demand is a decreasing function of the price of imports. This is expressed by multiplying the domestic currency in foreign currency by the exchange rate. According to him, it is expressed as follows:

$$IM = IM_D \ (EP)$$

Depreciation causes prices of imports to domestic residents to increase, thereby, reducing their demand for imports. The major setback of this theory is that it does not take into consideration major important variables that equally influence the demand for imports such as income of the country, gross domestic product, real effective exchange rate uncertainties, gross national product (GNP) etc. It is also general as its specific form is not known.

2.2.2 The Marshall-Lerner condition

The Marshall-Lerner condition and the J-curve are closely related concepts that are theoretically used in explaining the relationship that exist among the exchange rate of a country and trade balance of a country.

Marshall-Lerner condition shows that devaluation tends to bring an improvement in a country‟s trade balance provided the elasticity for imports in the country in addition to the foreign demand elasticity for exports is greater than unity. The Marshall-Lerner condition basically states that the summation of a country‟s value of import (that is absolute values) and export elasticities should be equal or more than unity. That is, if the percentage change in quantity supplied/demanded in response to a one percent change in price must be equal to one or greater, then depreciation is expected to move trade balance towards surplus. On the other hand, when the summation of the import and export demand elasticities is less than one in absolute value, then it is almost always associated with J-curve effects (Bahmani-Oskooee 1985). The J-Curve explains the effect of exchange rate depreciation or devaluation on imports and exports; hence trade balance (Ziramba and Chifamba, 2014).

2.3 Empirical Literature

A plethora of economic literature tried to assess the influence of exchange rate fluctuations on imports as it‟s of great interest to many researchers. Empirical literatures on the effect of exchange rate movements on import demand have yielded ambiguous results. Whiles many such researches such as the works of Byrne et al. (2008), Alam (2009), Bakhromov (2011), Jiranyakul (2013) etc found negative effects, other studies including Agolli (2003), Doyel (2001), Jiang (2014) etc found evidence for a significant positive effects. However, studies such as Aristolelous (2001); Alam and Ahmad (2010) did not find any significant relationship existing between exchange rate fluctuations and import demand.

Danquah (2008) observed the impact of exchange rates on Ghana‟s external trade. He used annual data from 1986 to 2005.The autoregressive distributed lag methodology was used to investigate the relationship that exists among the variables in the long run. The research realized that exports, imports and the real exchange rate relationship in the long run is very stable. He again realized that there should be a coordination and strengthening of exchange rate and demand management policies and should depend on the long run economy so that Ghana can experience improvement in its balance of trade.

Alam (2009) scrutinized the impact of exchange rate fluctuation on the import demand of Pakistan demand using the following explanatory variables: gross domestic income as domestic demand, effective exchange rate to estimate Pakistan‟s competitiveness level and

exchange rate fluctuation as a measurement of risk. Using VAR and VECM methodology, Alam found a significantly negative influence of exchange rate volatility on the imports demand of Pakistan during the study period from 1980 to 2005.

Akpokodje and Omojimite (2009) examined the effect of exchange rate volatility on ECOWAS countries imports. Data for the study spanned 1986-2006 periods. Using GARCH model, the study found a significant negative effects on imports of all ECOWAS countries as a sub region, however, the study also found mixed results for the sub-groups.
Thus, they reported that exchange rate volatility negatively influenced the imports of non-CFA countries but positively influenced CFA countries.

Alam and Ahmed (2010) employed the ARDL methodology between 1982Q1 to 2008Q2. Gross domestic income, prices of imports (in real terms), effective exchange rate and exchange rate movement were used as independent variables. The results found an insignificant negative effect on Pakistan‟s imports.
Mohammadi et al (2011) investigated the uncertainty and asymmetry effect of Iran‟s import trade and the impact of exchange rate on it by utilizing the TARCH model. An annual data covering 1959-2009 periods was used. They found out that volatility is greatly influenced by negative shocks. The study also the variables including import demand, national income, real exchange rate and uncertainties in exchange rate are correlated in the long run. Though they also found positive effect of real income on import demand, there was significantly

negative influence of real exchange rate on the demand for imports. The research concluded a significant negative effect of exchange rate uncertainty on imports of Iran.

Samimi et al (2012) also looked at impact of real exchange rate uncertainty on Iranian import demand for the period 1979-2007. The auto-regressive conditional heteroskedasticity (ARCH) methodology was used to estimate uncertainties in the real exchange rate. The study found that exchange rate uncertainty negatively impact of on

Iran‟s imports. They also found a negative impact of real exchange rate on imports.

Jiranyakul (2013) studied the effects of real exchange rate uncertainty on import demand of Thailand between July 1997 to December 2011 by adopting the AR(1)-EGARCH(1,1) and bounds testing for cointegration. The study shows that uncertainty in the exchange rate impact on Thailand‟s imports.

This empirical study differs from previous works because it is the first of its kind in Ghana, which utilizes exchange rate movement as key factor influencing import demand. Other previous works focused mainly on the effects of exchange rate fluctuations and uncertainties on macroeconomic variables such as foreign direct investment, economic growth, output, trade etc and not import demand.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter describes the conceptual framework of the study. Section one focuses on the data used; the type, sources and the time period for the study. Section two focuses on the variables measurements. These involve explanations, operational definitions as well as measurement of the variables used in the study. The third section focused specification of the model and the properties of data used.

3.1 Data source and Time Frame

Data for the study was obtained from secondary sources. The data used sourced from World Bank Development Indicator and UNCTAD. All the variables are real and in logs. The frequency of the data used is annual and spans from 1980 to 2014. The sample period selected and variables used were determined by three basic considerations, namely; data availability, theory, and the fact that statistically the variables fit better in the model.

3.2 Model Specification and Priori Expectation

In this research, the import demand function is expressed in terms of relative prices of imports, Real Income proxied by GDP and Real Effective Exchange rate (Dutta and Ahmed, 2006; Bahmani-Oskooee and Wang, 2007; Constant and Yue, 2010; Mohammadi,

2011; Knobel, 2013; Khan et al, 2013). The explanatory variables are included in the regression and regressed on the import variable in order to circumvent the problems that result from omission of other relevant variables (Samimi et al, 2012).

The model is formulated in logarithmic form; hence the estimated parameters represent elasticities. Log transformation is crucial here in the sense that it avoids the possibility of non-linear relationship between the dependent and the independent variables. Again, log transformation is the appropriate way of transforming highly skewed variables into one that is more normal. Lastly, it reduces the possibility of the occurrence of heteroskedasticity because it compresses the scale for measuring the variables (Gujarati, 1995).

Following Ahmad and Alam (2010), Ahmad (2011) and Mohammadi et al (2011), this study investigates the impact in the uncertainties in the exchange rates on import demand function. This research adopts the standard import demand equation augmented by including the term "fluctuation effect", which is an uncertainty of exchange rate and is specified as:

$$IMPV_t = f\,(Y_t\,, PRM_t\,, REER_t\,, ERM_t\,) \qquad (1)$$

Equation (1) is transformed into:

$$lnIMPV_t = \alpha_o + \alpha_1 lnY_t + \alpha_2 lnPRM_t + \alpha_3 lnREER_t + \alpha_4 lnERM_t + U_t \qquad (2)$$

Where α_o is constant intercept, Ut is stochastic error term which assumes properties of white noise.

$IMPV_t$ represents Real Imports of Ghana at time "t".

Y_t is real income, proxied by the real gross domestic product. It‟s expected to have a positive sign, because an improvement in the levels of income will increase domestic demand for imports, hence $\alpha_1 > 0$.

Relative price of imports (PRM) at time t is proxied as Ghana‟s unit value index of imports (UVIM) divided by Ghana‟s Consumer Price Index (CPI). It is also expected to be negative since a rise in imports prices, ceteris paribus, makes imports expensive to domestic consumers; hence a corresponding fall in demand for imports, therefore, $\alpha_2 < 0$.

Real effective exchange rates (REER) measures price level differences that exist between countries. It measures the country‟s competitiveness in international markets. The real effective exchange rate is expected to have a negative impact on import demand as stipulated by international trade theory, hence $\alpha_3 < 0$.

The country encounters depreciation whenever the REER index falls and then domestic prices become more expensive. This makes prices of foreign goods relatively cheaper; hence, their import will consequently rise (Ahmad and Alam, 2010). Fluctuations in REER suggest an emergence of a country‟s external price competitiveness, hence, it measures the level of competitiveness of the nation.

ERM_t measures the Exchange rate movements at time “t”. Theory indicates that the impact of exchange rate movements on the volume of trade is indeterminate. This depends on the

attitude of traders to risk. Risk neutral traders often benefit from the uncertainties in the exchange rate. It creates additional opportunity for the traders to increase profits and hence, it promotes overall trade flows. However, uncertainties in the exchange rate impose additional cost to risk averse traders which eventually affect overall trade by depressing overall trade flows. However, this study expect the exchange rate movement to be negative, therefore, $\alpha_4<0$.

3.3. Variables Measurements

In this section, the study specifies the operational definition and how key variables are measured. These are discussed below:

3.3.1 Import volume of goods and services (IMPV)

Different variables are empirically used in literature to represent imports. Some literature adopted either the nominal or real import values (Huchet-Bourdon and Korinek, 2012; Khan et al (2014), or the nominal or real import volumes (Bahmani-Oskooee and Wang, 2007; Arize et al., 2000; 2008; Samimi et al., 2012). Others such as Ahmad (2011) used the real bilateral imports by deflating the imports values in US dollars by the unit value index of imports.

Data needed for the estimation of real volume of imports are not available. Following Serigar and Rajan (2002), import volume is estimated as

$$lnIMPV_t = \frac{MVM}{UVIM}$$

Where $lnIMPV_t$ is the total import volume at time "t". *MVM* are the import values of

Ghana at time "t" and *UVIM* is Ghana‟s unit value index of imports at time "t". Data for the merchandise import values and the unit value index are sourced from the UNCTAD database.

3.3.2 Real Income (Y)

Income, irrespective of whether is foreign or domestic is assumed to positively impact trade flows. An increase in the income levels is often interpreted to mean an increase in purchasing power of both firms and individuals and thus leads to increases in demand for imports and goods consumed domestically. Real income is proxied by the real gross domestic product (real GDP). It measures the productivity level of the country. The real domestic product measures the nominal value of the GDP deflated by the consumer price index.

3.3.3 Relative price of imports (PRM)

The relative prices of imports used in this work measures the prices of domestically produced goods. A rise in the relative prices of imports mean the country‟s domestically produced are more expensive and a fall in the relative price indicate that the domestically produced good is less expensive. Relative price of imports at time t is measured as Ghana‟s unit value index of imports (UVIM) deflated by Ghana‟s CPI (Ahmed and Alam, 2010).

3.3.4 Real Effective Exchange Rate (REER)

Real effective exchange rate measures the nominal effective exchange rate divided by a price deflator or index of costs. It measures the value of a country‟s currency against a weighted

average of several foreign currencies. Other studies such as Samimi et al (2012) used the nominal Exchange rate and the CPI to calculate the Real Exchange rate.

3.3.5 Exchange Rate Movement (ERM)

Exchange rate movement is a measure of the rise and falls in the exchange rate. This captures the uncertainties traders faced resulting from to the unpredictable movements/fluctuations in the exchange rates (Alam and Ahmed 2010).

Bollerslev‟s (1986) generalized autoregressive conditional heteroskedasticity (GARCH) methodology is mostly employed to capture the fluctuations in the exchange rates. This model is believed to have the power to correct skewness distribution and volatility clustering problems (Najafov, 2010).

3.4 Estimation Procedure

This section looks at the time series techniques employed in this analysis. This time series econometric techniques follow two steps. First, the time series properties of the individual variables are checked by adopting standard techniques that has generally been adopted for testing for the presence of unit roots or otherwise. This aids to know the order of integration of the individual variables and the number of times that the non-stationary variable would have to be differenced to achieve stationarity. This study uses the ADF (Dickey and Fuller, 1979) and the PP tests (Philips-Perron, 1988).The second step involves determining the long-run relationship equilibrium among the variables. This study adopts the ARDL Bounds

Testing approach to cointegration. ARDL tests the long run relationships between the variables. Based on the findings from the first two steps, the long-run and short run estimates are measured by employing vector error correction framework.

3.4.1 Testing for Unit Roots

In Macroeconomics, estimates from non-stationary series usually generate spurious inferences unless the series are cointegrated. One way to overcome spurious regression estimates is to difference the series continuously until stationarity is obtained to be used for the regression analysis. However, in using the difference approach, one may encounter serious problems. It is important to difference continuously non stationary variables to ensure stationarity is achieved in order to deem it fit to be used in regression analysis.

To test for stationarity of the data, ADF and PP tests are generally employed. These two tests are the commonly employed tests despite its shortfalls (Maddala and Kim, 1998). These two tests yield almost the same results except that the process of rectifying autocorrelation in the residuals leads to differences in the two tests. The PP in particular caters for the probable loss of observation implied by the ADF because it relies on non parametric methods to cater for autocorrelation and endogeneity of regressors. The null hypothesis to be tested is that the variable of interest has a unit root against the stationarity alternative. The appropriate lag length is selected based on the Akaike Information Criteria (AIC) or Schwarz Bayesian Criteria (SBC) for both tests.

In the ADF test, the basic form of equation may be formulated as:

$$\Delta\chi_t = \alpha + \delta y + \rho\chi_{t-1} + \sum_{i=1}^{p} \lambda_i \Delta\chi_{t-i} + \varepsilon_t \quad \text{.....(1)}$$

Where χ_t represent the series at time t, Δ is the first difference operator, α, δ, β and λ denotes the parameters to be measured and ε is the stochastic term with properties of white noise.

The PP test is also specified as follows:

$$\Delta X_t = \alpha_0 + \phi_1 X_{t-1} + \phi_2 \left(t - \frac{T}{2}\right) + \sum_{i=1}^{n} \omega_i \Delta X_{t-1} + \varepsilon_t \quad \text{.....}$$

(2)

Where Xt denotes variables at time t, Δ is the first difference operator, α_0 , ϕ_1, ϕ_2 and ω_i are parameters to be estimated and ε is the stochastic random disturbance term.

Both ADF and PP methodology test the null hypothesis, (H_o): series contains unit root (series are non stationary) as against the alternate hypothesis ((H_1): series has no unit root (series are stationary). Thus,

H_O: β = 0 or ρ = 1 (where β = ρ –1)

H_A: β ≠ 0 or ρ ≠ 1

The series achieve stationarity if null hypothesis is rejected. If stationarity is not achieved at level, we take the first difference of it. However, if the first difference does not achieve stationarity, then we continuously take the difference and the ADF test is applied. From the above discussion, for the cointegrating relationship to exist, variables should have the same order of integration. The linear combination of the variables should also be integrated of the order. Thus, may not be cointegrated if they are stationary in levels.

3.4.2 The ARDL Bounds Test Approach

Having established the time series properties of each of the variables in the specified model, the study further tested for cointegration among the variables of interest.

Two or more variables are co-integrated when they show long run relationships and if they have common trend(s).One of the objectives of this study is to assess the long run and short run relationship that exist between the real exchange rates and imports demand. Therefore, cointegration technique is employed. Variables are cointegrated if they exhibit non stationarity and have the same order of integration. Therefore, the ARDL bounds testing approach is adopted to test for long run relationship among the variables. An ARDL representation of equation can be formulated into equation as below:

$$\Delta \ln IMPV_t = \beta_0 + \beta_1 \ln IMPV_{t-i} + \beta_2 \ln Y_{t-i} + \beta_3 \ln PRM_{t-i} + \beta_4 \ln REER_{t-i} + \beta_5 \ln ERM_{t-i} + \sum_{i=1}^{\rho} \beta_6 \Delta \ln IMPV_{t-i} + \sum_{i=0}^{q1} \beta_7 \Delta \ln Y_{t-i} + \sum_{i=0}^{q2} \beta_8 \Delta \ln PRM_{t-i} + \sum_{i=0}^{q3} \beta_9 \Delta \ln REER_{t-i} + \sum_{i=0}^{q4} \beta_{10} \Delta \ln ERM_{t-i} + \varepsilon_t$$

Where β_1 to β_5 are the long run multipliers, β_0 is the drift, β_6 to β_{10}, ρ and q are the order of lags and εt is white noise error which is independent and identically distributed and all other variables are as formerly defined. The variables can be viewed as an ARDL of order (ρ, q1, q2, q3, q4,).

Then the Bounds test is conducted using the F-test for the joint significance of the coefficients of the lagged levels of the variables. In that regard, the null and alternative hypotheses to be tested are:

$H_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$ (no long-run relationship)

$H_1 : \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$ (long-run relationship)

The ARDL model begins with conducting the bound test for the null hypothesis of no cointegration. The calculated F-statistic is compared with the critical value tabulated by Pesaran and Pesaran (1997) or Pesaran *et al*. (2001). If the test statistic exceeds the upper critical value, the null hypothesis of no long-run relationship can be rejected regardless of whether the underlying orders of integration of the variables are zero or one. Similarly, if the test statistic falls below a lower critical value, the null hypothesis is not rejected. The results however become inconclusive if the sample test statistic falls between these two bounds.

This study adopts the ARDL Bounds Test Approach proposed by Pesaran et al. (2001) to ascertain the long- and short-run dynamic relationships among the variables in the model. Though there are many common among techniques such as Engle-Granger (1987) test, Johansen (1988), and Johansen Juselius (1990), by critically examining the works of several authors such as Pesaran and Pesaran (1997), Laurenceson and Chai, (2003); Constant and Yue (2010), Ahmad (2011), Bahmani-Oskooee et al (2012), the choice of this technique is appropriate and is based on the following considerations.

First, the ARDL technique avoids the order of integration problems normally associated with other methodologies such as the Johanson Likelihood Methodology. The ARDL is useful irrespective of the stationary properties of the variables whether the variables are I(0) or I(1) or both. (See: Alam and Ahmad, 2010; Pesaran and Pesaran, 1997).

Again, this technique is strong enough to cater for the sample bias created by other conventional cointegration techniques which becomes only useful in large sample size. The sample bias is catered for since it useful in small sample (Pesaran et al., 2001).

In the ARDL framework, short-run estimates and long-run estimates are given in a single estimation (Tsen, 2014).

The ARDL methodology fundamentally tests for the null hypothesis of no cointegration. The computed-statistic is then compared with the critical values presented by Pesaran et al, 2001. If the calculated test statistic is greater than the upper critical value, the null hypothesis of no long run relationship can be rejected irrespective of the order of integration of the variables. On the other hand, the null hypothesis is not rejected if the computed test statistic is smaller than the lower critical value. However, if the test statistic lies between the upper and the lower bounds, the results then become inconclusive. When the variables are I(1), the result is based on the upper bound and if the variables are I(0), then the result is based on the lower bound.

3.4.3 Stability Test

The stability of the equations throughout the sample period is very crucial. The plots of Cumulative Sum (CUSUM) and Cumulative Sum of Squares (CUSUMSQ) tests by Brown et al (1975) are employed to assess the stability of the regression equations These tests are opted because, a movement of the CUSUM and CUSUMSQ residuals outside the critical lines is an indicative of the estimated co-efficient are unstable over the sample period (Danquah, 2008).

3.4.4 Variance Decomposition Analysis

This study also aims at assessing the elasticity of innovations in exchange rate and import demand by employing the variance decomposition methodology. The variance decomposition shows the percentage of a variable‟s forecast error variance attributable to its own innovations and innovations in other variables. This study decomposes the variance of the import demand to assess the contribution of the various shocks. In assigning variance shares to the variables, the residuals in the equations must be orthogonalised.

Following the VAR estimation, the study decomposed the forecast error variance by employing Sim‟s Recursive Cholesky decomposition method.

3.5 Historical Measurement of Exchange Rate movements

The persistent fluctuations of the exchange rate have gained much attention and interest in many recent literature as well as international finance owing to its effects on trade (Doyle, 2001; Bakhromov, 2011; Olayungbo et al., 2011); particularly exports (Wang and Barrett,

2007), Imports (Alam and Ahmed, 2011; Mohammadi, et al., 2011; Samimi et al., 2012;Jiranyakul, 2013) inflation (Danjuma et al., 2013); investment (Adewuyi and Akpokodje, 2013); employment growth (Belke and Kaas, 2004), economic growth (Adu – Gyamfi, 2011; Adeniran et al., 2014; Alagidede and Ibrahim, 2016).

Although, there is no consensus with regards to the factors that cause exchange rate movements, it assumed to be influenced by macroeconomic variables. Alagidede and Ibrahim (2016) were inconclusive on the drivers of exchange rate movements in Ghana.

The impact of exchange rate fluctuations has been a controversial issue that has been subjected to both theoretical and empirical reviews. While some argue for the measurement of short term variations or movements, others are of the view that long term movements are more appropriate for long term decisions. They opine that short term movements have the tendency of self cancelling thereby leading to inaccurate decisions (Orkhan, 2010).

Exchange rate fluctuation is mostly extracted from either real exchange rate or the real effective exchange rate (Tsen, 2014). Many studies are not unanimous as to which measurement to adopt. The reason is that empirical studies have difficulty in reaching consensus on the measurement of uncertainties in the exchange rate. As such, measuring the uncertainties in exchange rate is issue of serious contention; as such researchers are not unanimous as to which measurement to adopt. As such, different measurements are adopted to capture the variations in the exchange rate from a period to another in a vast number of

economic literatures. These include, variances or standard deviations where exchange rate movements is measured according to the degree to which exchange rate fluctuates in relation to its mean overtime (Gadanecz and Mehrotra, 2013)., average of absolute changes, the Gravity Approach adopted by Olayungbo et al (2011), Tabetando

Rayner (2014);the Standard deviation of the first difference of the log real exchange rate (See Clark et al 2004; Adu – Gyamfi, 2011); Recent literature are now adopting the ARCH models including GARCH, E-GARCH, TARCH and T-GARCH which are assumed to have superior power in estimating movements to capture these uncertainties in the exchange rate. (See Naghshpour, 2014; Abdalla, 2012; Mohammadi et al, 2011;

Jiranyakul2013).

Table 1: Summary of some of the measures of exchange rate movements used within empirical studies

Measure of Exchange Rate Movements	Paper	Results
Absolute percentage change of the exchange rate $V_t = \frac{E_t - E_{t-1}}{E_{t-1}}$ Where E_t is the spot exchange rate and *t* refers to t	Thursby and Thursby (1985) Bailey, Talvas and Ulan (1986)	Insignificant at aggregate level Significant at bilateral level Significant negative effect in a few regressions
Average absolute difference between the previous forward rate and the current spot rate $V_t = \frac{F_{t-1} - E_t}{n}$ Where *F* is the forward rate	Hooper and Kohlhagen (1978) Maskus (1986)	Relatively significant effect for US-UK case and insignificant effect for the rest Significant negative effect in machinery, chemicals and transport industries
Variance of the spot exchange rate around its trend which is predicted from $\ln e_t = \varphi_0 + \varphi_{1t} + \varphi_{2t}^2 + e$	Thursby and Thursby (1987) De Grauwe and De Bellefroid (1987)	Significant negative effect for most countries Relatively significant negative effect

Moving average of the standard deviation of the exchange rate $V_{t=} \quad \frac{1}{m} \quad Z_{t+i-1} - Z_{t+i-2}^{\ 2}{}_{1/2}$ Where Z is the log relative price of foreign consumer goods in terms of US consumer goods and m = 12	Cushman (1983), (1986), (1988a, b)	Significant negative and positive effects in the first two papers; negative effects for the last
	Thursby and Thursby (1987)	Insignificant at aggregate level, Significant at bilateral level
	Korayand Lastreps(1989)	Insignificant negative effect
	Bahmani and Oskooee (1996)	Significant negative effect
	Arize*et al.* (2000)	Significant negative effect
	Sauer and Bohara (2001)	Significant negative effect
	Bahmani and Oskooee (2002)	Significant negative effect
Within period standard deviation $V_t \quad \frac{1}{n-1} \quad E_i - E^{\ 2}$ Where n is the number of period	Hooper and Kohlhagen (1978)	Relatively significant effect forUS-UK case and insignificanteffect for the rest
	Akhtar Hilton (1984)	Significant negative effect
	Gotur (1983)	Insignificant for most of the countries
ARCH model: $\sigma^2 \ \varepsilon_t \quad = \quad \alpha_1 + \alpha_1 \varepsilon_{t-1}^2 + \cdots + \alpha_p \varepsilon_{t-p}^2$ Where p is the number of lags in $ARCH_{(p)}$ model	Cushman (1983)	Positive and negative effects
E-GARCH	Polodoo et al (2013)	No effect
T-GARCH	Mohammadi et al (2011)	Significant negative effect

Source: Najafov (2010) and Author"s compilation.

3.6 Modelling of Exchange Rate Movements

Following the practice in most other studies, this research employs Bollerslev‟s (1986) GARCH models to estimate the exchange rate movements. This is often considered as a more appropriate technique to capture the dynamic behaviour of exchange rate volatility. This study adopts the GARCH model because information of the exchange rate is able to impact on the future exchange rate movements. Again, exchange rate is often assumed to exhibit a phenomenon of volatility cluster.

This study conforms to most recent literature and adopts the conditional variance of the real effective exchange rate estimates of the GARCH (1, 1) is used as a measure of exchange rate movements. The GARCH (1, 1) models have proved to adequately cater for the exchange rate movement dynamics.

Following Insah (2013) and Asteriou and Hall, (2011) the conditional variance from the GARCH (1, 1) takes the form

$REER_t = \alpha + \beta' X_t + \mu t$

$\mu_t/\varphi_t \sim iid\ N\ (0, h_t)$

$h_t = \gamma_0 + \delta h_{t-1} + \gamma_1 u_t^2{}_{-1}$

Therefore, our conditional variance h_t captures the mean ($\gamma 0$), information about the previous movements, $u_t^2{}_{-1}$ (ARCH term) and the past forecast error variance, h_{t-1}(GARCH term). Thus, our GARCH model allows the error term to have a time varying variance conditional on the past behaviour of the series hence reflecting the actual volatilities as perceived by agents.

CHAPTER FOUR

ANALYSIS AND DISCUSSION OF EMPIRICAL RESULTS

4.0 Introduction

This chapter describes and discusses the results from the study. The results of the descriptive statistics of relevant variables, the stationary properties of the variables, long run relationship, the Error Correction Model (ECM), variance decomposition as well as stability of the variables are presented and analysed.

4.1Descriptive Statistics of Data

Table 4.1: Summary Statistics of Data

	LNIMPV	LNY	LNPRM	LNREER	LNERM
Mean	3.422364	8.936541	4.868202	4.991348	12.65032
Median	3.411544	8.889353	4.831673	4.927756	12.42068
Maximum	4.593144	9.895669	5.344837	5.772367	15.82462
Minimum	2.319768	8.246912	4.491057	4.587780	9.482575
Std. Dev.	0.690517	0.473771	0.231210	0.370386	0.963603

Table 4.2 reports that all the variables have positive average values (mean and median). On the average, exchange rate movement is highest, followed by domestic income, then real effective exchange rate, relative prices of imports and then volume of imports. Also, the minimal deviation of the variables from their means as shown in the table by deviations suggest slow growth rate (fluctuations) of the variables over the sample period. Again, it can

also be observed that exchange rate movement has the highest maximum value while import volume has the lowest minimum value.

4.2 Discussion of time series properties

4.2.1 Results of unit root test

The tests were done within the framework of the ADF test and PP test procedure. Each of the variables was tested in the levels and in the first difference forms as well as with and without a time trend. The automatic lag length selection per the Akaike Information Criterion (AIC) was used for both the ADF and the PP test. Table 4.1A and 4.1B present the results of the unit root tests.

Though theoretically testing for unit roots is not much needed when using ARDL approach to cointegration, some recent researches have indicated that, it is important to test for the presence of unit roots in order to avoid the problem of spurious results (See: Shrestha and Chowdhury, 2005). This study therefore investigated the stationarity properties of the variable by using the popular ADF and PP tests. Each of the variables except the exchange rate movement was tested in the levels and in the first difference forms as well as with and without a trend. The results evidently show that all the variables contain unit roots at their levels. Taking their first differences, made all variables achieved stationarity. The unit root tests are performed to make sure that the order of integration of each variable does not exceed one. The automatic lag length selection per the Akaike Information Criterion (AIC) was used for both the ADF and the PP test. Table 4.2 and 4.3 present the results of the unit root tests.

Results of the Unit Root

Table 4.2: Augmented - Dickey Fuller

AUGMENTED – DICKEY FULLER					
Variable	**Level**		**First difference**		
	Intercept	Trend + intercept	Intercept	Trend + intercept	Order of int.
LNIMPV	-0.957419	-2.270324	-3.192579**	-3.810853**	I(1)
LNY	2.046884	-0.001087	-4.805001***	2.456259	I(1)
LNPRM	-1.745697	-1.266661	-5.716125***	-6.149816***	I(1)
LNREER	-0.869326	-2.724180	-5.403005***	-5.275807***	I(1)
LNERM	-5.302708***	-5.740060***			I(0)

[***] (**) {*} denotes significance at [1%] (5%) {10%} respectively

Table 4.3: Phillips - Perron

AUGMENTED – DICKEY FULLER					
Variable	Level		First difference		
	Intercept	Trend + intercept	Intercept	Trend + intercept	Order of int.
LNIMPV	-0.957419	-3.328937	-5.714470***	-6.530180***	I(1)
LNY	3.148252	-2.335671	-3.070057**	-3.462274**	I(1)
LNPRM	-2.198504	-2.687833	-6.382855***	-8.952488***	I(1)
LNREER	-0.965141	-3.024035	-6.637939***	-11.15712***	I(1)

LNERM	-5.297022***	-5.758843***	I(0)

[***] (**) {*} denotes at significance at [1%] (5%) {10%} respectively

The results of both the ADF and the PP tests are reported in Table 4.2 and Table 4.3 reports that all the variables, with the exception of the exchange rate movements are non stationary at levels. However, the series achieved stationarity after first differencing, hence, all the series are stationary at I(1) except the exchange rate movement which is stationary at I(0). Clearly, the combination of both the I(0) and I(1) provide a good basis for this study to adopt ARDL Bounds Test as confirmed by Perasan et al (2001).

4.3. Results of the ARDL Bounds test for cointegration

Ascertaining long-run cointegration relationship among variables is important. Table 4.4 shows results from the bounds test for cointegration between import demand and its covariates. The results evidently show that the null hypothesis of no cointegration is rejected when imports is normalised given that the computed F-statistic is greater than the upper bound critical values. The calculated F-statistic of 7.3 exceeds the corresponding upper bound critical value of 4.01, hence suggesting the rejection of the null hypothesis of no cointegration at 1% level of significance. The results therefore show evidence of a strong long run steady state relationship between imports and its covariates and that prices of imports, income, real effective exchange rate and uncertainties in the exchange rate are long run forcing covariates if import demand in Ghana.

Table 4.4: ARDL Bounds Test for Cointegration

Test Statistics	Value	k

F-statistics	7.311889***	4	
Critical Value Bounds			
Significance	I0 Bound	I1 Bound	
10%	2.45	3.52 5%	
2.86	4.01		
2.5%	3.25	4.49	
1%	3.74	5.06	

[***] (**) {*} shows significance at 1, 5 and 10% levels respectively

Results of ARDL Long-run Coefficients

Based on the results of the cointegration analysis, long-run relationship is established in the model. As evident from the table, some of the estimated coefficients achieved their expected theoretical signs while others do not. Whereas income, economic relative prices of imports and exchange rate movements have their expected theoretical signs, real effective exchange rate does not achieve its expected sign.

Table 4.5: Results of estimated long run coefficients ARDL 1, 3, 3, 2, 1) Selected based on Akaike Information Criterion (AIC)

Dependent Variable: LNIMPV

Regressor	Coefficient	Std. Error	t-Statistic	Prob.

C	-25.588928***	5.168252	-4.951177	0.0001
LNY	3.303268***	0.641070	5.152741	0.0001
LNPRM	-0.611668	0.612349	-0.998888	0.3327
LNREER	1.544212**	0.652776	2.365608	0.0310
LNERM	-0.361143*	0.186988	-1.931366	0.0713

[***] (**) {*} denotes significance at 1, 5 and 10% levels respectively.

4.5 Interpretation of Estimated Long-run Model

As reported in the table, some of the coefficients achieved their expected signs while others could not. The results indicate that income achieved the expected positive sign and was statistically significant at 1% level. Thus, a 1% increase in the real income would cause an increase in import demand by 3.3% in the long run. The significantly positive influence of domestic income on import demand is suggestive that consumers tend to increase demand for foreign goods whenever they experience an increase in their levels of income. This confirms economic theory which assumes a positive relationship between income and the demand for imports. Most of Ghana‟s imports are necessary and luxury commodities and are expected to be positive and highly income elastic. This result is confirmed by other studies such as that of Bhattarai and Armah, 2005 and Danquah, 2011.

Relative prices of imports has coefficient which is negative and statistically insignificant. This also achieved its expected sign. The long run elasticity of import demand with respect to the prices of imports rate is 0.6; hence, hence a 1% increase in the price of imports will curtail import demand by 0.6%. This is in consistent with economic theory since increase in

import prices, ceteris paribus, makes imports expensive to domestic consumers; hence a corresponding fall in demand for imports. This is in tandem with empirical findings of Akpokodje and Omojimite, 2009.

The coefficient of real effective exchange rate in the long run is positive but statistically insignificant. This is contrary to the negative expected sign and against theoretical postulation of international trade theory. However, it is in tandem with Alam and Ahmed (2011) but contrary to the works of (Ahmad and Alam, 2010) who are of the view that if the real effective exchange rate index is falling, the country currency depreciates and the domestic prices become more expensive, making the prices of foreign goods relatively cheaper; hence, economic agents will change their behaviour by increasing the demand for imports.

The long run coefficient of exchange rate movement is negative but statistically insignificant. This achieved the expected negative sign. The negative long-run elasticity of real exchange rate movement implies that an increase in the exchange rate movement has an adverse impact on the import demand. This mean that a movement in the exchange rates imposes additional cost to risk averse traders which eventually affect trade by depressing overall trade flows. Therefore, 1% increase in real exchange rate movement may cause a decrease in demand for real imports by 0.36%. This is expected because economic theory argues that, an increase in relative prices is expected to have negative effects on import demand. That is depreciation of real exchange rates is inversely related to demand for imports. This result is confirmed by

Alam and Ahmed, 2010; Anderson and Skudelny, 2001; Mohammadi et al, 2011; Akpokodje and Omojimite, 2009 but contrary to the works of Choudhry (2008); Alam and Ahmad (2011) who found a positive or mixed impact of exchange rate movements on imports.

4.6 Short Run Analysis of Import Demand Function

The import demand function expressed in logarithms measures the degree of responsiveness of a change in imports to a change in any of the explanatory variables. This section reports the short run dynamics of the import demand function in the ARDL framework.

Approach ARDL (1, 3, 3, 2, 1) Selected based on AIC

Table 4.6: Results of Estimated Short -run Error Correction Model

Dependent Variable: D(LNIMPV)				
ARDL (1, 3, 3, 2, 1)				
Variable	**Coefficient**	**Standard Error**	**t-Statistic**	**P-Value**
D(LNPRM)	-0.402023	0.446420	-0.900550	0.3812
D(LNPRM(-1))	-1.389770**	0.483964	-2.871637	0.0111
D(LNPRM(-2))	0.679061	0.457810	1.483281	0.1574
D(LNY)	-2.973880	2.171611	-1.369435	0.1898
D(LNY(-1))	6.115311	3.698928	1.653266	0.1178
D(LNY(-2))	-8.630152***	2.770969	-3.114489	0.0067
D(LNREER)	0.872533*	0.500442	1.743526	0.1004
D(LNREER(-1))	-0.607867	0.432502	-1.405466	0.1790
D(LNERM)	-0.231767**	0.092823	-2.496887	0.0238
CointEq(-1)	-0.828714***	0.206687	-4.009521	0.0010

R-squared	0.961985
Adj. R-squared	0.928722
F-statistic	28.92032
Prob (F-statistic)	0.000000
Durbin-Watson stat	2.048501
Akaike Info. Criterion	-0.262799
Schwarz Bayesian Criterion	0.431066
Hannan-Quinn Criterion	-0.036616

4.7Interpretationofthe short-run results

Both coefficients of the current and second period lags of domestic income have negative effects on the import demand in the short run. Though the second period lag is statistically significant at 1% level, that of the current year is statistically insignificant. The import demand elasticity in the short run with respect to current year income is -2.97 and -8.63 respectively for the current year and the second year respectively. The coefficient of 6.12 for the first year is positive but statistically insignificant. A cursory look at the income elasticity of demand with respect to import demand shows that it is highly elastic.

The relative price of imports has a negative effect on the import demand of Ghana in the short run. This shows that a percentage increase in the prices of imports will bring about 0.40% decrease in imports demand in the short run. Imports become expensive to consumers in the short run when prices go up. This confirms theory which suggests an inverse relationship between prices of imports and demand for imports. However, the first period lag of the relative prices of import is negative but is statistically significant at 5% level. This suggests that if last year relative prices of import increased, the current import demand will experience a decline by 1.34%. The second period lag has an insignificantly positive impact

on the current import demand. This shows that if last two years a price of import is increased 1percent, the current import demand will increase by 0.68% in the short run.

The real effective exchange rate coefficient has a positive effect on the current import demand and it is statistically significant at 10% level of significance. This shows that if the current real effective exchange rate increases by 1%, import demand will significantly increase by 0.87% in the short run. However, the coefficient of the first period lag of real effective exchange rate has a negative effect on the current demand for imports and it is statistically not significant. Thus, the demand for Ghana"s imports is inelastic with respect to the real effective exchange rate in the short run.

In the short run, exchange rate movements negatively impact import demand at 5% level of significance. This implies an increase in the exchange rate movement by 1% will cause 0.23% decrease in the import demand. Therefore, the elasticity of demand for imports in the short run is inelastic with respect to the exchange rate movement.

The coefficient of determination, R^2, of 0.961985is reasonably high indicating that all the explanatory variables such as income, prices of imports, real effective exchange rate as well as the movements in the exchange rate explains about 96% of the variations in the import demand. This shows that the variables fairly satisfy the model. The F-statistic of 28.92032 with a probability value of 0.00000 also indicates that the overall impact of the covariates on the demand for imports to be very significant. The Durbin Watson (DW) statistics of 2.048501 indicate an absence of autocorrelation. It suggests that the residuals are not related

with their lagged values. Thus, there exists no first-order serial correlation problem among the residuals.

The ECM coefficient shows the degree of responsiveness of the variable to its equilibrium path. This implies that the coefficient of error correction term shows the rate of adjustment of variables back to its long- run equilibrium whenever there is a shock. It is expected to have a statistically significant negative coefficient. Hence, for the model to be accepted, the ECM value is expected to be statistically negative significant. The highly significant error correction term is an indication that there will be about 83% correction back to the long run equilibrium when there is a shock.

As such, as reported in the table, the value of the ECM term is -0.828714 with a P-value of 0.0010 at 1% significance level. This is indicative that the model is fit to be used. The negative significant ECM values suggest existence of long run relationship among the variables. The highly significant error correction terms suggest that whenever there is a shock, about 82.9% comes back to the long run equilibrium position and is completed on annual basis. This finding shows that the degree of responsiveness is relatively high in the model, meaning that variations in imports respond quickly to its last-period deviations from its long-run steady-state equilibrium. It suggests a quick response back to equilibrium when a disturbance occurs.

4.8 Results of model efficiency diagnostic and stability test

Series of diagnostic test are estimated within the ARDL framework to conduct the short run diagnostics is presented in Table 4.7. This is done in order to ensure the reliability of the estimates in the error correction model. Therefore, tests for normality, serial correlation, heteroscadasticity and structural stability of the model are directed to ECM model using various residual diagnostic tests.

Table 4.7: Series of Diagnostic Tests

Diagnostic	**Statistic**
Functionality	Ramsey RESET Test F-statistic = 1.964272 P-value = 0.1946
Normality	Jarque Bera Statistic = 0.460866 P-value = 0.794190
Serial Correlation	Breusch-Godfrey LM Test F-statistic = 1.092432 Prob. F(3,13) = 0.3871
Heteroscedasticity	Breusch-Pagan-Godfrey Test F-statistic = 0.748072 Prob. F(14,16) = 0.7045
Stability Condition	CUSUM = Stable CUSUMSQ = Stable

By Ramsey‟s RESET test, the study test for the correct specification of the model, that is the functional form of the model. The null hypothesis (H0) which states that the model has correct specification against the alternative hypothesis(H1) that the model has no correct specification are tested. The null hypothesis(H_o) fails to be rejected when the P-value of the test statistic is more than 5%.The result from table 4 is suggestive of the failure of rejecting

the null hypothesis(H0) since the P-value of the F-statistic of 0.1946 is more than 5%. This conclusively shows that the model was correctly specified.

The residuals of the estimates are checked whether they are normally distributed r not. As a result, Jarque – Bera test is used. This test the null hypothesis (H_o) that the residuals are normally distributed as against the alternate hypothesis (H_1) that the residuals are not normally distributed. The null hypothesis (H_o) fails to be rejected when the P-value of the Jarque-Bera test statistic exceed 5%. The results from the table reports that Jarque-Bera statistic has a probability value of 0.794190 which exceeds the 5%. Therefore, the null hypothesis cannot be rejected.

Breusch-Godfrey Serial Correlation LM Test is employed to check for the serial correlations among the residuals. The null hypothesis, (H_o): no serial correlation in the residuals as against the alternative hypothesis, (H_1) is tested. The null hypothesis (H0) fails to be rejected when the computed P-value of the F-statistic exceed 5%. As evidently shown in the table, the result of the p-value of the F-statistic is 0.3871. This exceeds the 5% hence; the residuals are not serially correlated.

The residuals of the estimates are checked for the presence of heteroscadasticity. As a result, Breusch-Pagan-Godfrey statistic is employed. The null hypothesis (H_o) fails to be rejected when the P-value of the test statistic is greater than 5%. The results indicate the failure of rejecting the null hypothesis (H0) that the residuals of the estimates are not heteroscedastic

since the P-value of the F-statistic which is 0.7045 is more than 5%. It can therefore be concluded that the data series in the model are homoscedastic.

Lastly, the plots of Cumulative Sum (CUSUM) and Cumulative Sum of Squares (CUSUMQ) tests proposed by Brown et al (1975) are adopted to check the stability of the parameter estimates. The constancy of the import demand function is important for formulating effective trade policy, therefore, the coefficients of the full ECM model are checked to ensure their stability during the sample period. The result shows no instability of the coefficients over the sample period. The plots of both CUSUM and CUSUMSQ fall within the 5% critical bounds suggesting stability in the parameters. Therefore, long-run stability of the coefficients is confirmed.

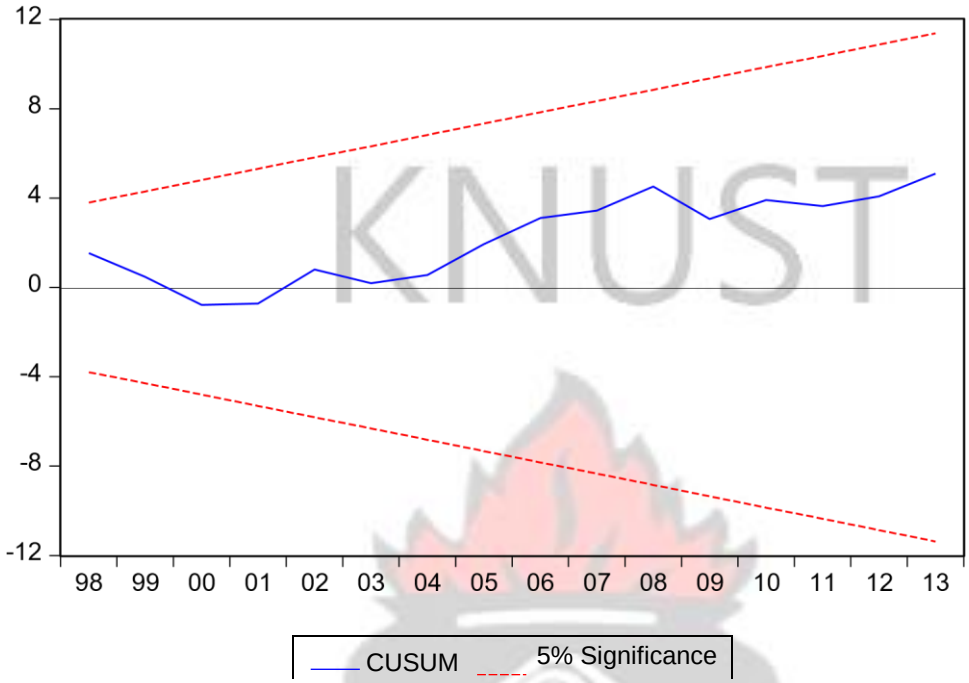

Figure 2: CUSUM

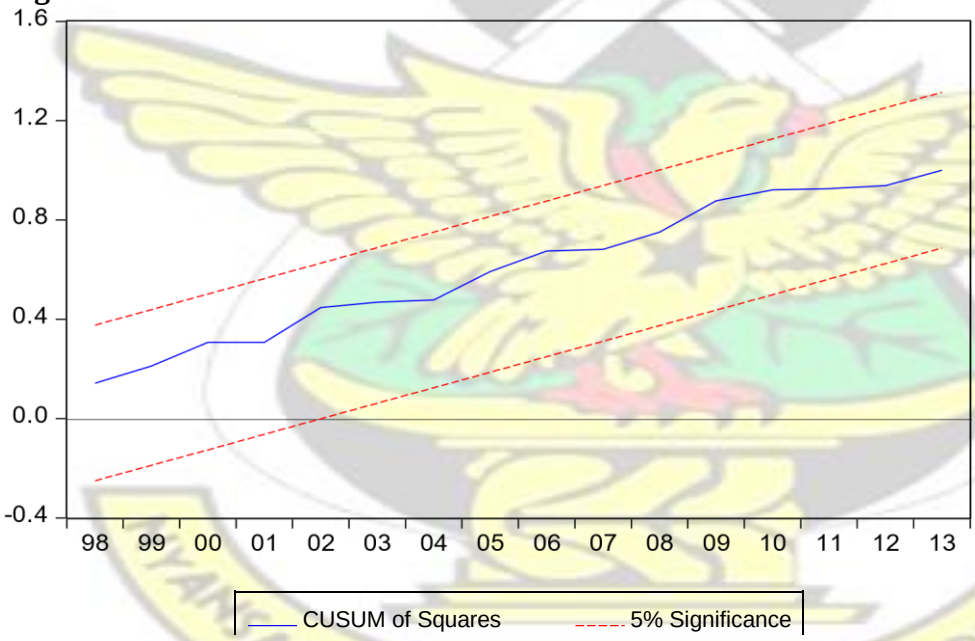

Figure 3:CUSUM OF SQUARES

Figure 4.4.1: Plots of the cumulative sum of recursive residuals and the cumulative sum of squares of recursive residuals

4.9Assessing the elasticity of innovations

This study also aims at assessing the elasticity of innovations in exchange rate and import demand by employing the variance decomposition methodology. The variance decomposition shows the percentage of a variable"s forecast error variance attributable to its own innovations and innovations in other variables. This study decomposes the variance of the import demand to assess the contribution of the various shocks. In assigning variance shares to the variables, the residuals in the equations must be orthogonalised.

The first step is to determination of the ordering of the variables as postulated by Pesaran and Shin (1998). The study then employs Cholesky decomposition variance – covariance matrix of error terms to orthogonalize shocks by Sim (1980). The error variance is decomposed by focusing on the import demand variable.

The ordering is shown in the table 4.8 while the result for the variance decomposition is shown in table 4.9.

Table 4.8: Contemporaneous Correlations of VAR Error Terms

	LNIMPV	LNPRM	LNY	LNREER	LNERM
LNIMPV	1.000000	0.670039	0.632516	-0.426925	0.093163
LNPRM	0.670039	1.000000	0.324291	-0.019010	0.162534
LNY	0.632516	0.324291	1.000000	-0.860104	-0.316437
LNREER	-0.426925	-0.019010	-0.860104	1.000000	0.465333
LNERM	0.093163	0.162534	-0.316437	0.465333	1.000000

The result shows that there are highly correlation between import demand and relative prices of imports movement with correlation coefficient of 0.670039. This is then followed by real income with correlation coefficient of 0.632516, then real effective exchange rate with correlation coefficient of 0.426925and exchange rate movements with correlation coefficient of 0.093163.Hence, Cholesky ordering will take the form: LNERM LNREER LNY LNPRM LNIMPV

4.6 Results of forecast error variance decomposition

Following the VAR estimation, the study decomposed the forecast error variance by employing Sim‟s Recursive Cholesky decomposition method. This is done in a ten year horizon.

Table 4.9: Results of Forecast Error Variance Decomposition

Horizon	% Forecast Variance Explained by Innovations in					
	S.E	**LNERM**	**LNREER**	**LNY**	**LNPRM**	**LNIMPV**
1	0.456543	9.843267	10.52409	5.085839	2.153006	72.39380
2	0.521170	9.087266	9.405125	7.161100	8.674075	65.67243
3	0.772730	8.244341	19.45820	8.054727	9.146209	55.09652
4	0.864636	7.974831	20.67143	8.213388	8.857583	54.28276
5	0.912452	9.117820	19.57453	10.47660	9.104172	51.72688
6	0.924686	9.796440	20.79799	11.99507	8.630774	48.77973
7	0.946341	9.572316	20.97387	11.82037	9.883618	47.74983
8	0.957066	9.525253	20.65412	11.67263	10.51061	47.63738
9	0.962700	9.667515	21.00231	12.51502	10.26187	46.55328
10	0.969014	10.23791	21.42867	15.62024	9.521000	43.19218

Cholesky Ordering: LNERM LNREER LNY LNPRM LNIMPV

Based on VDCs results for the ten year horizon, the results show that the largest source of variations in import demand forecast error is attributed to its own shocks. In the first horizon, the result shows that 72.39% of its forecast error variance is assigned to its own innovations. From period two through to the last period, innovations contributed 65.67%, 55.09%, 54.28%, 51.72%, 48.78%, 47.74%, 47.63%, 46.55% and 43.19% respectively. This suggests that within the ten year horizon, changes in the imports were very high as a result of its own innovations. of contributions in innovations in the explanatory variables, shocks in real effective exchange rate, r exchange rate movements, income and relative prices of imports are other important sources of the forecast error variance of Import demand in Ghana.

The study finds that the changes in the imports demand respond more to innovations in the real effective exchange rate. In the first horizon, the result shows that 10.52% of its forecast error variance is assigned to innovations in real effective exchange rate.. From period two through to the last period, innovations contributed 9.40%, 19.46%, 20.67%, 19.57%, 20.80%, 20.97%, 20.65%, 21.00% and 21.43% respectively.

The results showed that first period innovations in exchange rate movements contributed 9.84% to the variations in imports demand. Innovations‟ contributions decreased from the second through to the fifth period. Specifically, the contributions of innovations in exchange rate movements to the forecast error variance of import demand gradually increased to

9.79%, 9.57%, 9.52%, 9.67%, and 10.24% respectively from the sixth period to the tenth period. Therefore, the overall impact of the innovations in exchange rate movements to the forecast error variance of import demand is positioned at second among the explanatory variables.

The results showed that first period innovations in real income contributed 5.06% to the forecast error variance of import demand. Innovations increased from the second period through to the tenth period. Specifically, the contributions of innovations resulting from real income to the forecast error variance of import demand gradually increase to 10.47% in the fifth period and 15.62% respectively. Therefore, the overall impact of the innovations in trade openness to the forecast error variance of import demand is positioned at third among the explanatory variables.

Lastly, the results revealed that first period innovations in relative prices of import contributed 2.15% to the forecast error variance of import demand. Contributions of innovations in relative prices of import increased from the second period of 8.67% through to the ninth period. However, there was a decline in the tenth period innovations to 9.52% Specifically, the contributions of innovations in inflation to the forecast error variance of relative prices of import gradually increased from 8.67% in the second period to 10.26% in the tenth period Therefore, the overall impact of the innovations in inflation to the forecast error variance of FDI inflows is positioned at fourth among the explanatory variables.

CHAPTER FIVE

SUMMARY, RECOMMENDATIONS AND CONCLUSION

5.1 Summary of Major Findings

The study confirms the existence of both short run and long run relationship between exchange rate movements and import demand. In short-run imports move towards their equilibrium when there is a disturbance. The results concluded a long run steady state relationship between import demand and its covariates. Thus, prices of imports, income, real effective exchange rate and exchange rate movements are long run forcing covariates of import demand in Ghana.

The study finds that the income elasticity of imports is positive and significant. The significantly positive influence of domestic income on import demand is suggestive that consumers tend to increase their demand for foreign goods whenever they experience an increase in their income levels. This confirms economic theory which assumes a positive relationship between income and the demand for imports. Most of Ghana‟s imports are necessary and luxury commodities and are expected to be positive and highly income elastic.

It was also found that relative price of import has statistically negative impact on import demand in Ghana. Though the impact is not significant, a rise in the price of imports makes imports expensive to domestic consumers; ceteris paribus, hence a corresponding fall in demand for imports.

Ghana‟s imports are mainly goods that the country does not have the capacity produce domestically. As a result, these are goods are even demanded by consumers though they may complain about their high prices. The underlying explanation is that Ghana is still a developing country and has not seen much progress in terms of structure and growth as it continues to import increasing amounts of industrial supplies, raw materials, manufacturing machinery, capital goods and consumable products.

Again, the coefficient of long run real effective exchange rate though statistically significant, is positive. This is contrary to the negative expected sign and against theoretical postulation of international trade theory.

It was realized that movements in the exchange rate significantly impact import demand of Ghana, the study realized that during the concerned period, exchange rate movements had negative impact on imports demand both in the short run and the long run. Traders, particularly importers, fear the loss that is created by the uncertainties in the exchange rates so they try to avoid any risk associated with it. They therefore draw back from the risk presented to them as and when the movements in the exchange rate becomes more intensified simply because the exchange rate market is not transparent. Again, the movement in the exchange rate creates uncertainty for the traders to make their own decisions, because it makes price and profit projections more uncertain.

Lastly, the forecast error variance decomposition of imports results indicated that within the ten year period, variations in imports were high as a result of its own shocks and in terms of

innovations in the explanatory variables the innovations of Exchange rate movements, real effective exchange rate, income and relative prices of imports are other important sources of the forecast error variance of Import demand in Ghana.

5.2 Recommendations

Policymakers need to pay attention to the exchange rates. They should design pragmatic exchange rate intervention policies (fiscal and monetary policies) and also adhere to better regulatory and monitoring systems in the exchange rate market that will keep the exchange rate stable for a long period of time. There should be systematic and measured policy to mitigate exchange rate movements in Ghana. This will help reduce the risk level that traders they may face and also make the exchange rate market more transparent to traders particularly importers.

Again, since the results is suggestive that the importers are risk averse because they cut down their volume of imports and shift their attention to domestically produced goods in order to benefit relatively from the profits which are certain rather than relying on uncertain price and profit outlook which are results from exchange rate fluctuations, it therefore implies that, stakeholders need to come out with well-thought hedging facilities and mechanisms that can protect its importers against exchange risks.

Lastly, since imports are elastic with respect to the level of income. Income responds more to variations in income as such an increase in the income level will cause an increase in the volume of imports by more than the increase in income. Government policies should be

directed at motivating domestic industries that are not import intensive. Subsidies, tax holidays, tax rebates and other incentives can be given to import substitution industries in order to boost production levels. Development of such industries will significantly reduce pressure on the exchange rate.

5.3 Conclusions

This study investigated the impact of exchange rate movement on impact demand behavior in Ghana using the Auto Regressive distributed lag model framework from 1980 to2014. The results from the ARDL model show a negative significant ECM values suggesting that there exist long run relationship among the variables. The highly significant error correction terms shows that following a shock, about 82.9% of the adjustment would be corrected back to the long run equilibrium on annual basis implying speedy adjustment in the process.

Although, theoretical and empirical studies postulate an indeterminate impact of exchange rate movement on import demand, this study expected and achieved a negative sign. The negative movement implies that an increase in the exchange rate movement has an adverse impact on the import demand. This mean that a movement in the exchange rates imposes additional cost to risk averse traders which eventually affect trade by depressing overall trade flows. This is confirmed by studies such as Alam and Ahmed, 2010; Anderson and

Skudelny, 2001; Mohammadi et al, 2011; Akpokodje and Omojimite, 2009) etc.

Further Research

This research only focused on the impact of exchange rate movements on imports demand behaviour of Ghana. For asystematic analysis, it would be more prudent to look at both imports and exports together, thus ascertaining whether the effect of fluctuations in exchange rates on both sides is symmetric or not. This could be another area for future research.

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APPENDICES
APPENDIX A
RESULTS OF THE ARDL ESTIMATES

Dependent Variable: LNIMPV
Method: ARDL
Date: 03/03/16 Time: 10:10
Sample (adjusted): 1983 2013
Included observations: 31 after adjustments
Maximum dependent lags: 3 (Automatic selection)
Model selection method: Akaike info criterion (AIC)

Dynamic regressors (3 lags, automatic): LNPRM LNY LNREER LNERM
Fixed regressors: C
Number of models evalulated: 768
Selected Model: ARDL(1, 3, 3, 2, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNIMPV(-1)	0.171286	0.206687	0.828722	0.4195
LNPRM	-0.402023	0.446420	-0.900550	0.3812
LNPRM(-1)	-0.815583	0.528437	-1.543389	0.1423
LNPRM(-2)	1.389770	0.483964	2.871637	0.0111
LNPRM(-3)	-0.679061	0.457810	-1.483281	0.1574
LNY	-2.973880	2.171611	-1.369435	0.1898
LNY(-1)	3.196505	3.261865	0.979962	0.3417
LNY(-2)	-6.115311	3.698928	-1.653266	0.1178
LNY(-3)	8.630152	2.770969	3.114489	0.0067
LNREER	0.872533	0.500442	1.743526	0.1004
LNREER(-1)	-0.200690	0.565896	-0.354642	0.7275
LNREER(-2)	0.607867	0.432502	1.405466	0.1790
LNERM	-0.231767	0.092823	-2.496887	0.0238
LNERM(-1)	-0.067517	0.051890	-1.301160	0.2116
C	-21.20591	6.055070	-3.502174	0.0029

R-squared	0.961985	Mean dependent var	3.352688
Adjusted R-squared	0.928722	S.D. dependent var	0.681861
S.E. of regression	0.182043	Akaike info criterion	-0.262799
Sum squared resid	0.530237	Schwarz criterion	0.431066
Log likelihood	19.07338	Hannan-Quinn criter.	-0.036616
F-statistic	28.92032	Durbin-Watson stat	2.048501
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

APPENDIX B
RESULTS OF THE ARDL BOUNDS TEST FOR COINTEGRATION

ARDL Bounds Test

Date: 03/03/16 Time: 10:12

Sample: 1983 2013

Included observations: 31

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	6.728283	4

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

Test Equation:
Dependent Variable: D(LNIMPV)
Method: Least Squares
Date: 03/03/16 Time: 10:12
Sample: 1983 2013
Included observations: 31

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNPRM)	-0.402023	0.446420	-0.900550	0.3812
D(LNPRM(-1))	-0.710709	0.406338	-1.749060	0.0994

D(LNPRM(-2))	0.679061	0.457810	1.483281	0.1574
D(LNY)	-2.973880	2.171611	-1.369435	0.1898
D(LNY(-1))	-2.514840	2.317561	-1.085124	0.2939
D(LNY(-2))	-8.630152	2.770969	-3.114489	0.0067
D(LNREER)	0.872533	0.500442	1.743526	0.1004
D(LNREER(-1))	-0.607867	0.432502	-1.405466	0.1790
D(LNERM)	-0.231767	0.092823	-2.496887	0.0238
C	-21.20591	6.055070	-3.502174	0.0029
LNPRM(-1)	-0.506898	0.450038	-1.126344	0.2766
LNY(-1)	2.737465	0.632682	4.326766	0.0005
LNREER(-1)	1.279710	0.477556	2.679707	0.0164
LNERM(-1)	-0.299284	0.119986	-2.494329	0.0239
LNIMPV(-1)	-0.828714	0.206687	-4.009521	0.0010

R-squared	0.836673	Mean depen dent var	0.016765
Adjusted R-squared	0.693761	S.D. dependent var	0.328961
S.E. of regression	0.182043	Akaike info criterion	-0.262799
Sum squared resid	0.530237	Schwarz criterion	0.431066
Log likelihood	19.07338	Hannan-Quinn criter.	-0.036616
F-statistic	5.854483	Durbin-Watson stat	2.048501
Prob(F-statistic)	0.000597		

APPENDIX C

RESULTS OF THE ESTIMATED LONG RUN COEFFICIENTS AND THE ERROR CORRECTION REPRESENTATION FOR THE SELECTED ARDL

ARDL Cointegrating And Long Run Form
Dependent Variable: LNIMPV
Selected Model: ARDL(1, 3, 3, 2, 1)
Date: 03/03/16 Time: 10:13

Sample: 1980 2013
Included observations: 31

Cointegrati ng Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNPRM)	-0.402023	0.44 6420	-0.900550	0.3812
D(LNPRM(-1))	-1.389770	0.483964	-2.871637	0.0111
D(LNPRM(-2))	0.679061	0.457810	1.483281	0.1574
D(LNY)	-2.973880	2.171611	-1.369435	0.1898
D(LNY(-1))	6.115311	3.698928	1.653266	0.1178
D(LNY(-2))	-8.630152	2.770969	-3.114489	0.0067
D(LNREER)	0.872533	0.500442	1.743526	0.1004
D(LNREER(-1))	-0.607867	0.432502	-1.405466	0.1790
D(LNERM)	-0.231767	0.092823	-2.496887	0.0238
CointEq(-1)	-0.828714	0.206687	-4.009521	0.0010

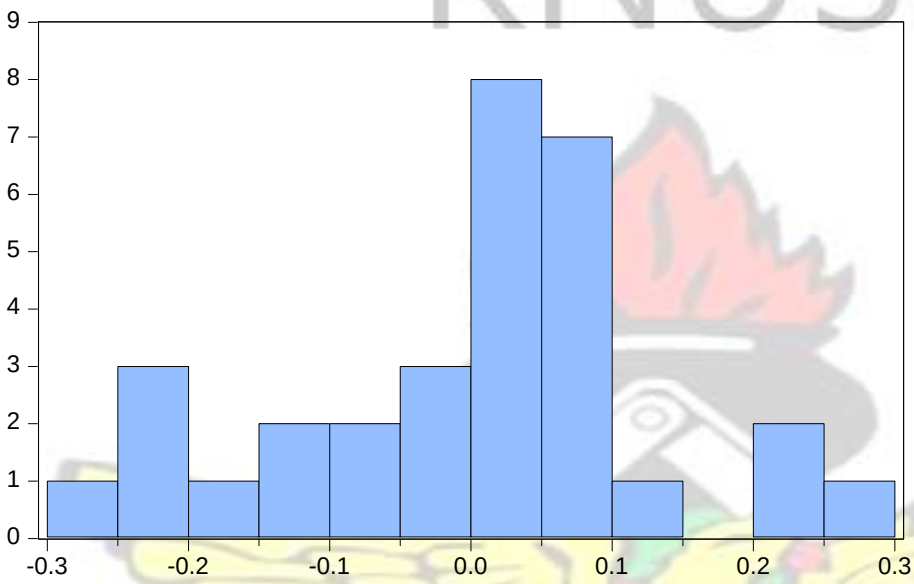
Cointeq = LNIM PV - (-0.6117*LNPRM + 3.3033* .NY + 1.5442*LNREER
-0.3611*LNERM -25.5889)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPRM	-0.611668	0.612349	-0.998888	0.3327
LNY	3.303268	0.641070	5.152741	0.0001
LNREER	1.544212	0.652776	2.365608	0.0310
LNERM	-0.361143	0.186988	-1.931366	0.0713
C	-25.588928	5.168252	-4.951177	0.0001

APPENDIX D

RESULTS OF THE DIAGNOSTIC TESTS AND THE STABILITY TEST



Series: Residuals
Sample 1983 2013
Observations 31

Mean	7.11e-15
Median	0.014890
Maximum	0.268304
Minimum	-0.293758
Std. Dev.	0.132946
Skewness	-0.296065
Kurtosis	2.921382
Jarque-Bera	0.460866
Probability	0.794190

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.092432	Prob. F(3,13)	0.3871
Obs*R-squared	6.241588	Prob. Chi-Square(3)	0.1004

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 03/03/16 Time: 10:15
Sample: 1983 2013 Included observations: 31
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.

LNIMPV(-1)	0.254502	0.423092	0.601527	0.5578
LNPRM	0.094443	0.475001	0.198826	0.8455
LNPRM(-1)	-0.057212	0.543868	-0.105195	0.9178
LNPRM(-2)	0.099049	0.535668	0.184907	0.8562
LNPRM(-3)	-0.222193	0.581923	-0.381825	0.7088
LNY	0.675686	2.330194	0.289970	0.7764
LNY(-1)	0.502889	3.297805	0.152492	0.8811
LNY(-2)	0.408690	3.723159	0.109770	0.9143
LNY(-3)	-2.325810	3.453230	-0.673517	0.5124
LNREER	0.164793	0.535700	0.307622	0.7632
LNREER(-1)	-0.364447	0.599815	-0.607599	0.5539
LNREER(-2)	-0.058728	0.464091	-0.126544	0.9012
LNERM	0.027963	0.096528	0.289686	0.7766
LNERM(-1)	0.004163	0.054575	0.076280	0.9404
C	6.830848	11.00585	0.620656	0.5456
RESID(-1)	-0.356351	0.538197	-0.662121	0.5195
RESID(-2)	-0.521330	0.295424	-1.764681	0.1011
RESID(-3)	-0.122846	0.341715	-0.359498	0.7250

R-squared	0.201342	Mean dependent var	7.11 E-15
Adjusted R-squared	-0.843058	S.D. dependent var	0.132946
S.E. of regression	0.180486	Akaike info criterion	-0.294072
Sum squared resid	0.423478	Schwarz criterion	0.538565
Log likelihood	22.55812	Hannan-Quinn criter.	-0.022653
F-statistic	0.192782	Durbin-Watson stat	2.155545
Prob(F-statistic)	0.998961		

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.748072		
		Prob. F(14,16)	0.7045

Obs*R-squared	12.26394	Prob. Chi-Square(14)	0.5851
Scaled explained SS	3.138559	Prob. Chi-Square(14)	0.9988

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 03/03/16 Time: 10:16
Sample: 1983 2013
Included observations: 31

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.806981	0.853372	-0.945638	0.3584
LNIMPV(-1)	-0.036061	0.029129	-1.237955	0.2336
LNPRM	-0.066885	0.062916	-1.063086	0.3035
LNPRM(-1)	-0.002315	0.074475	-0.031083	0.9756
LNPRM(-2)	-0.027531	0.068208	-0.403640	0.6918
LNPRM(-3)	0.066817	0.064522	1.035579	0.3158
LNY	-0.232249	0.306056	-0.758844	0.4590
LNY(-1)	-0.030766	0.459712	-0.066924	0.9475
LNY(-2)	0.455907	0.521309	0.874542	0.3948
LNY(-3)	-0.095701	0.390527	-0.245057	0.8095
LNREER	-0.047334	0.070530	-0.671115	0.5117
LNREER(-1)	0.100687	0.079755	1.262464	0.2249
LNREER(-2)	-0.019358	0.060955	-0.317584	0.7549
LNERM	0.008169	0.013082	0.624418	0.5412
LNERM(-1)	-0.002163	0.007313	-0.295707	0.7713

R-squared	0.395611	Mean dependent var	0.017104
Adjusted R-squared	-0.133230	S.D. dependent var	0.024101
S.E. of regression	0.025656	Akaike info criterion	-4.181709
Sum squared resid	0.010532	Schwarz criterion	-3.487844
Log likelihood	79.81649	Hannan-Quinn criter.	-3.955526
F-statistic	0.748072	Durbin-Watson stat	1.776719
Prob(F-statistic)	0.704452		

Ramsey RESET Test

Equation: UNTITLED

Specification: LNIMPV LNIMPV(-1) LNPRM LNPRM(-1) LNPRM(-2)

LNPRM(-3) LNY LNY(-1) LNY(-2) LNY(-3) LNREER LNREER(-1)

LNREER(-2) LNERM LNERM(-1) C

Omitted Variables: Squares of fitted values

	Value	Probability	df	t-statistic	0.155399	0.8786
F-statistic	0.024149	(1,15)		0.8786		

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.000852	1	0.000852
Restricted SSR	0.530237	16	0.033140
Unrestricted SSR	0.529385	15	0.035292

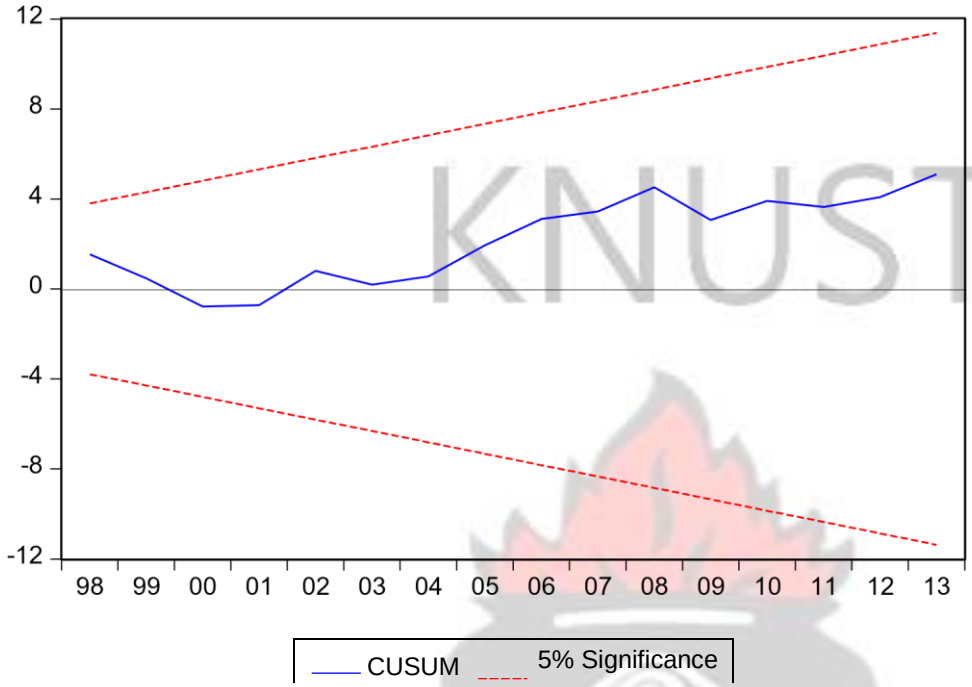
Unrestricted Test Equation:
Dependent Variable: LNIMPV
Method: ARDL
Date: 03/03/16 Time: 10:17
Sample: 1983 2013
Included observations: 31
Maximum dependent lags: 3 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (3 lags, automatic):

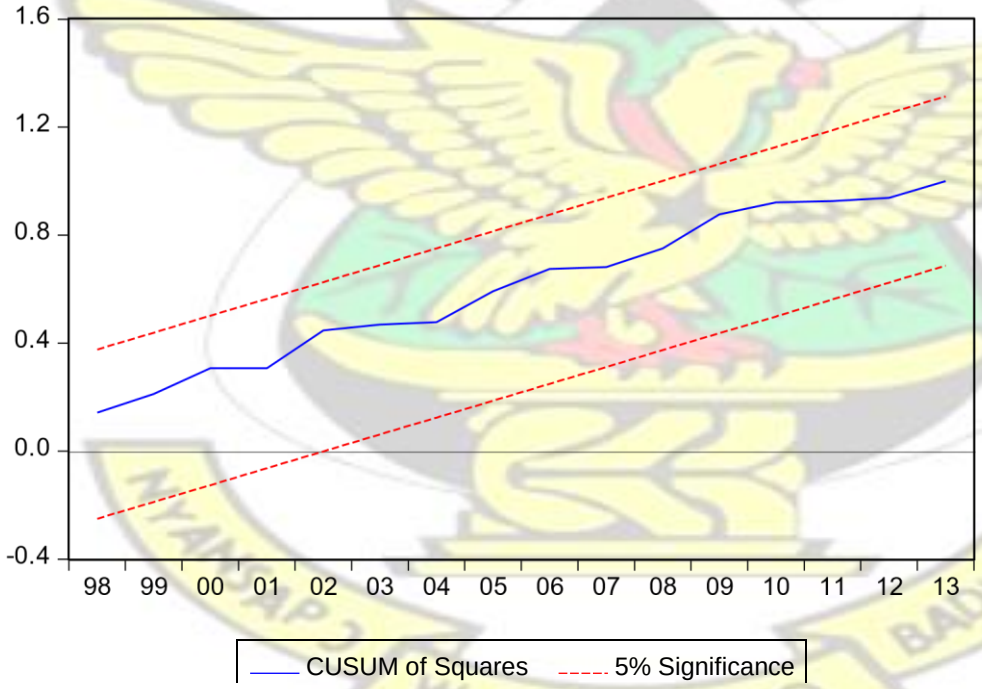
Fixed regressors: C

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNIMPV(-1)	0.118390	0.401695	0.294725	0.7722
LNPRM	-0.312960	0.735328	-0.425606	0.6764
LNPRM(-1)	-0.614034	1.406965	-0.436424	0.6687
LNPRM(-2)	1.017448	2.447411	0.415724	0.6835
LNPRM(-3)	-0.526508	1.089456	-0.483276	0.6359
LNY	-2.356225	4.562895	-0.516388	0.6131
LNY(-1)	2.326044	6.535080	0.355932	0.7268
LNY(-2)	-4.470474	11.25189	-0.397309	0.6967
LNY(-3)	6.539486	13.75409	0.475458	0.6413
LNREER	0.636586	1.603758	0.396934	0.6970
LNREER(-1)	-0.138791	0.706895	-0.196339	0.8470
LNREER(-2)	0.440470	1.166019	0.377755	0.7109
LNERM	-0.171686	0.398315	-0.431031	0.6726
LNERM(-1)	-0.048433	0.133972	-0.361519	0.7228
C	-15.03247	40.21486	-0.373804	0.7138
FITTED^2	0.040107	0.258092	0.155399	0.8786

R-squared	0.962046	Mean dependent var	3.352688
Adjusted R-squared	0.924092	S.D. dependent var	0.681861
S.E. of regression	0.187863	Akaike info criterion	-0.199891
Sum squared resid	0.529385	Schwarz criterion	0.540231
Log likelihood	19.09832	Hannan-Quinn criter.	0.041370
F-statistic	25.34763	Durbin-Watson stat	2.072641
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.





APPENDIX E

DATA USED FOR THE STUDY

YEAR	M	Y	PRM	REER	ERM
1980	53.74904762	4451661567	209.5238095	773.9008	1193673.45
1981	78.98714286	4295716859	185.7142857	1691.658	1476080.791
1982	58.75758333	3998296446	125	2129.108	911266.1089
1983	46.22222222	3815824683	170.3703704	3654.248	397957.2703
1984	12.15356	4145800765	132	561.7325	2135350.99
1985	14.42791667	4356889102	123.3333333	405.8717	7456694.461
1986	10.89145833	4583410740	135.4166667	257.5617	13128.95454
1987	12.30202128	4803180643	131.9148936	192.7783	264925.9097
1988	10.17331461	5073511803	125.8426966	173.8258	247048.533
1989	14.66666667	5331544145	105.7471264	162.4658	247159.1647
1990	12.29591837	5509021559	100	161.2925	247388.5841
1991	10.66424242	5799998499	102.020202	164.6242	247834.5474
1992	21.2772549	6025004753	95.09803922	145.205	248071.5504
1993	25.24509804	6317217484	89.21568627	126.8925	247112.9632
1994	20.30038462	6525685661	94.23076923	102.77	247173.1671
1995	18.17780952	6794049194	106.6666667	118.705	247047.4805
1996	20.10057143	7106742655	108.5714286	128.985	248971.5662
1997	23.2885	7404967010	114	136.4733	248483.7345
1998	27.00831579	7753029398	124.2105263	145.6492	248310.1554
1999	37.0562766	8094162423	109.5744681	143.8567	248429.5639
2000	29.7594	8393646433	100	94.12417	247766.9513
2001	32.7160301	8729392290	108.9985827	95.16	247108.3586
2002	28.18600959	9122214943	137.2961391	94.7675	247963.7925
2003	30.87491185	9596570120	132.8715796	94.99167	247856.4285
2004	36.49725425	10133978047	124.7122161	93.69167	247893.4824
2005	43.26082128	10731883141	124.7886401	102.3475	247810.7408
2006	50.61507436	11418723662	127.161374	107.7492	248411.1017
2007	55.83781661	12156343018	135.7560644	107.0217	248178.3998
2008	61.58053931	13181184012	157.6195323	101.885	247831.2318
2009	52.84123754	13707278823	175.135915	93.7675	247623.7542
2010	67.61028434	14804825657	186.2606497	100	247499.7011
2011	86.72806265	17026596445	187.9126368	95.03667	248262.0308
2012	97.62700004	18523201271	178.8425069	88.98167	247617.151
2013	98.80459769	19844237673	176.4338294	89.57167	247589.1697