KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY –KUMASI

COLLEGE OF ARTS AND SOCIAL SCIENCES

FACULTY OF SOCIAL SCEINCE

DETERMINATION OF COCOA PRODUCER PRICE IN GHANA

AN EMPIRICAL INVESTIGATION

A THESIS SUBMITTED TO THE DEPARTMENT OF ECONOMICS IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE IN MASTERS OF ARTS HONOURS IN ECONOMICS

BY

MAWULI AMEDOFU

OCTOBER 2009

DECLARATION

I hereby declare that, under supervision I have personally undertaken the study herein submitted. It is not a replicate of any work either published or unpublished. All references made in this study are duly acknowledged and all aspects of this study have been discussed with and approved by my supervisor, Prof. Joseph Ohene-Manu.

Signature: ....   ate: ....

MAWULI AMEDOFU

(STUDENT)

I declare that I have supervised the student in undertaking the study submitted herein. The student has been consistent in interaction with me for guidance and direction.

Signature: ....   Date: ....

PROF. JOSEPH OHENE-MANU

(SUPERVISOR)

Abstract

Various studies done in relation to domestic price has focused on the price transmission mechanism and the effect of Structural Adjustment Program and other policies. This paper investigates the determinants of domestic price of cocoa in Ghana using the vector error correction model. There was an improvement in the error correction term when the dummy variable was introduced and it also had a significant influence on the domestic price of cocoa. This implies whenever there was a great reduction in bottlenecks, economic agents and variables responded faster in order to restore long-term equilibrium.

Other factors mainly the world price and consumer price index also saw an increase in their coefficients with the inclusion of dummy. In essence the world price exerted a positive influence on the domestic price but the error of structural significance was greater than 5%.

This study was also to examine the role of domestic price of on big picture of the export supply of cocoa in Ghana. The result was statistically significant though the impact was low. The hypothesis test conducted suggests that export supply of cocoa is dependent on the previous year's domestic price implying that government will need to provide more financial incentives to cocoa farmers to enable them stimulate production and hence exports.

TABLE OF CONTENTS

5

LIST OF TABLES

LIST OF FIGURES

8

DEDICATION

This work is dedicated to my family: parents Prof G.K. Amedofu, Mrs. Doris Kafui

Amedofu and only brother and sibling Sitsophe Amedofu.

ACKNOWLEDGEMENT

To God be the glory, great things he has done! I acknowledge my supervisor Prof. Ohene Manu for his patience and believe in me. I also express my sincere gratitude to all lecturers and Staff of the economics department KNUST Mr. Kweku Boateng, Dr. Kuffour and Mr. Frimpong.

I will also like to acknowledge my parents Prof. G.K. Amedofu and Mrs. Doris Kafui Ziwu for their support and seeing to it that I made it through school especially my dad whose comment "AGBALA WONTOE SURO GE" meaning you have to do the learning yourselves, I say God bless you and give you long life so you can enjoy the fruit of your labour. I appreciate all your inputs Dela, Vera, Cece and Goerge.

To all my course mates George, Hughs, Awal, Lilly, Tony, Richard, Riendoff, Davis, Ayimpusa, Russel and Afrani I say thanks for your support, encouragement your fellowship.

To my friends Godsway, Enam, Ampa Sowah, all "CVC" members, EYO members and my business partners Andrew, Rev Matin and Louis (**SPRINGVERVE**) and to you, I say thank you and God bless you.

CHAPTER 1

INTRODUCTION

1.1 GENERAL BACKGROUND ISSUES

Available records indicate that, Dutch missionaries planted cocoa in the coastal areas of Ghana as early as 1815, whilst in 1857 Basel missionaries also planted cocoa at Aburi. However, these did not result in the spread of cocoa cultivation until Tetteh Quarshie, a native of Osu, Accra, who had travelled to Fernando Po and worked there as a blacksmith, returned in 1879 with Amelonado cocoa pods and established a farm at Mampong (Akwapim). Farmers bought pods from his farm to plant and cultivation spread from the Akwapim area to other parts of the Eastern Region. In 1886, Sir William Brandford Griffith, the Governor, also arranged for cocoa pods to be brought in from Sao Tome, from which seedlings were raised at Aburi Botanical Garden and distributed to farmers.

Agriculture, especially cocoa, is the mainstay of Ghana's economy, accounting for 36% of GDP in 2001. Cocoa exports in 2001 contributed 16% ($246.7 million) of GDP. Also Cocoa exports from Ghana produced almost a fifth of commodity export revenues (18%) and a competitive percentage of world cocoa exports (7.8%). Ghana is also the world's second largest producer of cocoa accounting of about 19% of the world's total export of the product.Throughout the world the standards against which all cocoa is measured are those of Ghana cocoa (UNCTAD,). This makes Ghana an important player in the cocoa sector in the world.

Most of Ghana's cocoa output is cultivated from small farm holdings and these farmers have a low propensity to save and poor access to efficient saving instruments thus, they live in poverty. The most important variables in explaining cocoa exports are the producer price of cocoa and the level of economic activity in the country or the agric sector-cocoa for that matter.

Between the 1970/71 and 1980/81, the cocoa sector experienced a divergence in the growth rates of output. This was mainly due to the differences in movements of real producer prices. Real producer prices affected the profitability of production and are the main determinant of output growth. Thus as a result of these differences, Ghana and Nigeria--the two largest producers of cocoa in 1970/71, with world production shares of 26% and 21% respectively--held only 16% and 9% of the total exports by 1980/81, while Brazil and Ivory Coast increased their shares from 12% to 22% and 12% to 24% respectively during the same period.

As former integrated monopolies for the production and exportation of commodities such as cotton, cocoa, and coffee are being privatized in many Sub-Saharan African countries, the question of the mechanism used to set producer prices is on the agenda (and) has become very crucial.

Additionally, structural rigidities in agriculture remain intractable largely because of the predominance of subsistence farming. Cash crops are subject to prohibitively high transaction costs, as evidenced by large differentials between producer and consumer prices, arising from monopolistic and inadequate distribution systems. Agricultural

policy, notwithstanding massive donor support, has failed to address these market impediments {Ghana Poverty Reduction Strategy Paper (2003, p. 32)

Although producer prices in general follow world market prices, different exchange rate movements and inflation rates in the various producing countries have yielded different real producer prices. Government policies have also influenced the behaviour of producer prices and returns in those countries where domestic prices were controlled by the national authorities and input prices and credit costs were manipulated to influence production (Akiyama, Duncan 1984).

In the early 1990s, Ghana Cocoa Board (COCOBOD) continued to liberalize and to privatize cocoa marketing. The board raised prices to producers and introduced a new system providing greater incentives for private traders. In particular, COCOBOD agreed to pay traders a minimum producer price as well as an additional fee to cover the buyers' operating and transportation costs and to provide some profit. COCOBOD still handles overseas shipment and export of cocoa to ensure quality control.

Historically, African countries had a system of guaranteeing that farmers have a fixed price for their cocoa for the season, but Ghana was the last to allow for the participation of the private sector. Thus the cocoa producer price had been set by the government before the Structural Adjustment Program was implemented. In a subsequent paper, Coleman et al. (1993) used the vintage capital approach in modelling the supply side of the cocoa production which captured the dynamics of supply response to policy changes

including the producer price. A hypothesis that the international cocoa price and Consumer Price Index (CPI) influenced the government's cocoa pricing policies was tested using regression analysis after the implementation of the SAP. The results of the analysis showed that the coefficients on the independent variables are statistically highly significant. This indicated that domestic price changes were influenced in fairly equal proportions by changes in international cocoa prices and by general domestic price increases-with the latter reflecting costs of production (World Bank Report 1994). In order to further liberalise the cocoa sector, the government developed a medium term strategy.

Key elements of the government's medium term strategy for cocoa in 1999 included: unifying the extension services of COCOBOD and those of the Ministry of Agriculture; increasing competition in internal marketing by giving licensed buying companies (LBCs) equal access to COCOBOD's warehouses and crop financing; allowing qualified LBCs to export at least 30 percent of their domestic purchases, starting with the 2000/2001 crop; maintaining quality-control services in a public sector institution; eliminating price discounts on exportable cocoa to domestic processors in the 1999/2000 crop season; increasing the producer price to 60 percent of the freight of board (f.o.b.) price of cocoa for the 1999/2000 crop, and thereafter by at least 2 percentage points in each of the next two years; reducing the share of the COCOBOD and the tax on cocoa to allow for increases in the farmers' share of the f.o.b. price; and outsourcing the Produce Buying Company for divestiture before end-March 1999 and offering it for sale before end-June 1999. Once the LBCs begin exporting cocoa, the Bank of Ghana will review

surrender requirements (COCOBOD Report). By implication, precipitous price decline has impacted primarily on countries and regions dominated by smallholder production systems. Within many of these systems, and against the expectations of the architects of market reform, costs to producers have risen with the widespread liberalisation of national input markets.

In the export guidelines, the Producer Price Review Committee (PPRC) determines the minimum producer price of cocoa based on the farmer's share of the fob price (rising from the current 66% to 70% by 2004/05).

The factors looked at by the Cocoa Marketing/ Export Sales Committee forecast of the f.o.b. price for crop year in question include the following:

1. forward sales prices and the spot prices (actual projected)

2. projections of the average exchange rate (in conjunction with the Bank of Ghana) for the period (October of the current year to September of the following year)

3. The prices prevailing or anticipated in the neighbouring countries (Cote d'Ivoire and Togo)

4. The occurrence of small bean size categories will be taken into account in determining the projected fob and therefore the producer price

5. The farmer's estimated cost of production

Farmers' share of fob price of cocoa exports increased by 1% every year from 66% in 1999/2000 to 70% by 2004/2005. The PPRC is made up of representatives of Ministry of Finance, COCOBOD, Farmers, LBCs, Hauliers, ISSER and Licensed Exporters.

1.2 PROBLEM STATEMENT

According to the annual report from the International Cocoa Organisation (2001), there was a 25% decrease in the world price of cocoa as a result of an increase in production mainly from Ghana and Cote d'Ivoire with 48% growth in the sector over the years. This according to the International Cocoa Organisation was as a result of the increase in the farm gate prices.

Indeed, faced in the period 2001/02 to 2003/04 with a 45% increase in producer prices, cocoa producers in Ghana responded by more than doubling output.

The long-term growth prospects in the cocoa sector are dependent on whether the increase in output represents the lifting of constraints on farmer's production possibilities or whether it simply reflects a short-term response to the windfall gains of strong cocoa prices especially the producer price (Andrew Zeitlin, Teal and Vigneri 2004) in their research on the cocoa sector.

The foregoing discussion clearly demonstrates that with the stable producer price of cocoa, farmers' share of world prices is very low. Thus one wants to find out what constitute the producer price, in the face of decline in the real price of cocoa on the world market.

Figure 1: World Price and Domestic Price of Cocoa in Ghana (1984-2004)
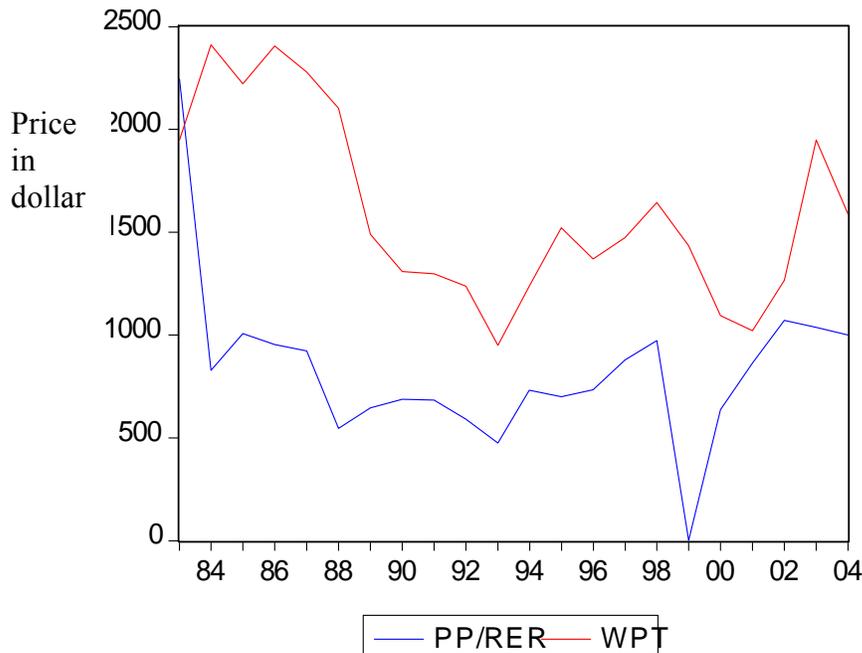
Figure 1 gives a clear picture as to the gap between the world price of cocoa and the domestic price of cocoa. One could observe that there has been a steady increase in the domestic price of cocoa as a result of government intervention. Thus government in determining the domestic price of cocoa consider other factors other than the world price.

The world price on the other hand fluctuates within this period. Despite the steady increase in producer price the gap between it and the world price still exist. Between 1983 and 1986 the producer price was 43.1% of the world price. This reduced to 42.8% between 1987 and 1992. From the period between 1992 and 2004 there has been an increase in the share of world price of cocoa paid to farmers from 54% between 1992 and 2000 to about 67.3% between 2001 and 2004. Thus there is a gradual reduction in the gap.

There is also the issue of the growing gap between the consumer prices in the importing countries and world price. This is due to the fact that the global commodity markets are increasingly dominated by fewer global transnational corporations that have the power to demand low producer prices, while keeping consumer prices high, thus, increasing their profit margins.

1.3   OBJECTIVES AND JUSTIFICATION OF THE STUDY

The general objective of the study is to

 ➢ identify the major determinants of cocoa producer prices and how they relate to the world price of cocoa in Ghana

The two specific objectives for the study are

 ➢ To find the impact of institutional factors on the domestic price of cocoa in Ghana

 ➢ To find the extent to which the world price relate to the domestic price of cocoa in Ghana

The reasons for these objectives are as follows. Firstly, the cocoa sector forms the main stay of the Ghanaian economy contributing about 36% of the GDP implying that a fall in output of cocoa would have a significant adverse effect on the economy. Thus in order to make sure that farmers are well catered for, there is the need to identify factors that affect domestic price of cocoa.

Secondly, most cocoa farmers are trapped in poverty and are forced to rely on child labour and even child slavery against their heartfelt wishes to do otherwise. This coupled

with other factors such as lack of interest of the youth in farming has prompted the study into the components that go into producer pricing of cocoa.

1.4 HYPOTHESES TESTING

The study is designed to address the following sets of hypotheses:

The first being, the hypothesis tested under the export supply function and this is represented below as i.

i. H_0: Export supply of cocoa does not depend on domestic price of cocoa

        H_1: Export supply of cocoa depends on domestic price of cocoa

The second set (of) hypothesis involves the domestic price of cocoa function and is stated in the following null hypothesis (ii, iii, iv).

ii. H_0: There is no significant difference between the world and producer prices

        H_1: There is a significant difference between the world and producer prices

iii. H_0: The producer price is independent of the general domestic price level

        H_1: The producer price of cocoa is dependent on the general domestic price level

iv. H_0: The domestic price of cocoa is independent on institutional factors

        H_1: The domestic price of cocoa is dependent on institutional factors

1.5 ORGANISATION AND SCOPE OF THE STUDY

The study is divided into five main chapters. Chapter one is made up of the general introduction, problem statement, objectives and its justification, the Hypothesis, Methodology and Scope of Study and Organisation of the paper. Chapter two is the literature review and presents a comprehensive and in-dept historical, theoretical and

empirical review on the cocoa sector. Chapter three, deals with the methodology of the study while chapter four presents the results of the study for analysis and discussion. The last chapter (chapter five) provides findings and recommendations of the study. There is also an appendix which has graphs and tables.

CHAPTER 2

LITERATURE REVIEW

The review of the literature is divided into three sections namely the theoretical review, the empirical review and the historical review of cocoa prices and production since the 1950s

2.1 THEORETICAL REVIEW

2.1.1 GENERAL PRICE DETERMINATION

The price of a good is determined on the basis of the demand for that good and the available supply of that good. In the case of cocoa, the price of cocoa beans changes according to the market perception of supply (ie. how many cocoa beans the market believes are harvested) and demand (ie. how many are needed by manufacturers of cocoa products).

In general terms, price is determined through the interaction of the broad forces of demand and supply, as illustrated in Figure 2.1. The forces of demand (DD) and supply (SS) interact to determine a unique price (OP) and quantity (OQ) for a given commodity.

In economics and business, price is defined as the assigned numerical monetary value of a good, service or asset. The concept of price is central to microeconomics and it is one of the most important variables in resource allocation theory; Lipsey and Chrystal, (1999).

<u>Figure 2.1 Equilibrium Market Price Determinations</u>

Price

```
      |        D           S
      |         \         /
      |          \       /
  P   |_____/
      |           /\    |
      |          /  \   |
      |    S    /    \  |
      |        /      \ D
      |       /        \|
   O  |_____|_____ Quantity
                      Q
```
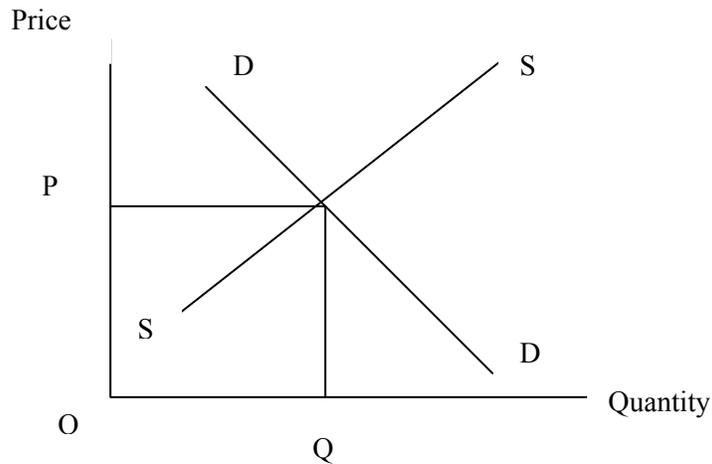
The price system has two important functions. It rations scarce output among competing users; and prices also determine how productive resources are allocated Lipsey and Chrystal, (1992).

Rationing of goods and services occurs because of the scarcity. This operates to differentiate between those "willing and able to buy from those who are able and are no longer willing to buy" Lipsey and Chrystal, (1999).

Finally, the allocation of resources is based on willingness and ability of consumers to pay. Demand is not only constrained by income and wealth but also based on the individual preferences.

22

2.1.2 CONCEPT OF FULL-COST AND AVERAGE COST PRICING

The average cost pricing (ACP) according to Lipsey R. and Harbury Colin (1992) refers to prices set by equating price to the average cost. This diverts from the Pareto efficient level of determination of prices where price is set to marginal cost. The average cost pricing is thus defined as

$$ACP = AVC + GPM$$

Where

ACP= average cost pricing

AVC= average variable cost

GPM= Gross Profit Margin also know as "mark-up",

$$GPM = AFC + NPM$$

For

$$AFC = TFC/ X$$

Where

AFC = Average Fixed Cost

NPM = Net profit Margin

TFC = Total Fixed Cost

X = planned output

Also, average cost pricing may refer to setting prices at the average variable cost plus a conventional percentage mark-up, or it may mean total unit cost. But both definitions

suffer from the ambiguity that the average total cost and to a less extent, average variable costs vary with output. The element of time plays a role in determining the average cost price thus the average level of output used in the calculation may be for a longer period of time (Lipsey R. and Harbury Colin, 1992). The principle of Full Cost Pricing (FCP) is defined in terms of the relation

$$FCP = AVC + AFC + Profit\ Margin$$

Where

AVC and AFC are already defined and the profit margin is the mark-up element.

According to Hall and Hitch (1939), businessmen calculate the average total cost of operating at full capacity which they call the full cost and then adding a conventional mark-up to determine price. People then sell whatever they can at that price, so that fluctuations in demand cause quantity, rather than price, to fluctuate.

They further explained that businessmen were uninterested in profit maximization, instead they were seen as creatures of habit, who add up conventional mark-ups to cost calculated at that typical output, and then were reluctant to change the price that resulted from such calculations. This suggests that oligopolistic firms are not short-run profit maximisers.

It does not follow the condition of MR = MC basis of profit maximization. This implies that firms did not know their demand curve over MC and thus FCP is the right price (R.L. Hall and C. J. Hall 1939)

These theories are not applicable to the determination of the price of cocoa since the market of this commodity exhibits oligopolistic tendencies. Thus, factors other than the full cost and average cost pricing mechanisms help determine the price of cash crops; mostly cocoa. Several price determination models have been propounded to cater for the certain oligopolistic tendencies within the price regime. These include a model of limit pricing propounded by Franco Modiglianni in 1958 and spatial price determination approach.

2.1.3   FRANCO MODIGLIANNI'S (1958) MODEL OF LIMIT PRICING

According to Franco Modiglianni (1958), Limit pricing refers to the pricing by incumbent firm(s) to deter or inhibit entry or the expansion of fringe firms. Franco Modiglianni's view of limit pricing after reviewing the works of Bain and Sylos (Modigliani 1958) is presented as follows:

$$P_1 = P_C (1 + X/Xc.e)$$

Where

P_1 = equilibrium (limit) price

Xc = absolute system of market

e = price elasticity of demand

X = minimum optimal scale

Pc = the Long Run Average Cost (LAC)

He stated that at the scale of X, cost are prohibitively high and that entrants can come in at that scale or larger, implying that, if the entry of new firms is defined, then the theory of limit pricing is simple.

Pashigian (1968) listed the assumptions that formed the bed rock of limit pricing concept. The assumptions included the following;

a) It is assumed that the monopolist is not able to charge the monopoly price and yet block entry by threatening to lower the price if entry is attempted. To enforce it, the monopolist would incur additional 'short'-run costs either by producing larger output to meet the demand at limit pricing. He either sacrifices flexibility for efficiency or doing it by a specialized plant design or increasing inventories.

b) It is assumed that the limit price does in fact forestall entry. Thus, in order to overcome a situation where the monopolist incur more losses than the entrant, Peter Pashigian (1968) called for the redefinition of limit pricing as that "price which causes the entrant to suffer a larger present value of losses than the monopolist suffers if entry did occur" Peter Pashigian (1968). This implied that the entrant do not present a threat to the monopolist. Under this, the limit price would be determined by the cost structure and this would be higher. The larger the economy of scale the larger is the cost of increasing the rate of output. This view was further supported by Jaehong Kim's (2000) statement that limit pricing is as a result of high entry cost for the firms.

Jaehong Kim (2000) argued that limit pricing can be self imposing where the monopolistic firm reduces price despite availability of information and easy entry. He concluded that limit pricing can be set

a) if current and future prices are correlated and that limit pricing can be an equilibrium strategy under complete information and without government intervention

b) with government intervention; that is, limiting entry via government dominates self-limiting strategy for incumbent monopolist.

c) entry regulation to prevent excess entry is exploited by incumbent as a way to protect monopoly position. As a result social welfare with entry regulation, which is aimed at enhancing efficiency, is lower than under pure market equilibrium

(See. Jaehong Kim, 2000)

Notably, under government intervention the firm does not set the price but a benevolent government deters entry if free market generates too many firms in terms of social welfare. The government does induce regulations and this takes place when the monopolist creates a situation of excess entry. These strategies can be implemented by either lowering current price or making future market demand small relative to entry cost.

2.1.4 SPATIAL PRICE DETERMINATION APPROACH

Spatial models are broadly defined as any theoretical construction having space as one component Bawden D. Lee (1964). Since price is the central mechanism by which markets are integrated, or linked, spatial price determination models postulate that spatial

arbitrage ensures that equilibrium domestic and world prices of a commodity that is sold in competitive foreign and domestic markets will differ only by transfer costs, when converted to a common currency. Therefore, the extent to which price signals are transmitted from the world to the domestic market affects the trade pattern. Transaction costs, border measures and other factors may hinder price transmission, affect trade and weaken the integration of domestic market with the international market giving rise to conditions that may result to different trade patterns (Conforti P.and Rapsomanikis G, 2005).

By implication and in theory, spatial price determination models suggest that, if two markets are linked by trade in a free market regime, excess demand or supply shocks in one market will have an equal impact on price in both markets. The implementation of imports tariffs, in general, will allow international price changes to be fully transmitted to domestic markets in relative terms. Thus, a proportional increase in the international price will result in an equal proportional increase in the domestic price, at all points in time provided that tariff levels remain unchanged. However, if the tariff level is prohibitively high, changes in the international price would be only partly, if at all, transmitted to the domestic market, as domestic prices may be close to the "autarky" price level, thus obliterating the opportunities for spatial arbitrage and resulting in the two prices moving independently of each other, as if an import ban was implemented.

Other policy instruments such as tariff rate, quotas may result in international price changes not being at all points of time proportionately transmitted to domestic prices as

changes in the domestic price level will depend on two different tariff rates that are applied according to whether the volume of imports falls within or outside the quota level.

In the event that imports are equal to the quota level, changes in the international price may not affect the domestic price level at all, provided that these changes are relatively small, as compared to the difference between the within-the-quota and the out-of-quota tariff levels.

2.1.5 PRICE FLOOR DETERMINATION AND SUPPORT POLICIES

An argument, which has received a great deal of attention since the 1950's and became known as the "export pessimism" hypothesis (Prebisch, 1950) was based on the fact that developing countries concentrated on exporting primary commodities, while industrialized countries were the main producers of manufactured goods. Primary commodity demand tends to be inelastic with respect to income; and therefore, if supply grows faster than demand; the resultant effect was lower prices and deteriorating net barter terms of trade vis-à-vis manufactured goods. Also, primary commodities tend to be inelastic with respect to price, so that in the short term higher production and productivity leads to relatively greater price declines, such that marginal revenues from additional output are negative, reducing the welfare of the country increasing production as well as of other producing countries. The policy implication of this logical sequence is that developing countries ought to constrain production and diversify out of primary commodities.

The implementation of price support policies, such as intervention mechanisms and floor prices, may result in the international and the domestic price being completely unrelated or being related in a non linear manner, depending on the level of the intervention or floor price relative to the international price. Changes in the international price will have no effect on the domestic price level when the international price lies on a level lower than that to which the floor price has been set. However, any changes in the international price above the floor price level will be transmitted to the domestic market. Thus, floor price policies may result in the domestic price being completely unrelated to the international market below a certain threshold determined by the floor price, or in the two prices being related in a non linear manner with increases in the international price being fully transmitted to the domestic level, whilst decreases are slowly and incompletely passed-through.

Taking the price relation (WP) as WP= ER(DP) as translating a domestically determined price level DP into foreign terms where ER is the exchange rate; it is implicitly assumed that the economy is large in terms of world markets and that foreign exchange, or world prices of its goods are determined by internal cost and demand conditions.

However, for a small country the causation runs the other way. The small country is assumed to be a price taker on the world markets. That is in an extreme small-country case, the world price is fixed at WP and the domestic price level is just WP/ER.

Implying that the aggregate supply curve is horizontal at DP= WP/ER for the small country case. This is shown in figure 2.2

FIGURE 2.2: Floor Price Determination a Small Country Case

Price   D

E_2

$DP=WP_2/ER$ S_2

E_1

$DP=WP_1/ER$ S_1

D

O   Q2   Q1   Output (Quantity)
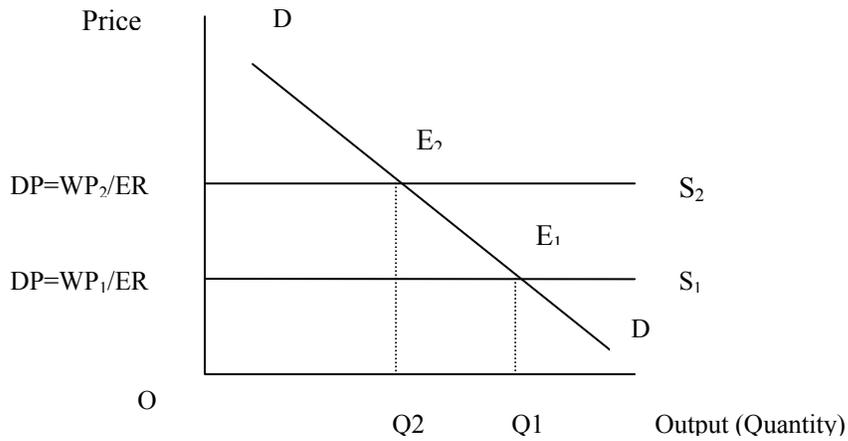
As can be seen in the figure, the point of intersection (E_1 and E_2) with the usual downward sloping aggregate demand curve gives the equilibrium level of output and the domestic price level DP= (WP/ER).

In a small country case, the usual IS-LM analysis fixes the demand curve. But the price level is determined in the world market and the intersection of the normal demand curve with the world-market supply price determines output. Thus an increase in the world price would result in an increase in the domestic price. Thus the exogenous increase in the world price level raises the internal (domestic) price level and reduces output in the smaller country.

2.2 EMPIRICAL REVIEW

Four main studies which relate to the present study are reviewed in this section as follows.

2.2.1 AKIYAMA AND TRIVEDI (1984) STUDY

Akiyama and Trevidi (1984) in their study, "Analysis of World Cocoa Market" among other estimations observed that although producer price is dependent world prices different exchange rate regimes and inflationary rates in the various countries yielded different real producer prices which invariably affect production. This study was conducted for various countries selecting periods between 1960 and 1978. They recognised the influential role government plays in the behaviour of domestic price of cocoa. Thus they concluded that the declining production of cocoa in Ghana and Nigeria in the 1960s and 1970s appears to have been the result of declining real producer prices. In these countries, stagnating or declining real producer prices were the consequence of high domestic inflation rates and of over-valued currencies. In Cote d'Ivoire, recovery of production in the 1970s appeared to have been influenced by the positive trend of real producer prices. In addition, various kinds of subsidies were extended to producers by governments. In Cameroon production increased in spite of negative real producer price trends, due to government sponsored hybrid plantings which increased yields significantly. These findings showed that the exchange and inflationary rate at current prices played a significant role in the producer price since they were captured in the regression (real producer price and real world price).

The estimated relationship between producer prices and the world price with Akiyama and Trivedi (1984) study are presented here for four countries including Ghana as follows:

Cameroon: (1963-1978)

$$\text{Log PP} = -0.943 + 0.514 \log PI$$

$$(7.3) \qquad R^2 = 0.78$$

Ghana: (1967-78)

$$\text{Log PP} = -0.135 + 0.748 \log PI$$

$$(9.6) \qquad R^2 = 0.89$$

Ivory Coast: (1962-78)

$$\text{Log PP} = -0.653 + 0.609 \log PI$$

$$(8.0) \qquad R^2 = 0.80$$

Nigeria: (1969-78)

$$\text{Log PP} = -0.357 + 0.748 \log PI$$

$$(5.4) \qquad R^2 = 0.76$$

The figures in brackets were t-ratios.

PP represented producer price in terms of US dollars.

PI was Average of daily prices, New York/London (3 months futures) USQ/lb, which represented the world price

In the case of Ghana, the R^2 was the highest and indicated that 89% of the real producer price was determined by world price and that there exist a high degree of responsiveness by the domestic price to a change in the world price.

The Akiyama and Trevedi (1984) study also provided the trend in real cocoa producer price for the selected countries in Africa. This is reproduced in Table 2.1

Table 2.1: Trend in Real Producer Prices Some Countries in Africa

Countries	Percent per annum		
	1960 -1980	1960- 1970	1970-1980
Cameroon	-2.3	-3.6	-3.0
Ivory Coast	-1.0	-4.8	-2.1
Ghana	-5.0	-6.9	-8.9
Nigeria	-0.3	-4.0	-0.7

In real terms, producer prices in those countries declined, and the situation in Ghana was the most serious.

2.2.2 COLEMAN J.R., AKIYAMA AND VARANGIS (1993) STUDY

In a World Bank project, Coleman, Akiyama and Varangis (1993) used various equations to estimate among others the domestic price of cocoa for Ghana and Nigeria. Their results revealed that, domestic price changes were influenced in fairly equal proportions by changes in international cocoa prices and by general domestic price increases with the latter reflecting costs of production. This was observed from the coefficients of 0.41 and 0.56 for the lag of world price divided by lag of exchange rate and lag of consumer price index respectively and were very significant. Also, with an adjusted R^2 of 0.99 and 0.96 for Ghana and Nigeria respectively, the domestic price (also producer price) was significantly explained by the variables of the lags of world price/exchange rate and the consumer price index. The model used by that study for the producer price of cocoa function was estimated as

Ghana (1966-81):

$$\text{Ln } PP_t = -3.72 + 0.41 * \text{Ln}(WP_{t-1}/ER_{t-1}) + 0.56 * \text{Ln}(CPI_{t-1})$$

$$(5.06) \qquad (7.82)$$

Adjusted R-Square: 0.99   DW: 1.22

Nigeria (1966-85):

$$\text{Ln } PP_t = -4.59 + 0.37 * \text{Ln}(WP_{t-1}/ER_{t-1}) + 0.74 * \text{Ln}(CPI_{t-1})$$

$$(3.38) \qquad (7.77)$$

Adjusted R-Square: 0.96   DW: 0.76

Source: Coleman, Akiyama and Varangis Working Paper (1993)

The study stated that government was responsible for setting the cocoa producer price before the Structural Adjustment Program (SAPs) was implemented, which they still did after SAP. A hypothesis that the international cocoa price and consumer price index (CPI) influenced the government's cocoa pricing policies was tested using regression analysis. The results of the analysis showed that the coefficients on the independent variables were statistically highly significant and indicate that domestic price changes were influenced in fairly equal proportions by changes in international prices and by general domestic price prevailing in the absence of structural adjustment. These were derived from an equation including the actual world price of cocoa and the estimated exchange rate and CPI derived from the respective equations. Finally, marketing costs for the period 1983/84/ and 1989/90 were assumed to be equal to their 1982/83 level in real terms, using the estimated CPI as the deflator.

It must be noted that most of the empirical work done on producer prices are related to the transmission mechanism of producer price in relation to the world prices.

2.2.3   BAFFERS AND GARDNER (2001) STUDY

Baffers and Gardner (2001) in their research of price transmission used the error correction model to estimate the responsiveness of the domestic prices to fluctuations on the world market for 10 commodities. They found out that those changes in the world price accounted for only a small share of variation in domestic prices. Also, they incorporated into their research structural essence of structural breaks (SAP) and concluded that structural changes (reforms) in most countries had a limited effect on price transmission. In Ghana, before reforms, cocoa indicated no sign of long run integration as both adjustment and short-run effect were not significantly different from zero.

The cointegration parameter for cocoa from the logarithmic regression in levels, however, was 0.40 and highly significant, with both stationarity statistics well below -3.00 implying that there was some comovement with a long run transmission elasticity well below unity.

But after policy reforms which he pecked at 1983, the 3 year adjustment of domestic to international price increased from 0 to 39% and this was supported by an increase in the explanatory power of the cocoa model from 0 to 15%.

The empirical results of the Baffers and Gardner (2003) study are partly reproduced for review in Table 2.2.

Table 2.2: Estimation by Baffers and Gardner (2003)

TABLE III Restricted Error-Correction Model.

	Constant	Adjustment Coefficient	Short-run Effect	Adj-R^2	DW	3-year Adjustment
Ghana						
Cocoa	−129.7	0.03	0.01	−0.07	2.16	—
	(−0.75)	(0.56)	(0.22)			
Maize	370.9**	0.53**	−0.85	0.27	2.35	81%
	(2.03)	(2.81)	(−1.08)			
Rice	38.6	0.19*	−0.03	0.08	2.45	45%
	(0.60)	(1.83)	(−0.25)			

$$(p_t^d - p_{t-1}^d) = \mu + \alpha(p_{t-1}^w - p_{t-1}^d) + \beta(p_t^w - p_{t-1}^w) + u_t. \quad (4)$$

Notes: These are estimates of equation (4). Asterisks denote levels of significance (* for 10 percent, ** for 5 percent, and *** for 1 percent). The 3-year adjustment is reported only when α is significantly different from zero at the 10 percent level (otherwise it is denoted as '—').

TABLE IV Logarithmic Regression in Levels.

	Constant	Log(β)	Adj-R^2	DW	ADF	PP
Ghana						
Cocoa	4.05***	0.40***	0.36	1.20	−3.23	−3.27
	(4.58)	(3.84)				
Maize	−7.39***	−0.08	−0.02	0.98	−1.27	−2.68
	(−13.20)	(−0.82)				
Rice	6.57***	0.07	0.03	0.46	−3.39	−3.49
	(18.35)	(1.34)				

$$p_t^d = \mu + \beta\, p_t^w + \varepsilon_t, \quad (1)$$

Notes: These are estimates of equation (1), expressed in logarithms. Asterisks denote levels of significance (* for 10 percent, ** for 5 percent, and *** for 1 percent). ADF and PP denotes the augmented Dickey-Fuller and Phillips-Perron unit root tests.

Source: Baffers and Gardner (2003)

Baffers and Gardner (2003) study also focused on maize and rice prices in Ghana. P^d represented domestic price and P^w represented the world price. Two basic models were estimated namely; the restricted error correction model and the logarithmic regression in the levels of variables.

Essentially, Baffers and Gardner (2003) study did not explicitly consider the influence and effect of change in the political environment of the country on the domestic price of cocoa.

2.2.4 KRIVANOS (2004) STUDY

The evidence regarding the degree to which world price signals is transmitted in domestic markets has been mixed.

Ekatrina Krivonos (2004), in his paper explored the extent to which market reforms had an effect on producer prices and price transmission of coffee. He employed the dynamic approach adopted by Baffers and Gardner (2003) and Quiroz and Soto (1995) and incorporated asymmetric price transmission. The results suggested that the long run share of producer price for coffee increased in some cases, and that the improved producer price of coffee reacted faster today to changes in world market price than they did after market reforms.

With the exception of Tanzania whose share decreased from 0.56 to 0.53, all the other countries who implemented reforms had significant increase in the target share of producer prices to world market prices of coffee. For example in Uganda and Ethiopia,

the target share increased from 0.32 to 0.91 and 0.40 to 0.73 respectively while that of Ghana increased slightly from 0.43 to 0.49.

Also turning to the long-term cointegration between the domestic and the world prices he noted that for most countries they could not reject the hypothesis of no cointegration before the reforms, which is consistent with their expectations.

Given the high degree of government intervention in the sector prior to liberalization we can expect the domestic prices to be driven by policy decisions, rather than by the world market prices. After the reforms cointegration is detected in some countries: In almost half of the cases the null hypothesis of the residuals following a unit root process was rejected at 5% level of significance. In the pooled model with structural breaks the null hypothesis of no cointgration is rejected at 10% significance in 9 countries out of 14. The exceptions are Colombia, Togo, Angola, Cameroon and Central African Republic. In all these countries, except Angola, a cointegrating relationship was found in the period after the reforms. Some of the results can be observed from table 2.3.

Even though these results are for coffee, they can be used for cocoa as well, for both cocoa and coffee are competitive commodities in the world market. Hence a review of Krivanos (2004) model is deemed appropriate.

Table 2.3: The error-correction model with asymmetric price transmission

			Ethiopia	Kenya	Tanzania	Central African Republic	Ghana
Type of coffee			Brazilian natural	Colombian mild	Colombian mild	Robusta	Robusta
Reform year			1992	1993	1994	1991	1992
Short-term transmission	price decreases	Before reforms (δ_1)	0.13	0.05	0.14		0.08
		After reforms (δ_3)	0.46 ***	1.06 ***	0.12 *	0.17 **	-0.31
		Change significant	Yes **	Yes ***	No		No
	price increases	Before reforms (δ_2)	0.17 **	0.01	-0.02		-0.10
		After reforms (δ_4)	0.44 ***	0.40 ***	0.17 ***	0.02	-0.07
		Change significant	Yes **	Yes *	Yes *		No
Asymmetric price transmission significant		Before reforms	No	No	No		No
		After reforms	No	Yes" ***	No	No	No
Net change in the short-term transmission[1]			0.06	0.62 *	-0.21		-0.41
Speed of adjustment		Before reforms (θ_1)	0.00	0.00	-0.04		-0.09 ***
		After reforms (θ_2)	-0.17 ***	-0.22 ***	-0.25 ***	-0.11 ***	-0.19 ***
		Change significant	Yes ***	Yes *	Yes ***		Yes *
Target share of world price		Before reforms (γ_1)	0.40 ***	0.72 ***	0.56 ***		0.43 ***
		After reforms (γ_2)	0.73 ***	0.93 ***	0.53 ***	0.44 ***	0.49 ***
		Change significant	Yes ***	Yes ***	Yes *		Yes *
Adjusted R-squared			0.22	0.27	0.15	0.09	0.09

$$\Delta p_t^d = \delta_1 \Delta p_t^w D_t^{ref} D_t^\Delta + \delta_2 \Delta p_t^w D_t^{ref}(1-D_t^\Delta) + \delta_3 \delta \Delta p_t^w (1-D_t^{ref}) D_t^\Delta + \delta_4 \Delta p_t^w (1-D_t^{ref})(1-D_t^\Delta) +$$
$$\theta_1 \hat{v}_{t-1} D_t^{ref} + \theta_2 \hat{v}_{t-1}(1-D_t^{ref}) + \varepsilon_t \tag{5}$$

Source: Krivanos (2004)

2.2.5 OTHER STUDIES

Rapsomanikis G., Hallam et el (2003), tested the market integration between coffee markets of Ethiopia, Uganda, Rwanda with the objective of assessing the extent to which coffee producers are integrated into the market process. The main variables they used included the world price and the composite indicator price with the producer price being

40

the dependent variable. The results showed that Ethiopian markets were well integrated and that price signals were transmitted in the short run with an Error Correction Term of 27% and moreover, the parameter on DWPt is estimated to be 0.77, suggested that international market shocks affect the Ethiopian market

Mundlak and Larson (1992) in a study covering 58 countries for the 1968-78 periods concluded that most of the variations in world prices are transmitted and that they constitute the dominant component in the variation of domestic prices. They used a simple logarithmic specification of the relationship between the domestic and world market prices and the exchange rate. Quiroz and Soto (1993), on the other hand, using a sample for 60 countries during 1966-91, concluded that in an overwhelming majority of cases, transmission of international price signals in agriculture is either very low or non-existent.

Morriset (1998) examined the gap between world and domestic commodity prices for major markets for industrial countries during 1975-94 and found that while upward movement in world price were clearly passed through in the domestic prices, downward movements were not. Comparison for both upward and downward adjustment indicates that the median value of the elasticities of consumer prices with respect to changes in world prices exceeds 0.25 when the world prices were increasing and reaches only 0.05 as those prices were decreasing.

In analyzing the commodity markets in most Sub Saharan African countries, Godfred (1984) concluded that greater emphasis should be placed on diversification from commodities with low income elasticity to high income elasticity products rather than expansion of output. Whiles Panagariya and Schiff (1990) in a latter paper observed that an increase in the productivity would increase profits in those countries but others would lose but African countries in general would gain from the expansion in productivity.

In the work of the studies reviewed, government policy was considered as influential in the behavior of producer prices and returns especially in those countries where domestic prices were controlled by the national authorities and input prices and credit costs were manipulated to influence production.

The price formation mechanism for cocoa to be sold is based on two delivery months from time of purchase of cocoa in the field. Export and local prices remain above Cocoa Board minimum prices, farmers and exporter's price risk will mostly be determined by fluctuations of the liassie fair (LIFFE) price, as the difference between the price that they receive and the LIFFE price tends to be relatively stable. In other words the basis risks for those involved in cocoa production and trade is quite small. Since the LIFFE price and Ghana fob prices are positively correlated.

As part of the Cocoa Price Risk Management Phase II Report (2000), the price risk project which was aimed at identifying the degree to which (based on the risks emerging) the farmers in Ghana need assistance in marketing the transition to an open economy and how they could benefit from having price protection available once the transition is made

found out that in order for a Liancesed Buying Company to pay its farmers higher prices it must exploit its market place niche.

2.3 HISTORICAL REVIEW

Ghana cocoa industry has gone through a lot of faces since 1950 with the level of production and prices being unstable as the years rolled. The level of production of cocoa is thus linked to the price of production as can be seen from in Figure 2.3

<u>Figure 2.3 Ghana Cocoa Production and Prices (1960-2004)</u>

Figure 1: Ghana Cocoa Production and Prices
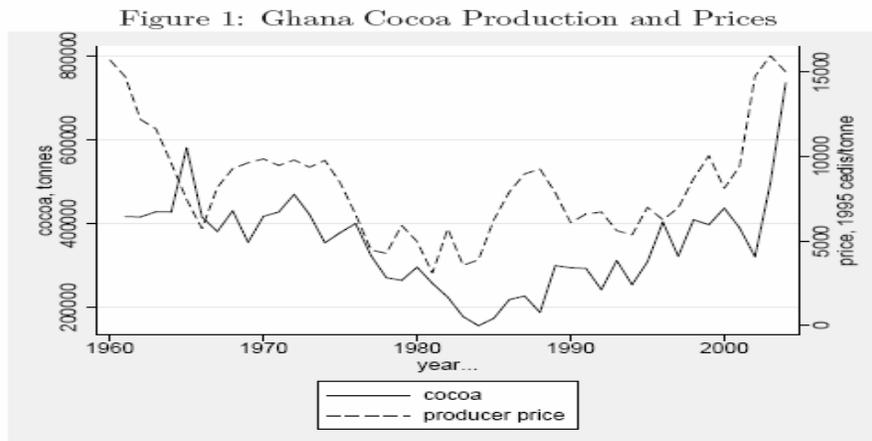
Source: Output, International Cocoa Organization (2003/04);
Prices, Ghana Cocoa Board.

The review captures the case of pricing system since 1950 till 2004 and this is divided in sub-period reviews.

2.3.1 1949- 1957 SUB PERIOD REVIEW

Cocoa producer price realised during the this period were highly variable on season averages; it increased sharply from a low of 85 pounds per ton in 1949 to 149.3 in 1951 falling to 130.5 in 1953 and recovered to 149.2 by 1956. The average producer price

43

within the period was 132.9 pounds. This was below the world price average which was 261.4 pounds. The percentage of value of sales paid to farmers rose from a low of 46% to 78% by 1956 but this fell sharply in 1957 to 44% after independence with an average of 52.8%. Table 2.4 shows the average domestic (producer) price (pp) for the period 1949 to 1957.

Table 2.4 Average Producer Price of Cocoa in Ghana

Year	1949	1950	1951	1952	1953	1954	1955	1956	1957
Average pp	84	130.7	149.3	130.5	134.4	135	148.5	149.2	134.2

Source: Rimmer Douglas, "Staying Poor Ghana Political Economy 1950- 1990"

2.3.2 1958- 1965 SUB PERIOD REVIEW

There was a continuous decline in the domestic price within this period, thus the producer price fell to a low of 74.7 Ghana pounds in 1965 with the initial price of 134.2 in 1958. The average domestic price was low at 107.6 Ghana pounds as compared to the period 1949- 1957 period. The average world price of cocoa within this period was on a decline with an average of   201.3. Thus one can conclude that the lower producer price was as a result of the fall in world price. Table 2.5 shows the average domestic (producer) price (pp) for the period 1958 to 1965.

Table 2.5 Average Producer Price of Cocoa in Ghana

Year	1958	1959	1960	1961	1962	1963	1964	1965
Average pp	134.2	131.9	112.2	112	100.8	100.8	100.8	100.8

Source: Rimmer Douglas, "Staying Poor Ghana Political Economy 1950- 1990"

2.3.3 1966- 1972 SUB PERIOD REVIEW

The trend of the domestic price within this period was directly opposite to the period 1958- 1966. There was an increase in the producer price for the various years moving from 149 cedis per ton to a high of 308 cedis per ton by the end of the cocoa season in 1972 with a period average of 249.6 ceids per ton. Also the world price was rising from 392 cedis in 1966 to a high of 1034 cedis in 1970 before falling to 579 by the close of the season in 1971. Table 2.6 shows the average domestic (producer) price (pp) for the period 1966 to 1972.

Table 2.6 Average Producer Price of Cocoa in Ghana

Year crop year	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72
Average pp	149	173	250	269	299	299	308

Source: Rimmer Douglas, "Staying Poor Ghana Political Economy 1950- 1990"

2.3.4 1973- 1983 SUB PERIOD REVIEW

The average producer price recorded within this period is 3247 cedis with a high of 12000 cedis in 1983 and a low of 293 cedis in 1971. From 1971 to 1983 the producer price of cocoa did not fall any longer, it continued to experience an increase almost every year with the lowest being the price of the following year.

Between this period, farmers' share of value of exports fell considerably to a low of 27% of the value of 2298 million cedis in 1978. This increased sharply to 198% in 1982 due to government intervention although the total value of sales was 1237 million cedis. Table 2.7 shows the average domestic (producer) price (pp) for the period 1973 to 1983.

Table 2.7 Average Producer Price of Cocoa in Ghana

Crop Year	71	72	73	74	75	76	77	78	79	80	81	82
Average producer price	293	366	439	549	585	732	1333	2667	4000	4000	12000	1200

Source: Rimmer Douglas, "Staying Poor Ghana Political Economy 1950- 1990"

2.3.5 1983- 2004 SUB PERIOD

Within the period of study, the average producer price paid to farmers is about 2,133,509.09 cedis. Prices within this period are either stable or increasing slightly above previous years share price. Thus, the highest price within the period was 9,000,000 cedis in 2004 with the lowest of 20,000 cedis being in the year, 1983. The percentage increase in the producer price of cocoa was about 449%, although this did not take into cognisance the inflation and exchange rate regimes switch within the period. Also the world price of cocoa fell by 18.5%. Table 2.8 depicts the average domestic (producer) price (pp) for the period 1973 to 1983.

Table 2.8 Average Producer Price of Cocoa in Ghana

Year	83	84	85	86	87	88	89	90	91
Average producer price (000s)	20	30	56.6	85	150	165	174	224	251

Year	92	93	94	95	96	97	98	00	01	02	03	04
Average producer price (000s	258	308	700	840	1200	1800	2250	3475	6200	8500	9000	9000

Source: Various editions of State of the Ghanaian Economy ISSER (1992-2005)

CHAPTER 3

METHODOLOGY AND CONCEPTUAL FRAMEWORK

The purpose of this chapter is to provide the model and the inherent conceptual framework upon which the empirical estimation is based. The first part of the chapter deals with the export supply relation of cocoa in Ghana in order to establish the correlation between the producer price and world price and also find the extent to which the domestic price affects export supply of cocoa. Coleman, Akiyama and Varangis (1993) original domestic price model and its modified version were also conceptualised in the next two sections. The author then proceeded to define the various variables used and to provide the estimation procedure in the last two sections respectively.

3.1 COCOA EXPORT SUPPLY RELATION FOR GHANA

The following export supply function is considered in the process of the study:

$$Xs = f\,(WP_t,\ WP_{t\text{-}1},\ DP_{t\text{-}1}) \quad \text{\textemdash\textemdash\textemdash} \quad (1)$$

Where

Xs = Export Supply

WP_t = World Price of Cocoa at Current level

$WP_{t\text{-}1}$ = World Price of Cocoa at previous years level

$DP_{t\text{-}1}$ = Domestic Price of Cocoa at previous years level

The intent as stated above was to determine the degree of correlation between the world producer price so as to be able to appreciate the relationship between the world and domestic (producer) price of cocoa and their export implications.

In order to develop the model, we checked whether the world price and producer prices are significant in determining factors of export supply of cocoa in Ghana. This is done by conducting a simple ordinary Least Square (OLS) regression analysis using the export supply as a function of the world price and the producer price which are also lagged by a year.

The first independent variable WP_t represents the stock depletion; whiles WP_{t-1} represents adjustment of the world price to previous year's world price which would have more impact on the supply. Also the lag of the producer price (P_{t-1}) represents the adjustment term. One expects that the lag producer price would have a little impact on export supply. Thus the amount of cocoa that is exported by the cocoa marketing company is expected to depend positively on the world price both current and lag. Though the real producer price is critical in determining the growth of output because of its role in profitability of production, it is expected that current years prices will not have an effect on export supply but previous years producer prices will have less effect on export supply, since the export of cocoa is handled by a different unit within the cocoa sector set up in Ghana

The operational model used in the study for the export supply function was the same as in equation (1)

48

3.2 THE DOMESITC PRICE RELATION BASED ON COLEMAN, AKIYAMA AND VARANGIS (1993) MODEL

The relevant equation of domestic price of cocoa used by Coleman, Akiyama and Varangis (1993) was formulated as

$$DP_t = f(WP_t / ER_t, CPI_t); \; \text{————————} \quad (2)$$

Where WP_t and DP_t has been already defined in the previous sub section of this chapter and

$$ER_t = \text{Current Exchange Rate}$$

$$CPI_t = \text{Consumer Price Index}$$

The non linear specification of Coleman, Akiyama and Varangis (1993) original model was used to estimate the long run function for Ghana in this study. The short run relationship was also estimated using the Johansens Cointegration technique.

3.6 THE MODIFIED VERSION OF COLEMAN, AKIYAMA AND VARANGIS (1993) MODEL

Coleman, Akiyama, Varangis (1993) original model was modified by the introduction of a dummy variable (PDV) to represent the impact of political and institutional factors on domestic price of cocoa in Ghana. The essence, for example, was to find out whether a change in different type of government results in a producer price change; irrespective of the world price, inflationary rate or the exchange rate; and how significant such change would be?

Thus the operational model used is

$$DP_t = f (WP_t/ER_t, CPI_t, PDV) \quad\text{————————}\quad (3)$$

Where DP_t, WP_t, ER_t and CPI_t have been defined in the previous sections and

PDV = Political Dummy Variable (representing institutional, legal political, structural and other factors) which have been defined later in the chapter. Equation (3) is estimated for Ghana using the error correction model based on prior test for co-integration and the stationarity of the variables.

This implies that coefficients or the linear functions represent marginals while that of the power function would be elasticity's measuring the degree of responsiveness of the producer price to the changes in the independent variables.

3.4 DEFINITION OF VARIABLES USED IN THE MODELS

Export Supply (Xs)

This represents the total amount of cocoa the country Ghana is willing and able to sell outside the country to other countries. Majority of the cocoa produced within the country is exported to various countries most especially European countries. The amount of cocoa products used and consumed locally is not part of this bracket of export supply. That is cocoa purchased by the Cocoa Processing Company and other small scale producers of cocoa products. Export of cocoa provides one of the main sources of foreign exchange, government revenue and employment. Cocoa is exported by the marketing board, who purchase the supply of cocoa from the Licensed Buying Companies who then serve as middle men. Thus the amount exported in relation to the world price is determined by the government agencies. The export supply is then the quantity of cocoa output exported.

Domestic Price (DP)

The domestic price of cocoa is the same as the producer price of cocoa.

For the purpose of this study, the starting point is the recognition that for an average producer, the real producer price of the commodity, also referred to as the commodity domestic terms of trade, is the most relevant domestic price in the production decision making process. Analytically, the real producer price of any product and for that matter cocoa in a given year is the outcome of several influences including domestic and external factors. It is therefore useful to decompose the movement of the relative price over a given period into factors determined by world market and those related to domestic policies. To this end let the nominal producer price of cocoa be defined:

$$(1) \qquad\qquad DP_t = WP(ER)(1+t)(1-m)$$

where

DP = the domestic price;

WP = the world price;

ER = the nominal exchange rate;

t = the implicit export tax rate on the commodity; and

m = the marketing margin that makes P and P* comparable

Considering that the marketing margin reflects normal transport costs and normal (competitive) profits, one can follow the assumption commonly used in the analysis of the movement of commodity prices that the marketing margin (*m*) remains relatively

constant over time (Quiroz and Valdes 1993; Elbadawi 1994; Baustista and Gehlhar 1994). In this case, the marketing margin can be set equal to zero. The expression (1) becomes:

(2) $DP = WP(ER)(1+t)$

It is established that what matters for a producer is not the nominal price, but the relative price of the product. Expression (2) can then be written as follows:

(3) $DP = (WP) \, RER \, NPC$

Where NPC is the norminal protection co efficient

The domestic price quoted at the beginning of the crop year is used in estimating the functions. The crop year for cocoa, spans from October (previous year) to September (following year). Since the domestic price is determined by the controlling authority, the price used in the regression is nominal producer price.

World Price of Cocoa (WP)

The movement of real world price of a tradable commodity like cocoa is, in the case of a small country, solely determined by world market developments. There is little a small country can do to affect the level of foreign terms of trade of its primary commodities and for that matter the world price of cocoa. Actions followed in the process of economic development include: (1) the promotion of processing of primary commodities into semi-finished and/or finished products which have a high value added; and (2) the improvement of resource productivity, among others. These and other actions help the

country to stay competitive even in the face of declining and unstable foreign terms of trade of its primary products (Tshikala B. Tshibaka, 2004). Thus the world price of cocoa is not determined locally but by foreign commodity markets buyers who process the cocoa into various products and this represents the spot price of cocoa.

However, government sells cocoa at a future price. Futures prices are determined through a bid system at a public commodity exchange. In its most simplistic sense, the futures market allows buyers and sellers to come together to publicly discover what one is willing to pay for a commodity and what the other is willing to sell it at, at some time in the future. Prices rise if domestic and/or international indicators suggest there will be a shortage or improved demand, and prices will fall if oversupply or decreased demand is expected. In Ghana, the future price of cocoa is negotiated by the cocoa marketing company on behalf of government with a promise to supply output at that price at a given date. This price helps to hedge against fluctuating world prices.

The study used the end of crop year spot price quoted by the International Cocoa Organisation (ICCO) for the estimation of the various regressions.

Exchange Rate (ER)

The second term in the independent variable is the exchange rate. This refers to the price of the local currency the cedi and other foreign currencies we are using in this study. The change in this second component is partly affected by government policies and by the

external shocks operating through the foreign terms of trade and international capital movements (inflows of foreign financial resources).

The real exchange rate plays an intermediary role in transmitting the price effects of domestic and macroeconomic policies and external factors to tradable goods production. In the theoretical and empirical literature, the changes in real exchange rate are often explained by changes in broad categories of variables known as long-run and short-run determinants (Edwards 1989). The long-run fundamentals of the real exchange rate are found to include mainly the country's external terms of trade, trade policies, capital flows, government consumption and technological or productivity change. The short-run determinants are found to include primarily the nominal exchange rate and monetary growth.

The study used the end of year average exchange as a variable in the estimation of the regression. The world price was deflatored by using the year on year exchange rate.

Consumer Price Index (CPI)

CPI is an inflationary indicator that measures the change in the cost of a fixed basket of products and services, including housing, electricity, food, and transportation. Thus inflation represents the rate of increase of the general price level within the country. There are various sources of inflation and economic theory suggests alternative views to explaining the sources of inflation. A first view is associated with the monetarist school, according to which the main cause of inflation lies in expansions of the money supply in

excess of real productivity growth. A second view focuses on the external factors that affect the domestic price level in an open economy, either through the transmission of import prices inflation in foreign currency terms into domestic inflation, or through the influence of the exchange rate on prices (via prices of imported intermediate and final goods). A third view lays emphasis on internal theories, which may be further subdivided into labour market theories and excess demand theories. The former highlights the role of the wage, being the result of labour demand and supply interactions, as a component of producers' costs, while the latter refers to excess demand pressure effects.

Consumer price index is the general method used in Ghana for calculating the level of prices, though the alternative GDP deflator is also used for measuring price level in Ghana. For this study, the 1995 base year CPI as an independent variable is used.

Political Dummy Variable (PDV)

The direct expression of government specific commodity policies, institutional and structural deficiencies is captured in this variable. Apart from the marketing and tax policies undertaken by the government to ensure the stabilization and growth of the economy institutional and structural factors play an important role in development process within an economy.

Change in government and for that matter political regimes results in a change in government commodity policy, institutional and structural developments.

Inadequate development of marketing infrastructure and institutions leads to high marketing costs for both tradables and non-tradables (Tshikala B. Tshibala, 2004).

It is also important to note that, in most African countries, the marketing costs include a large share of transport costs. The level of these transport costs are not only a function of development of infrastructure, but also a function of import policy and regulation related to transport equipment as well as fiscal policies (fuel taxes, etc.).

Since these are not directly handled by farmers this cost element is born by the government and the availability of good roads, store houses and other infrastructural developments are as a result of government policy which depends on the political climate pertaining in the country. It is therefore assumed, that enough resources are channeled to these areas if there is stability within the country.

What is particularly important to stress is that an improvement in the nominal protection coefficient over time suggests that there has been significant improvement in marketing infrastructure, institutions, legal framework, price and commodity-specific trade policies. Conclusively, the importance of the infrastructure, services, and institutions in the development process cannot be over-emphasized. Removing structural, institutional, legal and policy deficiencies that constrain economic agents to perform various marketing and other economic functions, remains one of the key actions government must undertake.

To capture the impact of a change in the political regime on the domestic price of cocoa in Ghana, the dummy variable PDV as defined earlier in the paper is used. This dummy measures the shift of the function over time where the constant intercept changes in different periods, while the coefficients remain constant. The dummy 1 was used to indicate the period under military regime which represents a period of instability. Within

this period, government policies and other institutional factors are assumed not to function well due to instability. This implies that the dummy 0 as used indicated the period under civilian regime which is assumed to be a stable period.

3.5 TEST AND ESTIMATION PROCEDURES

Causality Tests

Granger causality test is done to explain the nature of causality and this would be done under the following assumptions:

1. The future cannot cause the past-rather, the past causes the future
2. Detection of causality is only possible between two stochastic processes

Theses assumptions then make for estimating the following regressions for Granger Causality, where the variables are A, B and the disturbance terms, U_{1t} and U_{2t} are uncorrelated.

$$B_t = \sum_{i=1}^{n} \alpha_i A_{t-i} + \sum_{j=1}^{n} \beta_j B_{t-j} + U_{1t} \qquad \text{(a)}$$

$$A_t = \sum_{i=1}^{m} \lambda_i A_{t-i} + \sum_{j=1}^{m} \delta_j B_{t-j} + U_{2t} \qquad \text{(b)}$$

Equation (a) states that current B is related to past values of B as well as that of A and a similar reasoning is captured in (b). From both equations, four cases can be isolated;

i. unidirectional causality from A to B if the estimated coefficients on the lagged A in (a) are statistically different from zero as a group, and the set of estimated coefficients on the lagged B in (b) is not statistically different from zero.

ii. unidirectional causality from B to A if the set of lagged A coefficients in (a) is not statistically different from zero, and the set of lagged B coefficients in (b) is statistically different from zero.

iii. Feedback or bilateral causality when the set of A and B coefficients are statistically different from zero in both regressions

iv. Statistical independence when the sets of A and B coefficients are not statistically in both regressions – see Gujarati (1988)

Tests for Stationarity

The formulation of the domestic price equations suggests the need to employ time series variables for their empirical estimations. However, most macroeconomic time series data exhibit a characteristic of non-stationarity (Enders, 1995). A series is said to be non stationary if its mean, variance and other moments are invariant with respect to time. This study follows existing series using the Augmented Dickey Fuller (ADF) test. According to this test, a time series X_t is non stationary if $\beta=1$ in the following autoregressive function:

$$X_t = \alpha_0 + \alpha_1 t + \beta X_{t-1} + \sum_{j=2}^{n} \gamma_j X_{t-j} + \varepsilon_t \qquad \text{(c)}$$

To perform the ADF test effectively, the Akaike and Schwartz properties as well as the associated DW statistics of each of the variables under consideration is examined to find out which lag level to use in performing this test on each variable. The Dickey and Fuller (1981) F- statistic is also employed to find out whether or not to include an intercept term, α_0 and a trend term, α_1 (as in equation c) in performing the ADF test for stationarity of each of the series under consideration. Thus the stationarity property of the price time series is determined by using the ADF to test whether the model has a unit root. In each case we test the hypothesis that:

H_o: the variables contain unit root

H_1: the variables do not contain unit root

Rejecting the null hypothesis allows us to treat the time-series as stationary.

Co-integration Test

The study used the Johansen's (1995) procedure to test for co-integration. Since some or all of the variables in the equation might be non-stationary we started the econometric analysis by using Johansen.s (1988, 1995) procedure to test for co-integration, and whether some individual variables are stationary.

Hence, the long run cointegration relationship between the producer price and the other variables is found by using the Johansen (1995) approach. Thus the static long run model is given as after the normalisation of the variables.

This is given as:

$$lnDP_t = \beta_0 + \beta_1 lnWPt + \beta_2 lnCPI_t$$

Eigen Test was used to show if the variables under study are cointegrated and invariably find out a long run relationship exist between them. The number of cointegrating equations is tested using the maximum likelihood test statistic under the eigen test.

The Vector Error Correction Model

A vector error correction (VEC) model is a restricted VAR that has cointegration restrictions built into the specification, so that it is designed for use with nonstationary series that are known to be cointegrated. The VEC specification restricts the long-run behaviour of the endogenous variables to converge to their cointegrating relationships while allowing a wide range of short-run dynamics. The cointegration term is known as the error correction term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments.

The short-run dynamic model via the error correction mechanism is tested and this method involves estimating the model using the variables in their first differences using appropriate lag lengths. The choice of lags in the model is selected by either the Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC) or the Hannan -Quinn Information Criterion. Thus the following vector error correction model capturing the short-run coefficients will be estimated using OLS

$$\Delta InDP_t = \alpha_o + \alpha_1\Delta InDP_{t-i} + \alpha_2\Delta In\ (WP_{t-i}/ER_{t-i}) + \alpha_3\Delta InCPI_{t-i} + \alpha_5ECT_{t-i} + \varepsilon_t$$

The coefficient of the parameters α_1 α_2 α_3 represents how much of the given change in the independent variables would be transmitted to the domestic price within the i period that is the initial adjustment term.

Where all the variables have previously been defined except ECT which represents the error correction term. Thus the coefficient α_5 captures the disequilibrium in the system following a long-run equilibrium after the shock (Δ = change in the variable).

The author used E-views software to estimate the regression. The study used secondary data for the period from 1983 to 2004. Data was sourced from International Monetary Fund, World Bank, Bank of Ghana's Statistical Bulletin, Ghana Cocoa Survey and International Cocoa Organisation.

CHAPTER 4

RESULTS, DISCUSSIONS AND ANALYSIS

This chapter presents regression results conducted and also deals with the discussion of the various outcomes of the results.

4.1 RESULTS AND ANALYSIS OF THE EXPORT SUPPLY EQUATION

In estimating the producer price the author first estimated the export supply using the world price, its lag and the lag of domestic prices as independent variables. The rational for this analysis is to see if the domestic price matters in the overall export supply of cocoa. We see in table 4.1 the relation between the export supply function and its determinants: the lag of domestic price and the world price and its lag. The table represents the results of the analysis conducted on the export supply function.

Table 4.1 Results of Export Supply Equation for Ghana (1983-2004)

Variable	Coefficient	Std. Error	t-Statistic
Constant	299.4053	46.37951	6.455551
DP_{t-1}	3.05E-05	4.16E-06	7.316541
WP_t	-0.153406	0.043988	-3.487436
WP_{t-1}	0.101535	0.043410	2.338961

$R^2 = 0.785757$ Adjusted $R^2 = 0.747949$ DW = 1.663442

F = 20.78299

The world price and producer price had a great effect on the export supply of cocoa. This is due to the fact that the amount of cocoa exported though depends largely on output and government stock accumulation the amount of cocoa exported has been increasing since 1983 despite the volatility of the world price and the stable nature of the producer price looking at the data. From the table above, the R-square of 0.785757 shows that the explanatory variables in the export supply equation explains about 79% of total variation in export supply. Also, the F statistic of 20.78299 is statistically significant at 5 percent level indicating that all the right hand-side variables jointly explain variations in the export supply. Generally, the model under discussion performs well.

The current domestic price was not significant and had no influence on the export supply and thus its exclusion from the model. This is due to the fact that producers are not directly involved in the export supply of cocoa in Ghana. Also, the previous years domestic price (DP_{t-1}) matters only little in the export supply process though significant. This is explained in the price control that largely characterised the sample period. Thus cocoa price determination does not follow the basic rule of demand and supply.

But the world price played a significant role in determining the export supply both current and lag although the sign of the current price is negative. The current world price (WP) had a negative effect (-0.15) on the export supply as seen from the table 4.1 above; this may be due to the fact that government may withhold supply of cocoa to the world market expecting an improvement in the world price the following year. Also, there is the speculation that the cocoa is smuggled out of the country to neighbouring Cote d'voire

and Togo by farmers and even Licensed Buying Companies (LBCs') with expectation of higher profits coupled with poor supply management techniques. A fall in world price should result in a decrease in quantity of cocoa supplied for export but export supply keeps on increasing even with the fall in price. This could be attributed to the high volatility nature of the world prices, governments try to increase supply to cater for the decrease in prices and this is synonymous with Cocoa Producer's Alliance countries (Brazil, Cameroon, Cote d'Ivoire, Dominican Republic, Ecuador, Gabon, Ghana, Malaysia, Mexico, Nigeria, Sao Tom and Principe, Togo, Trinidad and Tobago) that, there is the oversupply of cocoa in the world market Stainer (1999). From the table above, the current export supply of cocoa would increase by a ratio of 0.10 tonnes if there is an increase in the world price of cocoa the previous year.

The correlation coefficient between producer price and the world price of cocoa is -0.220 implying a negative correlation between the producer price and the world price of cocoa. Thus the producer price and the world price move in opposite direction and the degree of movement is very low. An increase in the world price would result in a decrease in the producer price. The correlation coefficient was significant at 5%.

This supports the argument made that because of heterogeneity in commodities and variations in market-generated transportation margins we will not expect to see perfect correlation between world prices and any country's domestic prices no matter what trade policies are followed (Baffers and Gardner 2003).

4.2 RESULTS AND ANALYSIS BASED ON COLEMAN ET AL. (1993) ORIGINAL MODEL

The results of the vector error correction model specification based on Coleman's (1993) model are shown in table 4.2 below. As seen from the table, the R-square statistic of 0.927743 indicates that the explanatory variables in the domestic price of cocoa equation explain about 93% of the total variation in domestic price.

From the table below, one could observe that the exchange rate as a deflator within Coleman et al (1993) was dropped and therefore did not reflect the original model of equation (2) in previous chapter. The exchange rate as a deflator rendered the whole equation insignificant and distorted the signs of the expected results especially for the world price, consumer price and the error correction terms within the system of equations. This can be seen in appendix 2. Coleman et el used data ranging from 1966 to 1981 for Ghana and to 1985 for Nigeria and exchange rate within this period were fixed by the central banks of the various countries and the currency was overvalued. From 1983 and 1986, the currency was greatly devalued and later on depreciated respectively thus causing its use as a deflator very insignificant within the model.

As can be seen from the table 4.2 below, the world price change ($\Delta LnWP_{t-2}$) becomes significant at 5 per cent level after it has been lagged within two years as shown by the t-statistic of 2.01563. This indicates that a given change in world price of cocoa is transmitted to the domestic price in the two years by an amount of 0.525. As can be observed from the table 4.2 below, there is a positive relation between world price and

the domestic price of cocoa in Ghana. Implying that, an increase in the world price of cocoa would result in an increase in the domestic price of cocoa.

Table 4.2: Producer Price of Cocoa Function for Ghana (1983-2004) based on Coleman et al (1993) Original Model

Variables	coefficient	standard error	t-statistics
Constant	0.334346	(0.16295)	[2.05178]
$\Delta Ln\ (DP)_{t-1}$	0.463347	(0.16331)	[2.83725]
$\Delta Ln\ (WP)_{t-2}$	0.525534	(0.26073)	[2.01563]
$\Delta Ln\ (CPI)_{t-1}$	0.234970	(0.32555)	[0.72177]
ECT	- 0.066183	(0.01593)	[4.15531]

R square	0.927743	Mean dependent	0.259018
Adjusted R square	0.824519	S.D. dependent	0.231441
Sum square residual	0.065798		
S.E.E.	0.096952		
F	8.987643		

The consumer price index is not significant at 5 percent level although it possesses a positive sign in showing the responsiveness of the domestic price to it as seen in Table 4.2 above. The positive sign implies that an increase in consumer price index would

result in an increase in the domestic price of cocoa and this is consistent with the work done by Coleman et al (1993) and more importantly economic theory. The consumer price index captures the domestic rigidities within the country.

The error correction term and the change in the lag of the domestic variable are significant as represented by its significant t-statistic of 4.15531 and 2.83725 at 5 percent respectively. The speed of adjustment of the domestic price to its long run equilibrium level is about 6 percent a year.

As compared with Coleman's et al (1993) results, the cointegration technique took into cognisance the lag of the previous years domestic price which was significant and had a positive sign in the determination of the domestic price.

4.3 RESULTS AND ANALYSIS BASED ON MODIFIED VERSION OF COLEMAN, ET AL (1993) MODEL

In this section, an analysis of the short run effects, with the purpose of imposing a structural break (the inclusion of the dummy variable) is undertaken and this represents the main thrust of the work. In line with the vector error correction framework used here, the general structure of the short run with its respective coefficient values are presented in Table 4.3 below.

As seen from Table 4.3 below, the R-square statistic of 0.995197 reveals that the independent variables in the domestic price equation under discussion explain about 99

per cent of the total variation in the domestic price of cocoa in Ghana. Thus, there is an improvement in the coefficient of determination from 93% to 99%. Also, an F-Statistic of 113.0116 is statistically significant at 5 percent level indicating that all the right hand side variables jointly explain variations in the domestic price of cocoa. Generally, the model under discussion performs well.

Looking at Table 4.3 below, the dummy variable exerts much influence on the domestic price when introduced into the model. As shown below there is a positive relation between the stability of the country captured in the dummy and the domestic price of cocoa. This is also significant as represented by a high t-static which is significant at 5 percent level. Why this change and improvement? Within a stable environment, governments are held more accountable to the use of resources generated. The relationship between democratic environments and these variables provided an avenue for monitoring and scrutiny of policies and structural changes implemented. As reported in the Cocoa Market Report (2002), good access to technical assistance, inputs, credit, transportation, and marketing information are also critical for ensuring that small farmers get a good price for their products. They are also necessary conditions for improving yields, quality of production and processing capacities at the farm level. Conversely, taxation at local and national levels, can also place a heavy burden on small farmers, as can regulations that prevent competition between intermediaries along the supply chain (such as trade or export licenses for instance) or discourage the creation of strong producers' associations. With a strong dummy coefficient of 0.618553, as can be observed from the table, one could conclude that there has been a general improvement in

these institutional factors and this has resulted in an improvement in the domestic price of cocoa.

The coefficient of the error correction term recorded in Table 4.3 is significant at 1 percent level as shown by the t-statistic. Thus, after a deviation, there is an improvement in the overall speed of adjustment in restoring the long run relationship to equilibrium from a low of 6 percent without a dummy to 30 percent with the introduction of a dummy. This agrees with other findings reported by Baffers and Gardner (2003) though his reform date was 1983. Thus, the shift from an unstable political system to a stable political system resulted in an increase in the speed of adjustment. From 1993, there was a major restructuring of Cocoa Board and this was part of the plan to increase farmer's share of world price and this took effect from 1994 with about 110% increase in the producer price of cocoa.

The introduction of political dummy variable (PDV) in 1993 actually improve upon the fit of the regression from R^2=0.89 from the original Akiyama et al (1984) model to R^2=0.986 for the modified Coleman et al (1993) model for Ghana.

Although several authors stress that policies impede the extent of price transmission (see for example Mundlak and Larson, 1992; Quiroz and Soto, 1996; Baffes and Ajwad, 2001; Abdulai, 2000; Sharma, 2002),

Table 4.3: Results of Domestic Price of Cocoa function for Ghana (1983-2004) Based on Modified Version of Coleman et al (1993) Model

Variables	coefficient	standard error	t-statistics
C	0.273710	(0.04635)	[5.90544]
ΔLn (DP) $_{t\text{-}1}$	0.370429	(0.05740)	[6.45331]
ΔLn (WP) $_{t\text{-}1}$	0.142249	(0.07185)	[1.97974]
ΔLn (CPI) $_{t\text{-}3}$	0.574207	(0.10875)	[5.28030]
Dummy	0.618553	(0.04968)	[12.4502]
ECT	- 0.300486	(0.01824)	[16.4736]

R square	0.995197	Mean dependent	0.259018
Adjusted R square	0.986390	S.D. dependent	0.231441
Sum square residual	0.004374		
S.E. E	0.027000		
F	113.0116		

it should be noted that other reasons such as high transaction costs and other distortions may also be the cause for slow adjustment but there is a general increase in adjustment if the policies are adopted within a stable political environment.

From Table 4.3 above, consumer price index variable followed the expected positive sign (0.57420) after a three year adjustment period and was very significant in the regression

equation. The positive sign of the consumer price index agrees with Colemans' (1993) specification but the effect is seen after three years which is an indication of the rigidities within the system.

Also, the world price change variable maintained the expected sign and it is very significant at 5 percent significant level when lagged once as shown by its t-statistic in the regression equation. Thus although there is an improvement in share of world price to the domestic price as a result of stable condition, government continuous involvement in the fixing of domestic price and marketing of cocoa is still very much an influence on the domestic price.

Subtly captured is the fact that processing which is controlled by powerful multinationals, with their retail outlets concentrated in the hands of supermarket chains; means that corporations can use monopolistic buying practices to artificially inflate prices. This in turn reduces demand for cocoa, contributes to excess supply and which is supposed to exert a downward pressure on producer prices.

As stated early in section 4.2, the exchange rate variable is dropped from the model since it is not significant in determining the domestic price of cocoa in Ghana.

4.4   RESULTS OF THE HYPOTHESIS TESTS

The hypotheses results were obtained based on results in tables 4.1 and 4.2 representing the export supply of cocoa and domestic price of cocoa equations, respectively

The first set of hypotheses that,

H_0: Export supply of cocoa does not depend on domestic price of cocoa in Ghana was rejected at 5 percent significant level implying that the counter or alternative hypothesis that export supply of cocoa depends on domestic price of cocoa was accepted. Indeed there was a positive causal and significant relationship between export supply and previous level of domestic price of cocoa. The result thus indicated that export supply adjustments in relation to the domestic price plays a significant role in the determination of export supply of cocoa in Ghana.

The second set of hypotheses which involved the domestic price and its independent variables are shown below;

Firstly, the hypothesis

ii H_0: There is no significant difference between the world and producer
          prices

was accepted at 5 percent significant level. This result was derived from the coefficient of the vector error correction model as can be observed from table 4.3 above.

Secondly, the hypothesis

iii. H_0: The producer price is independent of the general domestic price level i.e. consumer price index (iii) was rejected at 5 percent significant level (Table 4.3, the coefficient of the consumer price index).

Lastly the hypothesis

iv.   Ho: The domestic price of cocoa is independent of institutional and political

factors

is rejected at 5 percent significant level. This shows, the alternative hypothesis of the

domestic price being dependent on institutional and political factors is accepted. Thus the

role of government institutions, agencies and a stable political atmosphere in the fixing of

the domestic price is very much evident. This can be seen from the table 4.3.

4.5 RESULTS OF OTHER STATISTICAL TESTS

Stationarity test for the variables

Table 4.4 presents the results of the Augmented Dickey Fuller test statistic for unit root

test for all the variables in their level form and first difference forms (both in linear and

non linear form). A unit root test was conducted on the various variables to ascertain

whether they are stationary. The tests was performed with and without a time trend and a

constant term, including a maximum of 12 lagged differenced terms.

When applied to the differenced series, both tests reject the null, indicating that all price

series are integrated of order one I(1) as shown in table 4.4. The graphical representation

of the tabled properties is shown in Appendix 3.

Table 4.4: Results of the (Augmented Dickey Fuller) ADF Unit Root Test Statistic

Variable	t-statistic of ADF in levels	t-statistic of ADF in 1st difference	Order of integration
Xss	-1.532013	-2.798637***	I(1)
DPt	-0.564315	-2.529675**	I(1)
CPI	10.33262	-3.901321	I(1)
WPt	-0.682626	-0.4376226***	I(1)

*** t-statistic significant at one per cent level using McKinnon critical value of -2.679735

** t-statistic significant at five per cent level using McKinnon critical value of -1.958088

* t-statistic significant at ten per cent level using McKinnon critical value of -1.607830

Co integration Test

In separating the short run dynamics from the long run situation we employ the Johansen (1995) cointegration technique of estimation. The results in table 4.5 and 4.9 for cocoa producer price, (both linearly and non linearly) have the maximal Eigen value indicating that there is one co-integration equation at both 1% and 5% critical values. It therefore means that the null hypothesis (K=0) of not having a co-integration would be rejected and the alternative hypothesis of having one (K=1) would be accepted. This implies that, the equation of interest is the relation between the producer price and the independent variables.

Table 4.9: Test for Number of Co-integrating Vectors Using Maximal Eigen Statistic

for the Non Linear Regression

Hypothesis		Eigen value	Trace Test statistic	5%critical value	1% critical value
Null	Alternative				
K=0	K=1**	0.722541	33.37748	24.31	29.75
K≤1	K=2	0.367685	9.017889	12.53	16.31
K≤2	K=3	0.016127	0.308913	3.84	6.51

*(**) denotes rejection of the hypothesis at 5% (1%) significance level

L.R. test indicates 1 co-integrating equations at 5% significance level.

Granger causality test (1983-2004)

Granger causality tests (reported in Appendix 2) on the export supply equation indicate unidirectional causality from each of the variables (domestic production price and world price) to export supply. The disparity between the lags at which unidirectional causality was noticed (fourth and second lags respectively) somewhat reflects the rigidities associated with domestic price setting behaviour.

Also, the Granger Causality tests for the domestic price equation similarly indicate a unidirectional causality from each of the independent variables to the dependent variable. Granger causality from the international to the domestic price indicates that policy makers in Ghana take the international price level into consideration when fixing the domestic price. The hypothesis of producer price Granger causing international price is

rejected for the period (1983-2004). This is consistent with work done by Alera Bulir (2003).

The domestic price of Cocoa Granger causes the export supply of cocoa in that, past values of domestic price irrespective of the prescence of other factors influences the export supply of cocoa. The four year rigidity period indicates the gestation period within which farmers respond to domestic price changes. And as such, the full impact of an increase in export supply, handled by Cocoa Marketing Board who purchase the cocoa from Lainsed Buying Company's will be realised in the forth year. Incentives for farmers to increase their yield within that period include the improvement in extension services (farm spraying, disease control) and replanting of high yielding hybrids (with short gestation period) on abandoned and new farms.

In summary, political stability plays a much significant role in the determination of domestic price as its inclusion in Coleman et al's (1993) model using vector error correction estimation procedure was significant.

CHAPTER 5

CONCLUSION

5.1 SUMMARY OF MAJOR FINDINGS OF THE STUDY

The examination of the process and time period of adjustments of real producer price in Ghana over the 1983-2004 period is the main contribution of this paper. Johansen's maximum likelihood cointegration approach is used to determine the causal relationship between producer price and world price, real exchange rate, inflation rate and dummy which represents the political change within the country and for that matter a change in policy. Once the presence of co integration was recognized, the relevant error correction model that incorporates the long run equilibrium relationship and the short run dynamics was estimated.

The empirical results of the study indicated the following major findings

1. the political dummy variable has a significant positive impact on the domestic price of cocoa. Therefore the stability of the country plays a major role in determining the producer price of cocoa. With a very high coefficient of 0.61 as observed in table 4.3 it would be agreed that domestic producer price of cocoa would increase within a stable and democratic environment. This buttresses the point made by Ales Bulir (2003) that reforms has led to a substantial reduction in smuggling of cocoa   from Ghana to neighbouring countries.

2. also, the speed of adjustment of the domestic price to its long run equilibrium position has greatly improved from 6 percent to 30 percent when the shift dummy variable was introduced. This shows that there is a great reduction in bottlenecks

3. a hypothesis test conducted suggest that export supply is not dependent on the initial domestic price but producers influence in the determinant of export supply would increase as we experience continuous political stability, as indicated by the impact of political dummy on the producer price of cocoa.

4. the study has revealed that there is a one way causality between the domestic price and world price of cocoa; this means that the world price granger causes the domestic price. In essence the world price exerted a positive influence on the domestic price but the error of structural significance was greater than 5%.

5. finally, the hypothesis of producer price being independent of the world price and general price level were rejected indicating that these factors play a major role in determining the producer price.

5.2 POLICY RECOMMENDATIONS OF THE STUDY

Based on these findings the following policy recommendations and suggestion for further research can be made;

1. the maintenance of a stable country is very crucial for the development of the cocoa sector in the country and efforts should be made to consolidate the democratic process within the country. The situation in Cote d'voire is a perfect example to be avoided in order to enhance, promote and increase the worth of farmers. Also, government intervention in the area of farm spraying, pest control

mechanisms, provision of fertilizers and other extension services are enhanced with a stable political environment.

2. economic indicators especially the consumer price index is stabilized in order to reduce the risk of volatile world prices.

3. the dependence of export supply on producer price is increasing with political stability,

4. While the specification is fairly standard, there is scope for alternative variable construction which perhaps studies the role of exchange rate more directly. Slightly different specifications could be attempted, and identifying restrictions imposed, to test the factors used to determine domestic price of cocoa in Ghana

5.3 LIMITATIONS OF THE STUDY

In conducting the study, several limitations were faced. Among the limitations include data availability, financing and access to journals. The process of getting data was very tedious and strenuous but in the long run relevant and required data were sourced to help undertake study.

Also the exchange rate as a deflator in data produced a spurious results thus making it very difficult to asses the impact of exchange rate on the domestic price of cocoa in Ghana.

5.4 CONCLUDING NOTE

The main objective of the study was to find out the main determinants of domestic price of cocoa in Ghana. Thus the major determinants of domestic price of cocoa in Ghana include the world price, inflation rate, exchange rate and changes in institutional factors which represent a core determinant. Institutional factors range from legal, (whose structure changes as the political regime changes)

BIBLIOGRAPHY:

ABDULAI, A. 2000. Spatial price transmission and asymmetry in the Ghanaian maize market" Journal of Development Economics, 63, 327-349.

AKIYAMA T., Duncan R. (1984), "Analysis of the World Cocoa Market" The World Bank

AKIYAMA T. and Trivedi, (1987), "Vintage Production Approach to Perennial Crop Supply," Journal of Econometrics

ALES Bulir (2003), "Can price Incentives to Smuggle Explain the Contraction of the Cocoa Supply in Ghana?" Journal of African Economics Volume 11

AQUAH B., (1999) "Cocoa Development of West Africa: The Early Period with Particular Reference to Ghana"

BAFFES J., Ajwad M. I. 2001. "Identifying price linkages: a review of the literature and an application to the world market of cotton." Applied Economics 33, 2001

BAFFES J., and Gardner B., (2002), "The Transmission of World Commodity Prices to Domestic Markets under Policy Reforms in Developing Countries", unpublished paper

BAWDEN D. Lee (1964) "An Evaluation of Alternative Spatial Models" Journal of Farm Economics, Vol. 46, No. 5, Proceedings Number. (Dec., 1964), pp. 1372-1379

COLEMAN R, Akiyama T., Varangis P. (1993) "How Policy Changes Affected Cocoa Sectors in Sub-Saharan African Countries" World Bank Working Paper Wps 1129

CONFORTI Piero and Rapsomanikis G. (2005) "Market Integration, Price Transmission and Import Surges" FAO Import Surge Project Working Paper

ENDERS, 1995. W. Enders. "Applied Econometric Time Series", Wiley, New York (1995).

ENGLE, Robert F. and C.W.J. Granger (1987) "Co-integration and Error Correction: Representation, Estimation, and Testing," Econometrica 55, 251–276.

FRANCIS Teal & Marcella Vigneri (2004) "Production changes in Ghana Cocoa Farming households under market reforms"

GUJARATI, Damodar N., (1988) Basic Econometrics, second edition. New York McGraw Hill

HALL B.J. and Hitch C. J. (1939), "Price Theory and Business Behavoir" Oxford Economic Papers, No. 2. , pp. 12-45.

JOHANSEN, Soren (1991) "Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models," Econometrica, 59, 1551–1580.

KIM Jaehong (2000) "Limit pricing through entry regulation" Journal of economics

KRIVONOS E., (2003), "The Impact of Coffee Reforms on Producer Prices and Price Transmission" unpublished paper

KOUTSOYIANNIS A. (2001), "Theory of Econometrics: An Introductory Exposition of Econometric Methods" Palgrave

LIPSEY, Chrystal (1999), "Principles of Economics" Ninth edition Oxford University Press

LIPSEY R. Harbury Colin (1992) "First Principles of Economics" Oxford University Press.

MODIGLIANI Franco (1958) "New Developments on the Oligopoly Front" The Journal of Political Economy, Vol. 66, No. 3. (Jun., 1958), pp. 215-232.

MORISSET J., (1998), "Unfair trade? The Increasing Gap between World and Domestic Prices in Commodity Markets during the Past 25 years." The World Bank Economic Review, vol 12,

MUNDLAK, Y., and Larson, D.F., (1992), "On the Transmission of World Agriculture Prices"

PASHIGIAN B. Peter (1968) "Limit Price and the Market Share of the Leading Firm" The Journal of Industrial Economics, Vol. 16, No. 3. (Jul., 1968), pp. 165-177.

PREBISCH, R., (1950), "The Economic Development of Latin America and its Principal Problems", New York: United Nations

RAPSOMANIKIS Goerge, Hallam David, Conforti Piero "Market Integration and Price Transmission in Selected Food and Cash Crop Markets of Developing Countries: Review and Application" Commodity Market Review 2003-2004, FAO Corporate Document Repository.

RIMMER, Douglas (1992) "Staying Poor Ghana Political Economy 1950- 1990" Pergamon Press for World Bank

SHARMA, R., 2003. The transmission of world price signals: the concept, issues and some evidence from Asian markets. FAO, Commodities and Trade Division, Rome

STAINER Robin (1999). Reform Roadblock? Coffee and Cocoa International,

YUSUF S. A. ,Edom C.A. (2007), "Determinants of Timber Exports in Nigeria: An Error Correction Model Approach" Munich Personal RePEc Archive Paper Number 2608

ZEITLIN A., (2006), "Market Structure and Productivity Growth in Ghanaian Cocoa Production" Centre of the Study of Africa Economics University of Oxford.

www.icco.org

www.cocobod.org

www.worldbank.org

www.unctad.org

 Encarta 2006

Ghana Poverty Reduction Strategy Paper (2003)

E-views 3.1 software

APPENDIX

Appendix 1: Export supply model is normally distributed.

Series: Residuals
Sample 1984 2004
Observations 21

Mean	-2.71E-14
Median	5.141775
Maximum	86.05294
Minimum	-83.09143
Std. Dev.	45.63029
Skewness	0.212853
Kurtosis	2.528393
Jarque-Bera	0.353183
Probability	0.838122
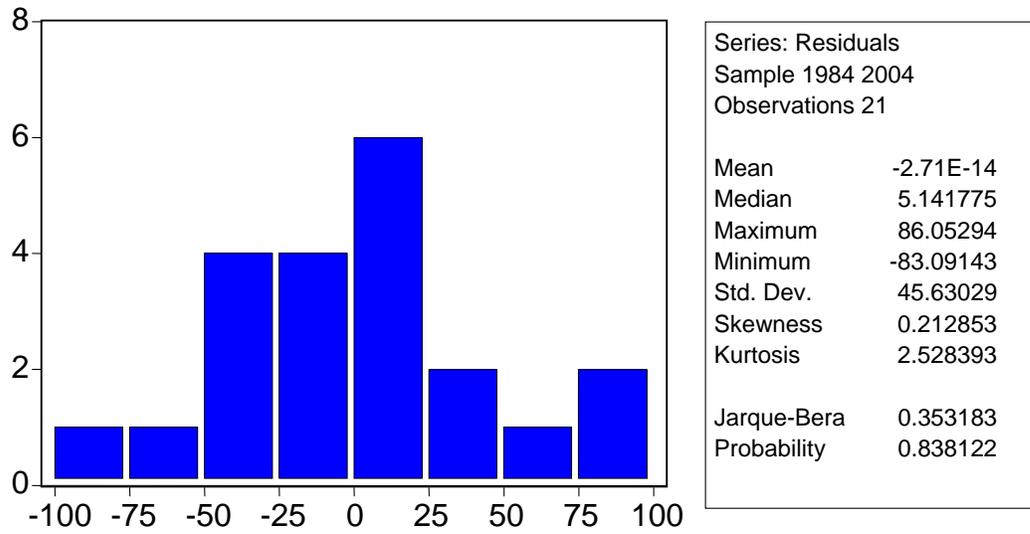
Appendix 2: Pairwise Granger Causality Tests

Pairwise Granger Causality Tests

Sample: 1983 2004
Lags: 4

Null Hypothesis:	Obs	F-Statistic	Probability
PRODPX does not Granger Cause EXPSS	18	12.6385	0.00098
EXPSS does not Granger Cause PRODPX		0.97829	0.46562

Pairwise Granger Causality Tests
Date: 10/15/07   Time: 20:22
Sample: 1983 2004
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
WPX does not Granger Cause EXPSS	20	5.69675	0.01444
EXPSS does not Granger Cause WPX		0.37583	0.69301

Pairwise Granger Causality Tests
Date: 10/15/07   Time: 20:32
Sample: 1983 2004
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Probability
WPX does not Granger Cause PRODPX	21	4.72727	0.04327
PRODPX does not Granger Cause WPX		0.34695	0.56316

Pairwise Granger Causality Tests
Date: 10/15/07   Time: 20:35
Sample: 1983 2004
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Probability
CPI does not Granger Cause PRODPX	21	5.88081	0.02605
PRODPX does not Granger Cause CPI		0.00047	0.98289