A STUDY OF CEREAL PRICE INTERRELATIONSHIPS ACROSS MARKETS AND COMMODITIES AT THE WHOLESALE AND RETAIL LEVELS IN MALI

by

Abdoul Wahab Barry

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ABSTRACT

Beginning in 1981, the government of Mali undertook several policy reforms to allow participation of private traders in cereal marketing, which up to that date was officially controlled by a parastatal. These reforms can be expected to have an impact on the working of the cereals market. One of the main objectives of this study is to assess the performance of the cereal marketing system. The task is to study how different markets are interrelated in terms of price formation, by using wholesale and retail price data and different techniques of analysis. These methods of analysis include bivariate correlations, calculation of margins, and multiple regression techniques.

Not only is the research aimed at showing the differences and similarities of the different methods of analysis, but also at showing the strength and weaknesses of different data sets on cereals prices in Mali. Another objective of this paper is to study the price interrelationships across commodities in order to determine the degree of substitutability between the cereals involved.

To my parents

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

I.1 Background

In Mali, cereals are very dominant in people's food consumption, accounting for between 71 and 83 percent of the calories consumed in urban areas, and between 61 and 71 percent of urban protein consumption on average. Cereals' share in food expenditure ranges from 28 percent to about 44 percent in urban areas (Rogers and Lowdermilk, 1988). These figures may be higher in the rural areas, where the bulk of the population lives and the level of income is lower. The importance of cereals in consumers' budget share and food consumption suggests that a change in cereals pricing policy is likely to affect consumers.

In 1981, a reform program was launched in Mali to liberalize the cereals marketing system to give an opportunity to private traders to [illegible] this reform is to provide both producers and consumers with improved signals for resource allocation. The extent to which the marketing system sends signals to market participants depends upon the functioning of the marketing system. In order to fully understand how the reform program came about, it is necessary to know the background of Mali's economic and political environment.

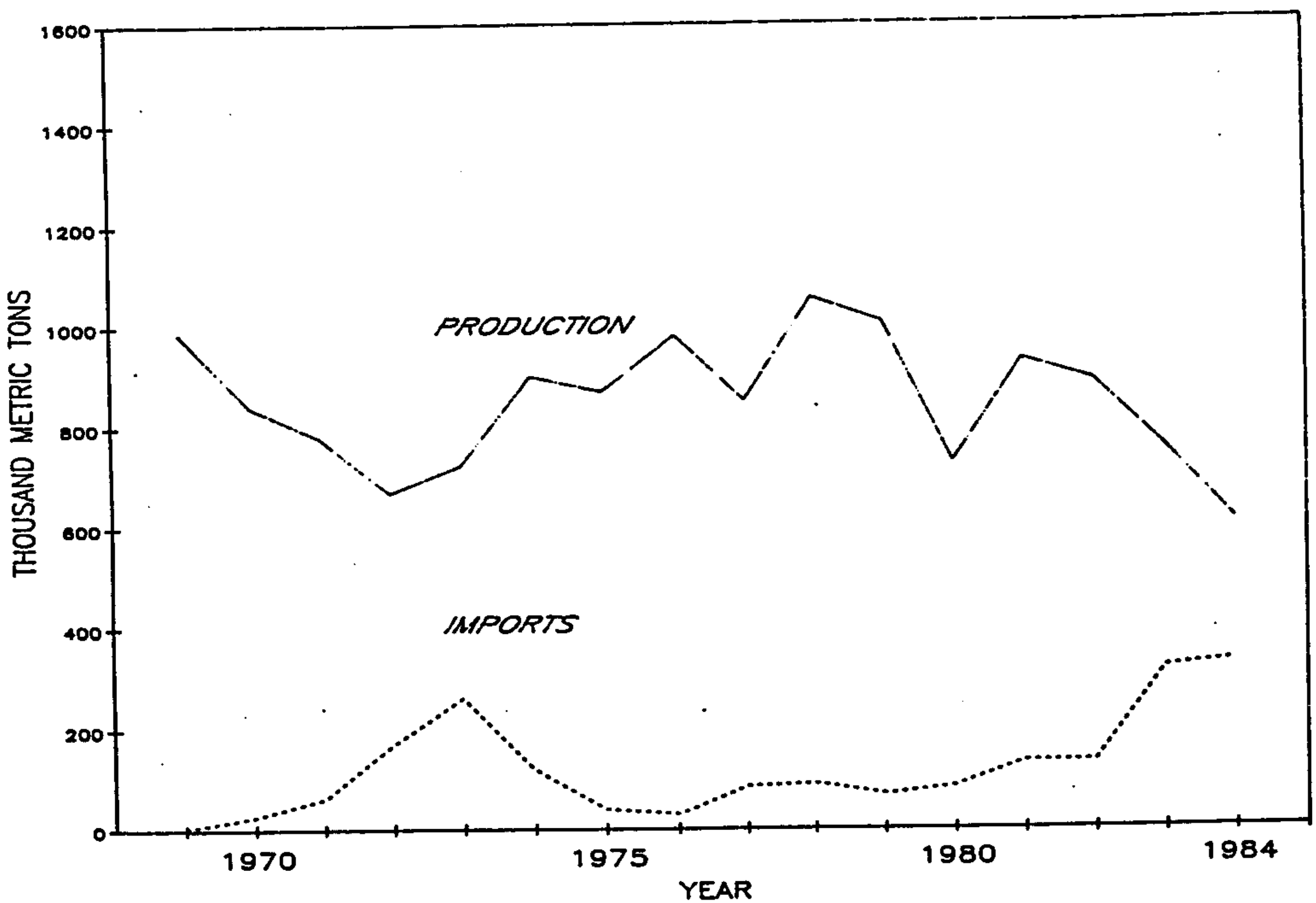
Located in West Africa, Mali is classified, according to the conventional development measures, as one of the poorest nations in the world. Constrained by financial resources, the country has limited industrial activities. The major productive activity is agriculture, and the population is largely rural. Influenced by a semi-arid climate, Mali's agricultural sector is very uncertain because weather is very erratic and uncertain. Uncertainty is greatest in the Sahelian belt in the middle of the country.

Mali's economic policy can be divided into three main periods. The first period (1960-68) was characterized by a strong socialist orientation. The dominant philosophy in this period was that modern development should be centrally planned by the government and financed by surpluses extracted from the agricultural sector. It is along this line that parastatals were created in order to support the government's economic policies. Within this broader socialist approach to development, OPAM (Malian Office of Agricultural Products) was created in 1964 to deal with foodgrains. OPAM was granted a legal monopoly on the grain trade, and through OPAM, the government fixed both producer and consumer prices. In doing so, the government had three objectives, which were increasing rural incomes, extracting agricultural surpluses to finance the development, and providing cities with cereals at low prices on a regular basis (Dembélé, Dioné, and Staatz, 1986a). If the main purpose of this policy was to please both producers and consumers, the results deviated from the intended goals. In fact, a shortage of cereals started in the late 60's.

The second period, which lasted from 1968 to 1981, witnessed an attempted liberalization, with a less strict state control over economic activities. However, OPAM still had an official monopoly in cereals marketing, except for a brief experiment with liberalization in 1968. Marketing functions were given exclusively to OPAM, operating in conjunction with rural development agencies, with producer and consumer prices set by the government. Since official producer prices were low, a parallel market arose, where prices were 25 to 100 percent higher than the official prices (Humphreys, 1986). Even though OPAM had a legal monopoly power through 1981, in reality the private grain trade remained very active and handled most of the grain marketed in Mali. According to the Wold Bank figures, OPAM handled only 20 to 40 percent of the domestic production of cereals traded (Humphreys, 1986). As a result of the low official prices, the only way OPAM could acquire cereals was to force private traders or farmers to sell at low official prices.

The period 1960-81 gradually witnessed the passage of the country from being a net cereals exporter in the early 60's to being a net cereals importer and a major food aid recipient in the 80's. Between 1960 and 1980, the per capita production of cereals fell by 8 percent (Humphreys, 1986). To fill the gap between the declining per capita local production and the increasing level of consumption as a result of the growing population and urbanization, the government was forced to import substantial amounts of cereals. Figure 1.1, which presents the total Malian cereals production and imports between 1969 and 1984, indicates that over this period cereal production was variable, while cereals imports showed an increasing trend. The imported cereals were subsidized in order to sell them to consumers at low prices. Coupled with OPAM's poor management, the subsidies to consumers generated large financial deficits, which amounted 4,647 million francs CFA in total during the period 1980-81 (Humphreys, 1986).

FIGURE 1.1. MALIAN CEREALS PRODUCTION AND IMPORTS
(1969 — 1984)



The substantial deficits faced by OPAM and major pubic-sector firms and the increasing dependence of Mali on imports and food aid led the government to undertake an analysis of its policies, with the help of major donors such as USAID, Word Bank, FAO and the EEC. The donors came to the conclusion that low official prices were in part responsible for the decrease in domestic cereals production and that the Malian government ought to introduce reforms in the cereals marketing system.

The introduction of the reforms in 1981 began the third phase of Mali's economic policy. The reforms did not constitute a drastic change from the previous system. They were, rather, a compromise between OPAM's total legal monopoly-monopsony power and a system where market forces would prevail. The reforms were aimed at liberalizing the grain marketing system by giving opportunities to private individuals to participate in the marketing of cereals. "The reform program that was officially agreed to by the government in March 1981 proposed three actions: (a) increase in official prices, both consumers' and producers'; (b) liberalization of grain trade to include private traders; (c) improvement in OPAM's operating efficiency" (Humphreys, 1986, pp.8). Under these new rules, determination of market prices would be subject to market forces, with the exception that prices would fluctuate within a certain range determined by the government. In therory, OPAM would intervene in the market only to keep prices within the range. OPAM could sell when consumer prices exceeded the upper limit and buy when producer prices were below the lower bound. OPAM's role would be a price regulator and holder of national security cereal stocks rather than being the major active participant in the cereal marketing system. In practice, OPAM never defended a price band. Rather, it bought cereals at the official producer price until it ran out of money, and sold at the official consumer price. Given its limited budget, OPAM's actions may have destabilized the market more than stabilized it (Dioné and Dembélé, 1987). As a result of its inability to stabilize prices within the defined bands, OPAM gave up defending the official prices at the beginning of 1988. The prices of millet, sorghum, and maize are now set entirely by market forces.

With the liberalization of the cereals marketing system, one needs to assess the effects of the policy reform on the cereal marketing distribution system. The marketing system involves the physical distribution of products and all mechanisms that coordinate and facilitate production and distribution of the products. The focus of this paper is how efficiently the marketing system is working. This raises the question of what we mean by "the cereal marketing system working efficiently". Although there has been a downward trend in the per capita cereal production, some regions export cereals to deficit zones on the basis of prices prevailing in both surplus and deficit areas. A key question is whether prices in the marketing system provide marketing agents with signals that induce transfers of cereals from the surplus regions to the deficit zones. In short, the major issue addressed in this paper is how markets are related in terms of price formation.

The extent to which forces in one market influence price formation in another market is known as the degree of market integration. Transmission of these forces from one market to the other is achieved through flow of information and products between markets. In an efficient marketing system, prices reflect information about production possibilities and consumer preferences. Prices provide producers and consumers with signals. But, "the effectiveness of prices as carriers of information, incentives, and rewards in the coordination of economic activities depends upon the institutional structure organizing transactions" (Shaffer et al., 1985, pp.313). The flow of information depends upon the institutional setting and the existing infrastructure, which includes among others, the communication network, storage facilities, and grades and standards. Each stage of the marketing process involves some costs. Reducing these costs may improve the access of marketing agents to market information in order to lower uncertainty in the marketing system. In an efficient marketing system, transfer costs are reflected in prices of regions that trade. The relationship between regions that trade is that the price of the product in the deficit region should be equal to the price in the surplus region plus transfer costs.

I.2 Data Collection and Analysis Techniques

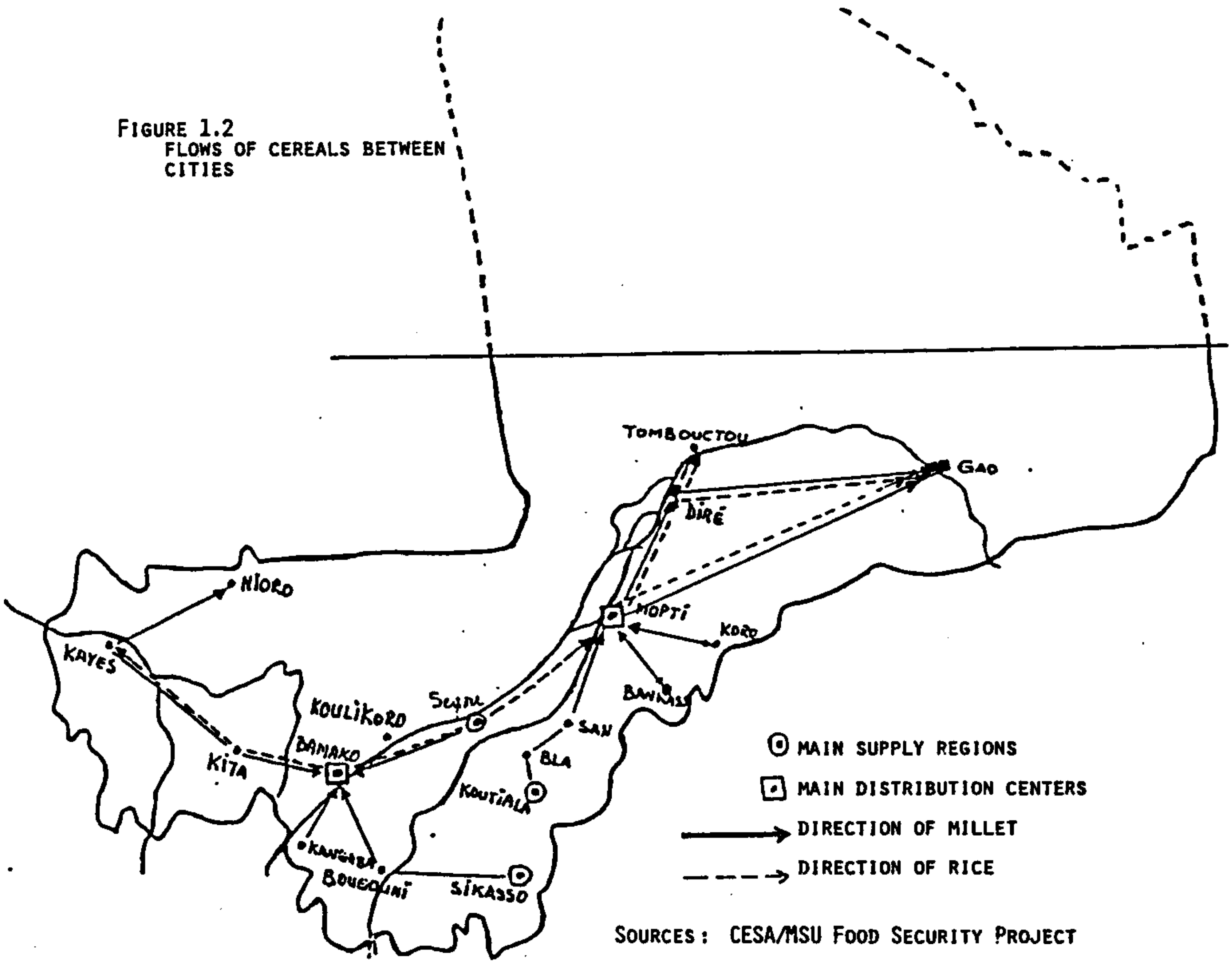
The focus of this study is the cereals marketing system in Mali. Even though cereals consumption is very important in people's diets in Mali, cereals consumption differs from one region to another and from one type of cereals to another. This variation in consumption patterns is one reason why this study investigates the price interrelationships across commodities to determine the degree of substitution between different cereals in each region. The cereals of interest in the price interrelationships across products are millet, sorghum, and maize, and rice.

The production areas for millet are basically the zones surrounding Koutiala, Sikasso, Segou, Koulikoro, Bamako, and Mopti. Sorghum production is concentrated in the Koutiala, Sikasso, Segou, and Koulikoro regions. However, the number of regions producing maize is limited to the higher rainfall southern areas surrounding Koutiala, Sikasso, and Segou. As cereals are produced in limited quantities in the northern region, the southern surplus regions export cereals to the north either directly or via Mopti. The movement of cereals between regions is shown in figure 1.2, showing the different axes of cereals distribution.

I.2.1. Data Collection at the Retail Level

At the retail level, the data upon which this paper is based were collected by OPAM in Bamako, Mopti, Sikasso, Kayes, Segou, Tombouctou, Koulikoro, and Gao from April 1983 to October 1986. The method of data collection is available only for Bamako. There, prices were collected every ten days of the month, and the monthly price was computed as a simple mean of the measurements. For the other regional capitals, the details of the frequency of collection are still unknown, but there are several missing observations. The monthly retail price data are presented in the Appendix.

FIGURE 1.2
FLOWS OF CEREALS BETWEEN
CITIES



SOURCES: CESA/MSU FOOD SECURITY PROJECT

I.2.2 Data Collection at the Wholesale Level

The wholesale-level data presented in the Appendix were collected as part of the CESA/MSU food security project in Mali, which is studying the performance of the cereals subsector. Prices were collected in four major markets, namely Bamako, Mopti, Sikasso, and Koutiala, from October 1985 to October 1987. In these four cities, once the regular wholesalers were identified on the basis of a census, the unit price of the trader's cereal was obtained by dividing the total value of the trader's total cereal sold by his/her total quantity of cereal sold during the month. From the individual unit values, the market unit value was calculated by taking the weighted average unit of all the wholesalers during the specific month. This process was based on monthly interviews.

I.2.3 Techniques of Analysis of the Data

Both retail and wholesale data sets for millet, sorghum, and maize are analyzed in this study to assess the degree of integration between the different markets. Moreover, the same techniques are used to determined the price interrelationship across products to determine the degree of substitution between pairs of products. The methods of analysis include bivariate correlations, calculation of margins, and development of multiple regression models. A summary of the results generated by the different methods of analysis will then be presented in order to draw conclusions regarding the marketing system. Not only will the results pinpoint the difference between the techniques, but they may be used to show the difference between the quality of the two data sets. On the basis of the findings of these different techniques, we hope that this piece of research will contribute to better understanding of the cereals marketing system.

CHAPTER II

CORRELATION ANALYSIS

II.1 Correlation Coefficients Across Regions

The correlation analysis is aimed at testing the spatial pricing efficiency in order to help evaluate the performance of the marketing system. It is also used to examine the degree to which prices are systematically related across commodities. In an efficient marketing system, prices act as signals to sellers and buyers. Traders attempt to buy a commodity in a market where the price is low and sell the same commodity in a market where the price is higher than the original price plus the transfer cost. This action of traders continues until the prices in the different markets are closely related. In a perfectly operating market the price in the deficit market is just equal to the price in the surplus market plus the transfer cost. This phenomenon is known as spatial arbitrage. Moreover, prices move in a parallel fashion in an efficient marketing system, assuming transfer costs remain stable. Market integration measures the degree of interrelationship in price movements between different markets.

A major question is how to measure this interrelationship between different markets. The extent to which one market influences another can be measured by means of correlation analysis. The formula for the correlation coefficient r is as follows:

$$r = \frac{Cov(x,y)}{\sigma_x * \sigma_y}$$

Where σ_x and σ_y represent the standard deviations of x and y, respectively.

A correlation coefficient r measures the degree of the relationship between two variables. Its values range from -1 to +1. A positive correlation coefficient indicates that the variables move in the same direction, while a negative one implies that they move in opposite directions. When the value of the correlation coefficient is close to zero, this indicates a low degree of association between the variables. Values of r close to -1 or +1 suggest a high degree of relationship between the studied variables. Applying the concept of correlation to assess a marketing system, the correlation coefficient is equal to +1 when the marketing system is perfectly integrated. However, a perfectly linked system is rarely observed in the real world, especially in the Third World countries because of:

" -the lack of perfect mobility due to transport costs.

-poor dissemination of information regarding market conditions.

-the lack of standard grading of produce. As a result, prices do not refer to equivalent grades in the two markets" (Lele, 1971, pp.23-24).

At this point a problem arises: how large should the correlation coefficient be to indicate a well-integrated system? Following the study done by Stephan Goetz for his Masters Thesis in 1986 ("A Review Of Basic Price Analysis Techniques With Emphasis On Interpretation and Data Limitations in Third World Food System Applications"), we will choose his cut-off points to categorize the coefficients showing weak, medium, and strong market integration. According to this standard, a correlation coefficient greater than 0.77 indicates a well linked marketing system. This means that approximately 60 percent of the price variation in one market can be explained by the variation in the other market. The expression 60 percent is obtained by squaring the number 0.77. With a correlation coefficient below 0.45, the relation between the markets can be described as weak on the grounds that only 20 percent of the variation in one market can be explained by the variation in the other market. Between 0.45 and 0.77, the integration can be described as medium. These figures are lower than the 0.90 and 0.80 chosen by Lele in India (Lele, 1971) and by Southworth in Ghana (Southworth, 1981).

Applying this rule to the case of Mali, what do the correlation coefficients suggest about the Malian grain marketing system? The first section will discuss correlation analysis of integration as measured by retail prices for millet, sorghum, and maize. In a subsequent section, market integration as measured by correlation analysis of wholesale prices for these grains will be discussed.

II.1.1 Spatial Correlations at the Retail Level

II.1.1.1 Millet

Table 2.1, which presents the results of the correlation of retail millet prices collected between March 1984 and October 1986, indicates that 7 out of 16 coefficients (44 percent) are greater than or equal to 0.77. This suggests that for these market pairs, at least 60 percent of the price variation in one market is associated with the price

TABLE 2.1. CALCULATED CORRELATION COEFFICIENTS ACROSS MARKETS FOR MILLET, SORGHUM, AND MAIZE BASED ON THE MONTHLY RETAIL PRICES FROM APRIL 1983 TO OCTOBER 1986

Markets	Millet	Sorghum	Maize
Bamako-Sikasso	0.71	0.68	0.63
Bamako-Kayes	0.42	0.60	0.57
Bamako-Segou	0.79	0.91	0.75
Bamako-Koulikoro	0.79	0.75	0.87
Mopti-Sikasso	0.82	0.76	0.65
Mopti-Segou	0.90	0.87	0.74
Mopti-Tombouctou	0.60	0.51	0.63
Mopti-Koulikoro	0.74	0.76	0.69
Mopti-Gao	0.83	0.79	0.43
Sikasso-Segou	0.85	0.79	0.68
Sikasso-Tombouctou	0.63	0.64	0.59
Sikasso-Gao	0.54	0.74	0.55
Segou-Tombouctou	0.37*	0.33*	0.44
Segou-Koulikoro	0.82	0.86	0.76
Segou-Gao	0.77	0.85	0.62
Tombouctou-Gao	0.58	0.68	0.60

Note: The correlation coefficients followed with * are not statistically significant at the five percent level.

Source: Calculated from the data provided by OPAM, under funding from PRMC.

variation in the other market. The pairs Segou-Mopti, Sikasso-Segou, Mopti-Gao, Sikasso-Mopti, Segou-Bamako, Bamako-Koulikoro, and Segou-Gao are well integrated, as indicated by the correlation coefficients above 0.77. One may explain the good integration between these cities by the existence of major highways between these cities, which facilitate the movement of cereals and the flow of information. Moreover, one may hypothesize that the good connection between Segou and Mopti, and Mopti and Gao is in part due to the import of substantial quantities of millet from Segou to Mopti and from Mopti to Gao during the period 1983-85. Indeed, the period 1983-85, characterized by a severe drought in the northern part of the country, witnessed a movement of large quantities of millet from Segou to Mopti to compensate for the decrease of production in Mopti. At the same time, Mopti served as a redistribution center between Gao and the surplus regions such as Sikasso and Segou (Dioné and Dembélé, 1986a). A second reason for the good connection on the axis Bamako-Koulikoro-Segou-Mopti may be the presence of the Niger river, which serves as a supplement to the highway between Koulikoro and Mopti during the rainy season. As such, the movement of millet and the flow of information between these regional capitals become easier. In general, Bamako, Segou, Sikasso, Koulikoro, and Mopti are well connected because of the good communication network among the cities and the location of these cities in the major producing area of millet.

In the meantime, 6 out of 16 correlation coefficients, representing 38 percent of the correlation coefficients, range between 0.77 and 0.45. Tombouctou seems to be fairly well connected with Mopti, Sikasso, and Gao.

Only 2 out of 16 correlation coefficients (13 percent) are below 0.45, suggesting that less than 20 percent of the price variation in one market is associated with the price variation in the other market. The results show that Kayes is very poorly connected with Bamako. Kayes is located near the border of Senegal. As such, one may hypothesize that Kayes is strongly influenced by the border prices on the grounds that a shortfall of millet production in Kayes can be compensated by imports from Senegal, provided that production is better in Senegal. A second reason for the poor connection between Kayes and Bamako may Kayes' status as a food aid recipient. This is confirmed by the study undertaken by the CESA/MSU Food Security Project (Dioné and Dembélé, 1986a). The pair Segou-Tombouctou has a low correlation coefficient, which is not statistically significant at the 5 percent level.

II.1.1.2 Sorghum

The results of the correlation coefficients in table 2.1 show that 6 out 16 correlation coefficients (38 percent) are higher than or equal to 0.77. As with millet, the axis Bamako-Koulikoro-Segou-Mopti represents a well-integrated system. In addition, Sikasso is also well integrated with the other surplus areas because of the highways linking Sikasso to the main producing zones. The deficit region of Gao is well-integrated with Segou and Mopti. In fact, following the drought of 1983-85, Gao imported large quantities of sorghum from Segou and Mopti (Dioné and Dembélé, 1986a). These imports were facilitated by the good communication network between Gao and these two cities. As such, prices in Gao and those in Mopti and Segou will strongly be interrelated.

In contrast, the price relation between Tombouctou and both Segou and Mopti is relatively poor. This poor price interrelationship may be due to the low demand for sorghum in Tombouctou, where sorghum represents less than 2 percent of consumers' budget share (Rogers and Lowdermilk, 1988). Moreover, during the survey period, much of the sorghum consumed in Tombouctou originated from food aid in the form of red sorghum. As such, the price formation in Tombouctou reflected local supply conditions, but those conditions were likely to be strongly affected by food aid, which does not influence the other regions as much. The lack of major highways connecting Tombouctou to Segou also hinders the flow of information and the movement of sorghum between Tombouctou and Segou.

However, Tombouctou and Gao are fairly well connected. This may well be due to the relative proximity of these two cities. Indeed, from Mopti, some sorghum moving by river transits first in Tombouctou before reaching Gao. But Gao is also linked to Mopti by a paved highway opened at the end of 1986, while Tombouctou is not. This may explain the good connection between Gao and Mopti and the poor connection between Tombouctou and Mopti.

II.1.1.3 Maize

Table 2.1 shows that only one correlation coefficient for maize prices is higher than 0.77 and 13 out 16 coefficients (81 percent) range between 0.45 and 0.77. The strong price interrelationship between Bamako and Koulikoro may be explained by the very short distance between these two cities, which facilitates the flow of information between them. Moreover, Bamako and Koulikoro are connected by a railway, transmitting information and moving the product between the two cities.

The concentration of the majority of the correlation coefficients between 0.45 and 0.77 may explained by several factors. First, the production of maize is located in the southern portion of the country, which receives at least one thousand millimeters of rainfall. This zone is represented mainly by Sikasso and Koutiala. As a result, the quantity produced and marketed is not as great as millet and sorghum and limits the relation between regions. During the period 1983-86, while maize production was 117,000 tons on average, that of millet and sorghum reached 825,000 tons on average (EEC, 1988). Second, the demand for maize is generally local. In fact, maize is primarily consumed in the region that produces it because maize is the crop that comes in first, breaking farmers' "hungry season." As a result, the transactions of maize between surplus regions and demand regions are limited. In other words, the markets for maize are very thin. This thinness is exacerbated by the fact that the bulk of the trade in maize takes place mainly between September and December because of the difficulty of storing it.

II.1.2 Spatial Correlations at the Wholesale Level

II.1.2.1 Millet

Table 2.2 presents the results of the correlations between wholesale prices of selected market pairs for the period from October 1985 to October 1987. The results show that the wholesale millet marketing system in southern and central Mali is very strongly integrated, with all the correlation coefficients standing well above 0.77. Several factors may explain the strong price interrelationship between these markets. First, the regions involved in this analysis all fall in the surplus regions of millet, where millet can be exchanged. Second, the data were collected during the good rainy years of 1985/86 and 1986/87. Thus, the markets had substantial quantities of millet to exchange during the period under study. The increase in millet production during the period 1985-87 undoubtebly resulted in an increase in millet transactions between different markets. This led to a better connection between markets. A third factor is that these regions are linked by major highways, which facilitate the distribution of millet and the flow of information between cities. The fourth major factor regarding the strong integration of the millet wholesale marketing system compared to the retail system is that the quality of the wholesale price data appears to be much better than that of the retail data. As mentioned in the introductory chapter, while the retail price data are characterized by a lot of missing observations, suggesting that the data were not collected on a regular basis, the wholesale price data were collected with a more consistent methodology on a regular basis. Even when the monthly price is available at the retail

TABLE 2.2. CALCULATED CORRELATION COEFFICIENTS ACROSS MARKETS FOR MILLET, SORGHUM, AND MAIZE BASED ON THE MONTHLY WHOLESALE PRICES FROM OCTOBER 1985 TO OCTOBER 1987

Regions	Millet	Sorghum	Maize
Bamako-Sikasso	0.91	0.87	0.81
Bamako-Koutiala	0.91	0.86	0.81
Mopti-Sikasso	0.77	0.85	0.41
Mopti-Koutiala	0.85	0.85	0.43
Sikasso-Koutiala	0.88	0.94	0.90

Source: Calculated from the data collected by CESA/MSU Food Security Project.

level, nobody knows how it was obtained.

II.1.2.2 Sorghum

The results in table 2.2 indicate that the wholesale sorghum marketing system is also very well integrated, as all the correlation coefficients are above 0.77. The apparent good connection among the cities is probably due to the same factors that accounted for the high degree of integration measured across wholesale markets for millet.

II.1.2.3 Maize

Table 2.2 shows that the maize marketing system is not as strongly integrated as those of millet and sorghum. The pair Sikasso-Koutiala has the best connection, with a correlation coefficient of 0.90. Such a good connection may be explained by the short distance between the two cities and the location of both cities in the surplus area. Bamako is also well connected with Sikasso and Koutiala, with correlation coefficients of 0.81. One important reason for the strong connection between Bamako and both cities is that Bamako imports large quantities of maize to satisfy its large population. The large flows of maize from Sikasso and Koutiala to Bamako are facilitated by the good communication network, which also transmits information between Bamako and both cities.

In contrast, Mopti is very poorly connected to Sikasso and Koutiala. In fact, the correlation coefficients between Mopti and both Sikasso and Koutiala are 0.41 and 0.43, respectively. The low correlation coefficients between Mopti and both cities may be due to the low demand for maize in Mopti, where the share of maize in consumers' budget is less than one percent (Rogers and Lowdermilk, 1988).

In light of the results at the retail and wholesale levels, one can assert that the millet and sorghum marketing system is strongly integrated, particularly in the southern part of the country. In contrast, the maize marketing system appears to be poorly integrated because of the low demand for maize and the difficulties associated in storing the commodity during most part of the year. Such results are consistent with the findings of Dioné and Dembélé (1986a). Nonetheless, maize markets may be integrated for a few months of the year, when the bulk of the crop is marketed, but disconnected during the rest of the year when little of the crop is marketed. In this case, a low level of integration, as measured on an annual basis, might not be so serious for market performance.

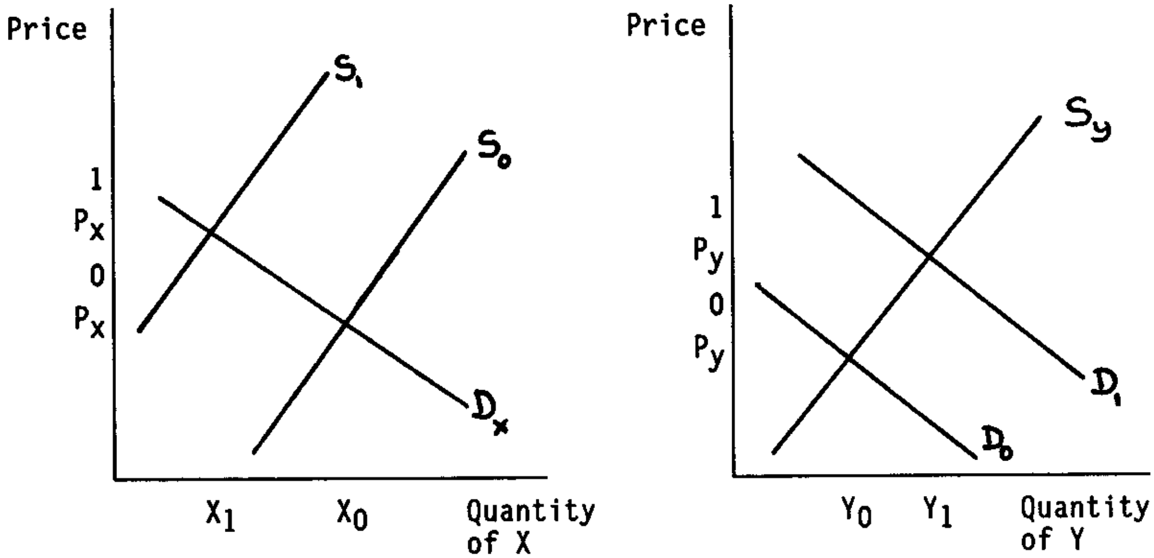
II.2 Correlation Coefficients Across Commodities

The correlation analysis across products is aimed at measuring the degree of substitution between pairs of products. Two goods are substitutes if a rise in the price of one of the goods causes more of the other good to be bought. In contrast, two goods are complements if a rise in the price of one good causes less of the other good to be purchased (Nicholson, 1984). A positive correlation coefficient between prices of a pair of commodities suggests that they are substitutes. However, a positive correlation coefficient is not equivalent to a cross-elasticity of demand. The positive correlation shows only the interrelationship between prices. The positive correlation and the substitution effects are shown in figure 2.1. Consider market A, in which there are two commodities, X and Y. Let us assume that for some reason there is a shift to the left in the supply curve of commodity X, holding the demand for X constant. This shift induces an increase in the price of commodity X. If the price increase in X induces people to demand more of commodity Y, the price of commodity Y will also increase. This suggests that the price of X and Y are positively related and that X and Y are substitutes. However, the magnitude of the price increase of Y as a result of the shift of the demand for Y depends on the elasticity of supply of Y. Following the same reasoning, one can conclude that a negative correlation coefficient indicates that the goods are complements. This is also shown in market B of figure 2.1. However, we need to stress the fact that these correlation coefficients are different from cross-elasticities of demand. The correlation coefficients show how prices move together, and this a function of both supply and demand. The cross-elasticities of demand show how the quantity demanded of a commodity changes as a result of a change in the price of the other commodity.

II.2.1 Cross-Commodity Price Correlations at the Retail Level

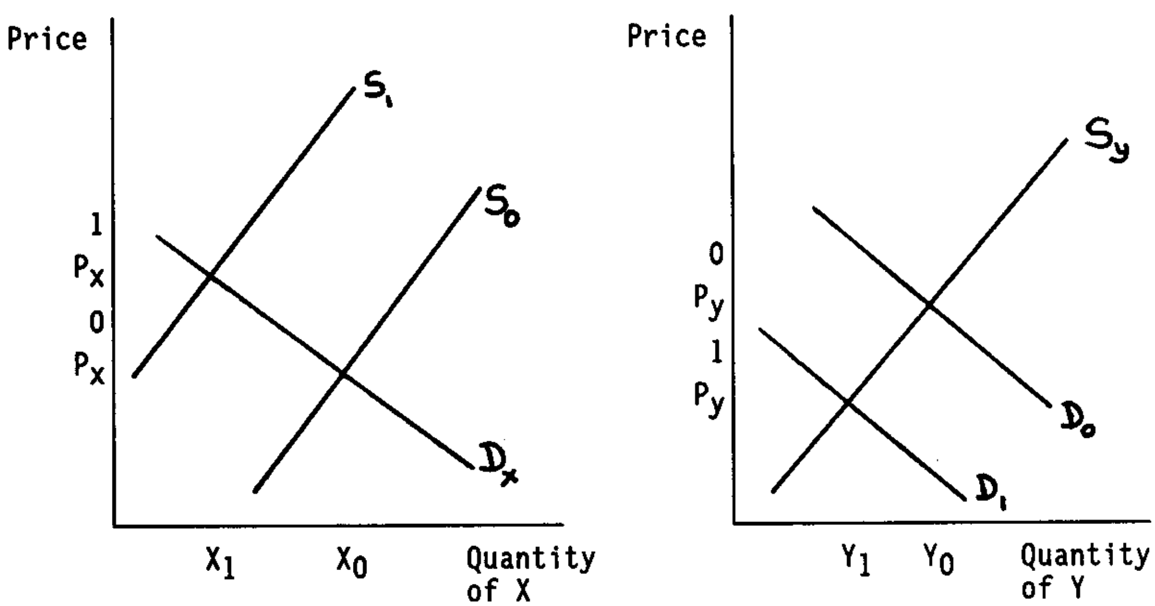
The cross-commodity price correlations obtained from the retail price data should be interpreted with care and not be generalized to the whole country. These results are true only for urban consumption, as the data were collected in urban areas.

A- MARKET A



In market A, the prices of commodity X and Y are positively interrelated

B- MARKET B



In market B, the prices of commodity X and Y are negatively interrelated

FIGURE 2.1. PRICE INTERRELATIONSHIP ACROSS COMMODITIES

II.2.1.1 Millet-Sorghum

The results of the retail price correlations across commodities presented in table 2.3 show that millet and sorghum prices are very strongly interrelated, as evidenced by the large correlation coefficients. This suggests that the two commodities are very close substitutes in most of the regional capitals. Indeed, millet and sorghum prices are given under the same heading in most official documents, indicating that these two products are considered as the same product.

II.2.1.2 Millet-Rice

The calculated correlation coefficients in table 2.3 suggest that millet and rice are very weak substitutes, as indicated by the low positive correlation coefficients. This situation is more noticeable in Mopti, Gao, and Tombouctou, known as major cereal deficit regions. The low degree of substitution between millet and rice in the deficit zones may be explained by the food aid status of these regions in the sense that the price formation of cereals in these regions reflect market conditions, which are likely to be strongly affected by food aid received in the form of one commodity. As a result, consumers buy what is available, as the choice of commodities is limited. In addition, millet consumption is low in these cities, but the consumption of cereals such as wheat is relatively higher. The share of millet, sorghum, maize, and rice in total cereals expenditure for Bamako, Gao, Mopti, and Sikasso is shown in table 2.4. Even in Bamako, Sikasso, Kayes and Segou, the price interrelationship is weak.

TABLE 2.3. CALCULATED CORRELATION COEFFICIENTS ACROSS COMMODITY PRICES BASED ON MONTHLY RETAIL PRICE DATA FROM APRIL 1983 TO OCTOBER 1986

Commodities	Bamako	Mopti	Sikasso	Kayes	Segou	Tombou	Kouli	Gao
Millet-Sorghum	0.92	0.96	0.96	0.97	0.96	0.91	0.98	0.88
Millet-Rice	0.38	0.16	0.35	0.43	0.48	0.18	0.71	0.30
Millet-Maize	0.87	0.81	0.89	0.86	0.92	0.90	0.97	0.69
Sorghum-Rice	0.26	0.25	0.37	0.49	0.61	0.08	0.64	0.04
Sorghum-Maize	0.92	0.81	0.88	0.86	0.94	0.99	0.95	0.88
Maize-Rice	0.40	0.45	0.44	0.34	0.49	0.20	0.62	0.01

Source: Calculated from the data collected by OPAM, under funding from PRMC.

TABLE 2.4. URBAN RESIDENTS' EXPENDITURES ON MILLET, SORGHUM, MAIZE, AND RICE AS A PERCENTAGE OF TOTAL CEREALS EXPENDITURE FOR 1985/1986

Commodities	Bamako	Mopti	Gao	Sikasso
Rice	58	49	43	54
Millet	21	17	10	9
Sorghum	<1	6	1	15
Maize	<1	<1	<1	<1
Others (e.g. wheat)	21	45	46	22

Source: Obtained from Tufts/DNSI/USAID Food Price Project (Rogers and Lowdermilk, 1988).

In fact, rice constitutes the most consumed commodity in urban areas, as it is quicker to prepare and requires less fuel wood. Moreover, rice in the form marketed in urban areas needs no pounding. Consequently, rice is consumed in priority. Within the price ranges covered by these data, a change in millet price would appear to have a small effect on rice price in those urban areas and vice versa.

II.2.1.3 Sorghum-Rice

Table 2.3 indicates that the relationship between sorghum and rice prices is also very weak. This suggests that sorghum and rice are weak substitutes. Such a weak substitution between these two commodities may be due to the same factors that limit substitution of millet for rice. The correlation is particularly weak in the northern cities of Gao and Tombouctou, where little sorghum is consumed.

II.2.1.4 Maize-Rice

The results in table 2.3 show that the relationship between the maize and rice prices is weak, as evidenced by the low correlation coefficients between prices of the two commodities. This may be due to the low demand for maize in the country. However, the correlation coefficients between the maize and rice prices are slightly higher than between the other coarse grains and rice in Bamako, Mopti, and Sikasso. This suggests that if a more easily prepared form of maize were available, there might be scope for substituting domestically produced maize for imported rice.

II.2.1.5 Millet-Maize

Table 2.3 indicates that millet and maize are good substitutes, for almost all of the correlation coefficients between retail prices of these cereals are positive and above 0.77. This suggests that more than 60 percent of the variation in the price of one product is associated with the price variation of the other commodity.

The strong relationship between millet and maize prices may be explained by the similar consumption patterns for both commodities in people's diet. Moreover, millet and maize are both dryland crops whose supply is affected by the same factors, especially rainfall; hence their prices covary closely.

II.2.1.6 Sorghum-Maize

The results shown in table 2.3 indicate that sorghum and maize prices are strongly interrelated in general, with all the correlation coefficients being higher than 0.77. The reasons for such a strong relationship are the same as those obtained above for millet and maize.

II.2.2 Cross-Commodity Price Correlations at the Wholesale Level

Wholesale price data are available only for millet, sorghum and maize. This section analyzes the relationships between prices of these three commodities.

II.2.2.1 Millet-Sorghum

The correlation coefficients between millet and sorghum in table 2.5 show that millet and sorghum prices are highly interrelated. In fact,

TABLE 2.5. CALCULATED CORRELATION COEFFICIENTS ACROSS COMMODITY PRICES BASED ON MONTHLY WHOLESALE PRICE DATA FROM OCTOBER 1985 TO OCTOBER 1987

Commodities	Bamako	Mopti	Sikasso	Koutiala
Millet-Sorghum	0.96	0.98	0.90	0.99
Millet-Maize	0.93	0.88	0.79	0.84
Sorghum-Maize	0.95	0.85	0.92	0.88

Source: Calculated from the data collected by the CESA/MSU Food Security Project.

all the correlation coefficients are greater than or equal to 0.90. As with the retail price data, this suggests that millet and sorghum are very close substitutes. In Koutiala, the correlation between prices of the two commodities reaches 0.99. Such a strong interrelation may well be explained by the role of Koutiala as a major trading center for both products. In contrast to Koutiala, relatively small quantities of millet are traded in Sikasso. But substantial quantities of sorghum are exchanged in Sikasso, as sorghum consumption is relatively more important there than millet consumption.

II.2.2.2 Sorghum-Maize

The results presented in table 2.5 indicate that sorghum and maize prices are strongly correlated, although generally not quite as highly as between millet and sorghum. In Sikasso, where sorghum and maize are the major consumption products, the correlation among prices reaches 0.92. But, in Mopti, the correlation coefficient between sorghum and maize is relatively low, at 0.85. This may be due to the low consumption of maize and the high demand for millet in that city.

II.2.2.3 Millet-Maize

Table 2.5 shows that the prices of millet and maize are also strongly correlated. Nonetheless, the correlation coefficient in Sikasso is relatively low, at 0.79. This may be explained by the low consumption of millet and the strong demand for maize in Sikasso.

In summary, the study of price interrelationship across commodities indicates that millet, sorghum, and maize are poor substitutes for rice. In the medium term, improving the substitutability between rice and the other coarse grains may require developing easily prepared forms of the coarse grain. In the long term, improving the substitutability between rice and millet, sorghum, and maize means increasing the availability of millet, sorghum, and maize by improving the techniques of production for these grains. However, maize is a very good substitute for millet and sorghum in general at both the retail and wholesale levels. Sorghum and millet constitute very close substitutes in most of the regions, as evidenced by the high correlation coefficients between the two commodities.

II.3 Limits to Correlation Analysis

Even though the use of correlation coefficients to assess marketing efficiency can suggest some noteworthy ideas about the current situation, these coefficients must be considered with care. In fact, high correlation coefficients may indicate either a situation of monopoly or perfect competition. An interpretation of high correlation coefficients requires good knowledge of the system being studied. At the same time, a question must be raised about how high correlation coefficients were obtained. Correlation coefficients tend to rise in an inflationary situation because absolute deviations from the trend will become incresingly small in percentage terms, provided marketing costs remain constant (Harriss, 1979). As a result, correlation coefficients cannot be considered as proof of market integration or competition. But they can serve as indicators. Another shortcoming of the correlation analysis is that it does not provide information about the source of the influence between two markets. A high correlation coefficient between markets X and Y does not indicates whether the price formation in market X is influenced by market Y or vice versa. One needs to know the field very well in order to determine which market influences the price formation in the other market. A look at a correlation coefficient does not provide such information. As a result of the shortcomings of the correlation analysis, this approach should be combined with other types of analyses in order to make accurate and sound decisions.

CHAPTER III

ANALYSIS OF MARGINS

The level of the marketing margins in grain subsectors is often a major concern of policy makers. There exist price differentials in terms of spatial distribution, different periods, and different forms of the same product. These price differentials are related to the three different functions of markets: creation of time, place, and form utility.

When an agricultural commodity is produced by farmers at a point in time, it is not consumed entirely at harvest. In order to assure a reliable supply of the commodity from one harvest to the next, some quantity of the product is kept by either farmers or other marketing agents in a storage facility. Costs and risk are involved in undertaking such an activity. The marketing agent may borrow money to build the warehouse and assure its maintenance and depreciation over time or he may rent the storage facility. Of major importance is the opportunity cost of the capital tied up in keeping the inventory during the year. An additional cost involved in this activity is that of moving the commodity in and out the warehouse. Risk is involved in storing because of the likelihood of insects, rodents or mildew damaging the product. Another major risk is price risk. Prices faced by farmers may be lower than expected later in the year, leading to losses in the storage operation. Due to the risk involved in storing the commodity, the marketing agent may try to insure against possible unexpected outcomes. Because of the costs of storage, the price of the product stored normally will be higher than that of the original commodity. This is the time dimension of marketing function.

A second source of price differentials is the existence of transfer costs. Farmers do not consume all their production on-farm. They may sell the surplus directly to either consumers or other marketing agents who will sell the product to consumers later. In either case, transfer costs, including transport, losses, ownership transfer costs and risk are incurred. As these costs are reflected in the final delivered price of the commodity, which will be higher than the price of the product at the original point. This is known as the place utility of the marketing function.

The third source of price differentials in marketing functions is the change in the form of the product. Most of the time, consumers cannot eat the commodity in its original form. As such, the product needs to be transformed. Transformation of the product requires some investments. For instance, processing millet into flour requires a mill. Moreover, labor costs are involved in processing the commodity. This aspect of marketing is known as the form utility of the marketing function.

Even though these three aspects were described individually, it is difficult in practice to separate them. Taking these costs into account in the price of the final product, the difference between the price of the final product and that of the original product can be defined as the marketing margin. Defined formally, a marketing margin is "the difference between the price paid by consumers and that obtained by producers" or "the price of a collection of marketing services which are the outcome of the demand for and the supply of such services" (Tomek and Robinson, 1982, pp 120).

In an efficient marketing system, marketing margins reflect only transfer costs. Markets will be related through the phenomena of arbitrage, discussed extensively in the previous chapter. One way of testing market efficiency is to assess the behavior of the margins over time. A marketing system is said to be efficient if the margins between pairs of markets are stable during the period considered, assuming marketing costs are constant over time. However, the margins will change when costs of services change. If the change in the margins reflects the change in service costs, the marketing system may still be said to be efficient. Nonetheless, if the change in the margins does not stem from a change in costs of services, the marketing system can be qualified as inefficient. As a result, the analysis of the stability of the marketing margins may require information of service costs, which are not available in this context.

In the case of Mali, a large share of the transfer costs in the cereals marketing system is made of transport costs, which have been stable over time. The trucking fees between regions are fixed by the transportation union, in collaboration with the government. The fees change only when the price of fuel changes. Since the early 1980's, the price of gasoline and diesel increased only in 1981. Thus, transport costs have been relatively stable over the last eight years.

The following analysis will be based upon the standard deviation and the coefficient of variation of the marketing margins coupled with some graphical analysis. The standard deviation shows the absolute deviation of the observations around the mean of the sample. While the standard deviation may show that the margins display wide fluctuations, the coefficient of variation, which measures the standard deviation as a proportion of the sample mean, shows the relative spread of the observations around the mean. The coefficient of variation has the advantage of standardizing the spread of two different samples for comparison. The sample generating the lowest coefficient of variation is considered to have the smallest variation. As such, it can be considered as more stable than that with the higher coefficient of variation. Nonetheless, a criterion in deciding whether a given coefficient of variation represents a high or low degree of integration must be defined. The cut-off point in this analysis in deciding the degree of stability of the margins is 0.75. This cut-off point is chosen for the simple reason that it is close to the mean of all coefficients of variation of the monthly wholesale margins for the three cereals. Given this cut-off point, coefficients of variation below this value indicate that the margins are stable compared to the other margins in the sample.

Although the coefficient of variation (CV) represents a means of showing stability, there are problems associated with it. The most important is that if the net margins display both positif and negative numbers, it difficult to use the coefficient of variation to show the stability of the margins. The net margins need to be either consistently positive or negative. If margins are both positive and negative, the mean margin may be close to zero, leading to high CVs even for small absolute deviations from the mean. Consequently, the coefficient of variation must be interpreted with care and be combined with a graphical analysis. The stability of the margins can also be shown graphically. For example, we may plot the actual margins against time. Then, by running a regression of the margins against time, we can plot this regression line and compare the actual values to the fitted line. The behavior of the actual values around the fitted line will indicate whether or not the actual margins are subject to wide fluctuations. We may compare two sets of margins around their fitted line to determine which is more relatively stable. In order to do so, we need to make sure that the graphs have the same scale. However, the plots will be done only at the wholesale level, as the data at the retail level lack a lot of observations. A question is how the margins analysis is related to the simple correlation method described in the previous chapter. How should the results of the margins analysis compare to the correlation method? The margins analysis and the correlation method represent different ways of displaying the same data. A low standard deviation, indicating stable margins, suggests that prices move together. A constant margin is equivalent to a very stable margin, which is also equivalent to saying that prices move perfectly in the same direction. This suggests a correlation coefficient of one between prices. Hence, the two methods should generate the same ranking of the degree of interrelationship between pairs of markets.

III.1 Margins across Markets at the Retail Level

III.1.1 Millet

Table 3.1, which presents both the standard deviations and

TABLE 3.1. STANDARD DEVIATIONS AND COEFFICIENTS OF VARIATION FOR MONTHLY MARGINS ACROSS RETAIL CEREALS MARKETS FROM APRIL 1983 TO OCTOBER 1986

Markets	Cereal	S.D.	Mean	C.V.	# of Obs.
Bamako-Sikasso	Millet	15.02	33.57	0.45	30
Bamako-Segou	Millet	14.52	22.94	0.63	31
Bamako-Koulikoro	Millet	15.46	21.58	0.72	18
Mopti-Sikasso	Millet	19.66	26.16	0.75	28
Mopti-Segou	Millet	14.16	12.41	1.14	29
Kayes-Bamako	Millet	24.67	1.71	14.43*	28
Segou-Sikasso	Millet	13.28	14.30	0.93	28
Tombouctou-Mopti	Millet	44.58	37.61	1.19	22
Tombouctou-Sikasso	Millet	48.51	66.89	0.73	22
Tombouctou-Segou	Millet	50.19	51.59	0.97	22
Koulikoro-Sikasso	Millet	20.01	16.09	1.24	17
Koulikoro-Segou	Millet	15.60	1.91	8.17*	17
Gao-Mopti	Millet	15.81	26.45	0.60	19
Gao-Sikasso	Millet	23.01	51.85	0.44	17
Gao-Segou	Millet	17.66	37.38	0.47	17
Gao-Tombouctou	Millet	25.07	1.13	22.19*	16
Bamako-Sikasso	Sorghum	17.22	30.30	0.57	22
Bamako-Segou	Sorghum	11.05	14.43	0.77	21
Mopti-Sikasso	Sorghum	19.42	23.45	0.83	21
Mopti-Segou	Sorghum	14.10	3.19	4.42	21
Mopti-Tombouctou	Sorghum	54.70	19.63	2.79	20
Tombouctou-Sikasso	Sorghum	64.80	57.50	1.13	13
Tombouctou-Segou	Sorghum	62.99	32.25	1.95	16
Koulikoro-Sikasso	Sorghum	18.93	18.91	1.00	11
Gao-Mopti	Sorghum	20.43	18.47	1.11	16
Sikasso-Bamako	Maize	13.16	22.63	0.58	30
Bamako-Segou	Maize	14.76	15.83	0.93	30
Bamako-Koulikoro	Maize	13.80	10.36	1.33	18
Mopti-Sikasso	Maize	23.99	12.15	1.97	27
Mopti-Segou	Maize	20.48	1.09	18.79*	27
Tombouctou-Sikasso	Maize	72.33	44.43	1.65	15
Tombouctou-Segou	Maize	73.86	37.70	1.96	15
Gao-Sikasso	Maize	26.33	25.37	1.04	15
Gao-Segou	Maize	23.71	9.50	2.50	16
Gao-Tombouctou	Maize	31.89	19.17	1.66	6

Note: S.D. represents the standard deviation and C.V. the coefficient of variation. The coefficients of variation followed with * have a mean close to zero.

Source: Calculated from the data collected by OPAM, under funding from PRMC.

coefficients of variation of the calculated monthly margins, suggests that the retail millet marketing system is poorly integrated relative to the wholesale trade. This is evidenced by the large coefficients of variation. However, one should be careful in interpreting certains large coefficients of variation. The large coefficients of variation based on mean margins close to zero should be disregarded in the analysis because of the reason outlined earlier. The poor quality of the retail level data may explain this poor integration.

Bamako is strongly connected to the surplus regions of Sikasso, Segou, and Koulikoro. Several factors may explain this phenomenon. First, Bamako imports substantial amounts of millet from these surplus regions in order to satisfy its large demand for millet, due to its large population. In addition, millet is very important in the diet of Bamako's population and represents, on average, 21 percent of the total expenditures on cereals consumed in Bamako (Rogers and Lowdermilk, 1988). Second, the good communication network between Bamako and these cities facilitates the transportation of millet and the transmission of information between them. Gao is also relatively well integrated with Sikasso, Segou, and Mopti. As a large consumption area of millet, Gao may have imported substantial quantities of millet from these cities to satisfy the increasing demand for millet during the period 1983-85, characterized by a severe drought.

In contrast, Mopti is relatively poorly connected with Segou. Mopti is also poorly integrated with Tombouctou. In fact, Tombouctou is a major food aid recipient and this status may have disrupted the relationship between Tombouctou and Mopti. A second reason for the poor connection my be the poor quality of the data collected in Tombouctou, discussed extensively in the previous chapters.

III.1.2 Sorghum

The results of standard deviation and the coefficients of variation presented in table 3.1 suggest that the retail sorghum marketing system is poorly integrated relaive to the wholesale trade. However, Bamako and Sikasso are well integrated for the same reason as with millet.

The high coefficients of variation between Mopti and both Tombouctou and Gao, attesting to a poor connection between them, may be due to the low demand for sorghum in Tombouctou and Gao. Moreover, both Tombouctou and Gao were food aid receipients during the period under study. As such, the price formation in these two cities is likely not to be transmitted in Mopti and the other regional capitals.

III.1.3 Maize

The results presented in table 3.1 indicate that the maize marketing system is also poorly integrated relaive to the wholesale trade. Such poor integration in the maize marketing system is essentially due to the low demand for maize in most of the country, the thinness of the market, and the difficulty of storing the commodity for a long period of time. However, Sikasso is well connected to Bamako. Although the per capita consumption of maize is relatively low in Bamako, Bamako has the ability to influence the price formation in Sikasso through its large population.

III.2 Margins Across Markets at the Wholesale Level

III.2.1 Millet

The results of the coefficients of variation presented in table 3.2 show that the indicate that the millet marketing system is strongly integrated at the wholesale level. Bamako, a major consumption region of millet, is relatively strongly integrated with Koutiala, a major millet production region. One may hypothesize that Bamako draws substantial amounts of millet from this surplus region of Koutiala. As such, Bamako is likely to influence the price formation in this region. The relative stability of the margins between Bamako and Koutiala is seen graphically in figure 3.1, showing the evolution of the millet margins. Figure 3.1 also indicates that the margins between Mopti and Koutiala are relatively stable, as indicated by the coefficient of variation in table 3.2. Moreover, Koutiala is well connected with both Sikasso and Mopti.

In contrast, Mopti and Sikasso are not well connected apparently. Mopti may not have imported millet from Sikasso during the period under study, due to the good rainfall.

III.2.2 Sorghum

Table 3.2, which presents the coefficient of variation shows that the wholesale sorghum markets are well integrated. The pair Bamako-Koutiala is well integrated for the same reason as millet. Koutiala is also well connected with both Sikasso and Mopti, as shown in figure 3.2.

In contrast, table 3.2 indicates that Mopti and Sikasso are

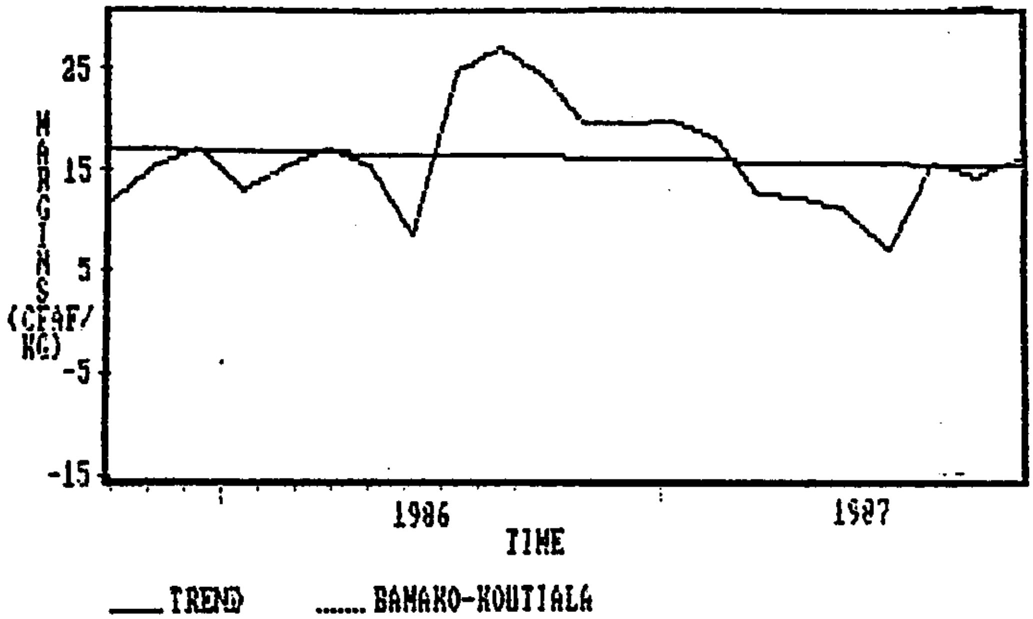
TABLE 3.2. STANDARD DEVIATIONS AND COEFFICIENTS OF VARIATION FOR MONTHLY MARGINS ACROSS WHOLESALE CEREALS MARKETS FROM OCTOBER 1985 TO OCTOBER 1987

Markets	Product	S.D.	Mean	C.V.	# of Obs.
Bamako-Sikasso	Millet	4.29	6.59	0.65	25
Bamako-Koutiala	Millet	4.83	16.18	0.30	25
Mopti-Sikasso	Millet	10.18	4.77	2.13	25
Mopti-Koutiala	Millet	8.32	14.35	0.58	25
Sikasso-Koutiala	Millet	5.36	9.58	0.56	25
Bamako-Sikasso	Sorghum	5.43	9.84	0.56	24
Bamako-Koutiala	Sorghum	5.72	16.44	0.35	24
Mopti-Sikasso	Sorghum	8.44	9.75	0.87	25
Mopti-Koutiala	Sorghum	8.13	16.29	0.50	25
Sikasso-Koutiala	Sorghum	3.93	6.54	0.60	25
Bamako-Sikasso	Maize	7.80	8.61	0.91	23
Bamako-Koutiala	Maize	7.73	18.70	0.41	23
Mopti-Sikasso	Maize	10.51	0.72	14.60*	13
Mopti-Koutiala	Maize	10.86	9.85	1.10	13
Sikasso-Koutiala	Maize	4.91	9.88	0.50	25

Note: S.D. represents the standard deviation and C.V. the coefficient of variation. The coefficient of variation followed with * has a mean close to zero.

Source: Calculated from the data collected by the CESA/MSU Food Security Project.

FIGURE 3.1. EVOLUTION OF WHOLESALE MARKETING MARGINS ACROSS MARKETS FOR MILLET, OCTOBER 1985-OCTOBER 1987



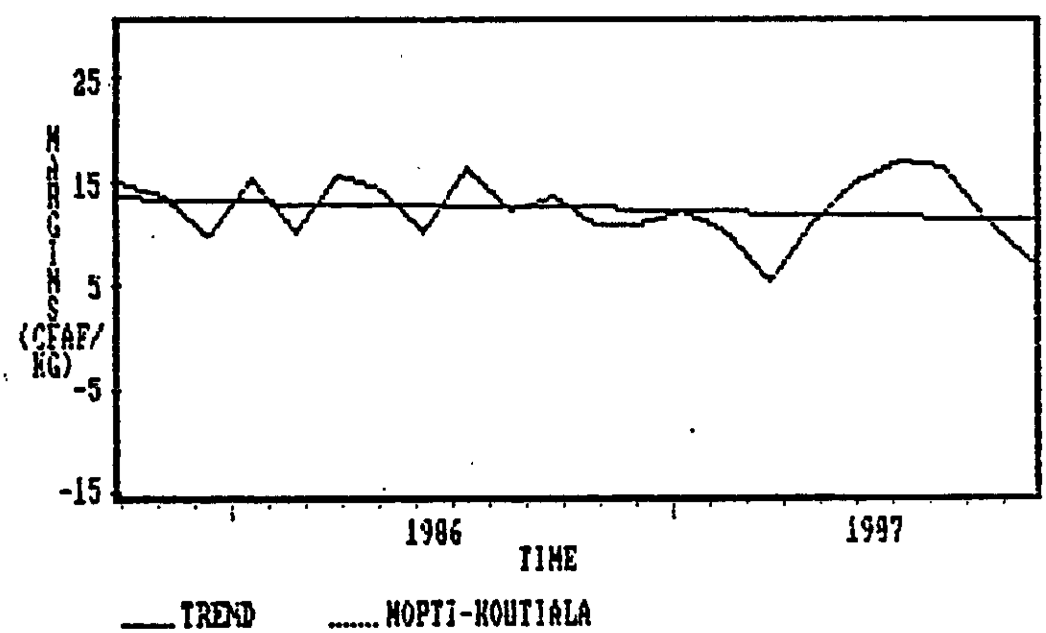
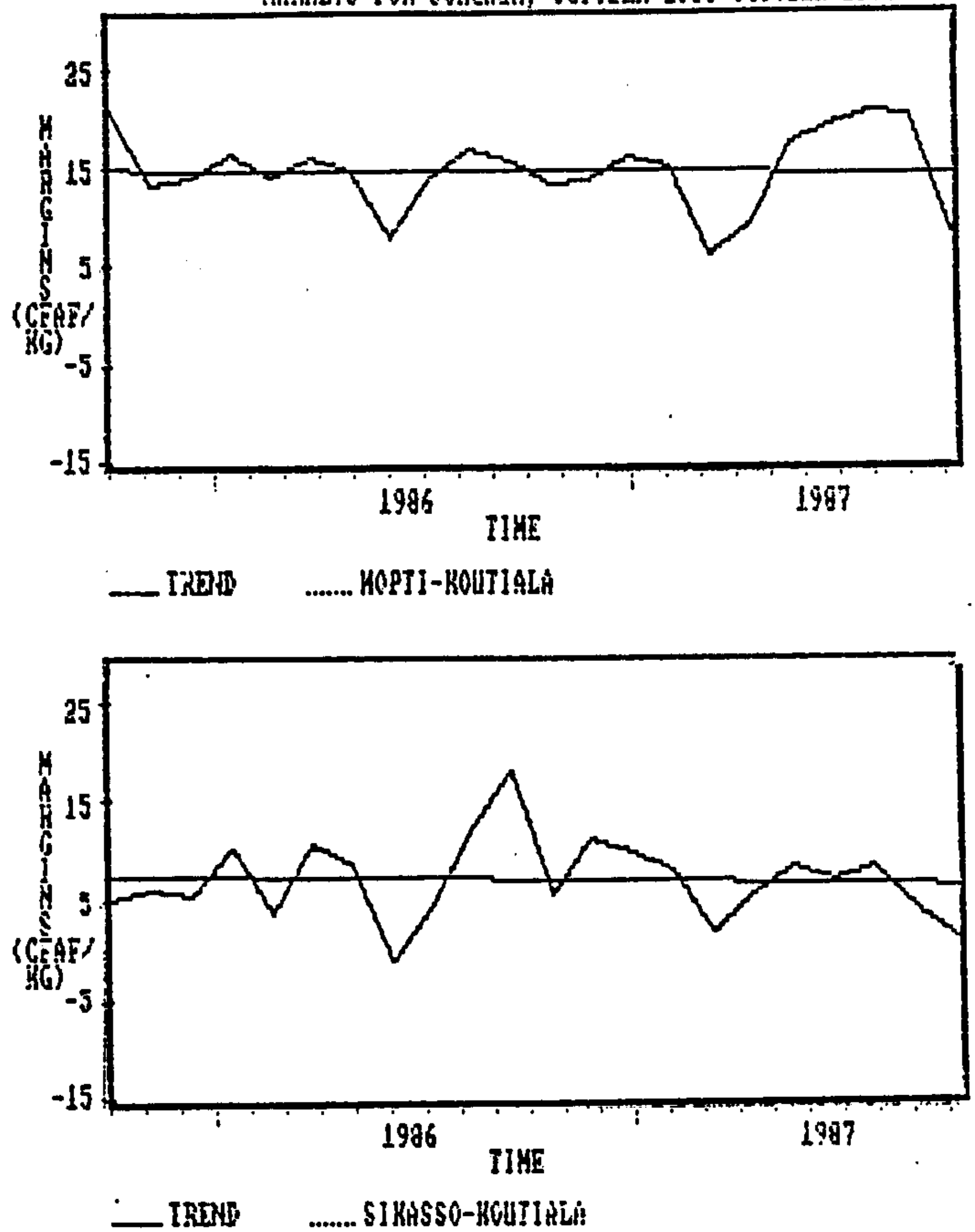


FIGURE 3.2. EVOLUTION OF WHOLESALE MARKETING MARGINS ACROSS MARKETS FOR SORGHUM, OCTOBER 1985-OCTOBER 1987



relatively poorly connected, as with millet.

III.2.3 Maize

As evidenced by the results presented in table 3.2, the wholesale maize marketing system is poorly integrated relative to that for millet and sorghum. Koutiala is well connected with both Sikasso and Bamako.

In contrast, Koutiala is poorly integrated with Mopti. This may be due to Mopti's low imports during the period under study.

III.3 Summary

In summary, the margins analysis displays different results at the wholesale and retail levels. At the retail level, the coefficients of variation show that the millet, sorghum, and maize margins across markets are, in general, unstable. This suggests that the marketing systems are poorly integrated. Such seemingly poor integration may be due to the poor quality of the data.

At the wholesale level, the coefficients of variation of the margins across markets suggest that the millet and sorghum markets are, in general, well integrated. In addition, the coefficients of variation for maize reveal that the maize marketing system is poorly integrated relatively to both millet and sorghum. Such results are consistent with that generated by the correlation analysis.

CHAPTER IV

REGRESSION ANALYSIS

The purpose of the regression analysis, like the correlation and margin analyses presented in the previous two chapters, is to assess the degree of integration of the cereals marketing system at both the retail and wholesale levels. The advantage of this approach, compared to the previous techniques, is that it can take into account different time frames in the degree of market integration.

IV.1 Timmer's Model

The model presented in this section was originally developed by Timmer to analyze market performance in the corn economy of Indonesia (Timmer, 1986). Based on generalized distributed lags, the model uses two different markets, namely a local market (rural) and a central market (urban). According to the model, prices in the rural market will adjust to prices in the central market if the two markets are interrelated by traders' actions. The model attempts to test the extent to which prices in the rural market are integrated into the central market over the long run, and the extent to which short-run changes in the rural market are caused by similar short-run changes in the margin between the rural and central markets. As a result, the model tests the short-run market connection and the long-run market integration. A formulation of the original model is given by equation 4.1:

$$P_t - P_{t-1} = d_0 + d_1 * (P_{t-1} - R_{t-1}) + d_2 * (R_t - R_{t-1}) + d_3 * R_{t-1} + d_4 * X + e \quad (4.1)$$

where

P_t = the logarithm of the rural or farm price of the commodity in month t.

R_t = the logarithm of the central or urban price of the commodity in month t.

X = a matrix of exogenous seasonal, regional, or other special variables that might influence local price formation independently of central prices.

d_i = estimated parameters.

e = random error term.

As shown by equation 4.1, the monthly change (first difference) in the logarithm of the local price ($P_t - P_{t-1}$) is a function of four factors. First, it depends on the corresponding change in the central market price ($R_t - R_{t-1}$). This assumes that traders in the local market know about the price change in the central market quickly in order to adjust the local price. In other words, information flows from the central market to the local market. Second, it is influenced by the change in the spatial margin in the previous month between the rural and central markets ($P_{t-1} - R_{t-1}$). Third, it depends on the previous central market price (R_{t-1}). Fourth, it is influenced by the matrix of exogenous variables, X.

As formulated, it is difficult to use equation 4.1 to separate the short-run and long-run effects of the central market on the local market. Such a distinction can only be done through a transformation of the original equation. A transformation of equation 4.1 generates equation 4.2:

$$P_t = d_0 + (1 + d_1) * P_{t-1} + d_2 * (R_t - R_{t-1}) + (d_1 - d_3) * R_{t-1} + d_4 * X + e \qquad (4.2)$$

In equation 4.2, the price formation in the local market in time t depends on the historical local price, the historical central price, and the central price differential between the current period and the previous period. In this form, $(1+d_1)$ can be interpreted as the contribution of the local price lagged one month to the formation of the current local price. Along the same line $(d_1 - d_3)$ shows the contribution of the central price lagged one month to the formation of the current local price. The coefficient d_2 measures the transmission of the price change in the central market to the current local price. One should note that the log-log form generates coefficients readable in percentage terms.

From equation 4.2, it is possible to generate an index of market connection (IMC), which is the ratio between the contribution of the past local price to the current local price and the contribution of the past central price to the formation of the current local price.

$$IMC = \frac{1 + d_1}{d_1 - d_3}$$

The IMC indicates a short-run market connection on the grounds that it considers only the effect of the historical central and local prices on the current local price. The value of the IMC reflects the degree of market connection. If the ratio (expressed in absolute value terms) is less than one [i.e. $(d_1 - d_3) > (1 + d_1)$ when absolute values are considered], this means that the central market contributes more than the past local market price to the formation of the local price in the short run. This is equivalent to saying that the local market and the central markets are well connected in the short run. In contrast, an IMC with an absolute value greater than one [i.e., $(d_1 - d_3) < (1 + d_1)$ in absolute value] suggests a poor connection between the local and central markets. Since the IMC measures a short-run relationship between the local and central markets, one may wonder if the index of market connection and the correlation coefficient generate the same results in terms of market integration. Such a a conclusion requires availability of both results for accurate comparison.

On the other hand, the coefficient d_2 is a measure of long run market integration. The reason for such an interpretation is that d_2 takes into account the effect of both the current and historical central prices on the current local price.

In order to capture the seasonal effect, a dummy variable was added to the model. Introduced as a separate independent variable, the dummy variable is equivalent to the X matrix. For millet and sorghum, the dummy takes the value of one in November and December, and zero elsewhere. For maize, the dummy takes the value of one between September and December, and zero elsewhere. The periods during which the dummy is one correspond to the harvest period, characterized by lower market prices.

IV.2 Spatial Market Integration

Spatial market integration, which can be divided into short-run market connection and long-run market integration, will be discussed by analyzing first the wholesale price data, then by looking at the retail data. At each level of data collection, the marketing system of millet, sorghum, and maize will assessed to determine market performance.

IV.2.1 Short-Run Market Connection at the Wholesale Level

IV.2.1.1 Millet

At the wholesale level, the results in table 4.1 show that Sikasso is very well integrated with the other regional capitals, as all the indices of market connection are less than one. The index of market connection of 0.72 between Sikasso and Koutiala suggests that Sikasso contributes to a large extent to the price formation in Koutiala. The reason for the influence of Sikasso on the price formation in Koutiala is that Sikasso is a major wholesale market that draws in millet for shipment farther south to Côte d'Ivoire. The short distance between Koutiala and Sikasso coupled with the good communication network may be a very important factor in the good relationship between the two cities. The low index (0.08) between Mopti and Koutiala suggests a good connection between these two cities. The strong contribution of Mopti to the price formation in Koutiala may be explained by the significant demand of millet in Mopti. Mopti imports from Koutiala not only to satisfy its own demand, but also to redistribute some of the imports to the north. Table 4.1 also indicates that the price formation in Sikasso is strongly influenced by that in Bamako, which is one of the major millet consumption centers in the country. Indeed,

TABLE 4.1. INDICES OF MARKET CONNECTION FOR MILLET, SORGHUM, AND MAIZE AT THE WHOLESALE LEVEL FROM OCTOBER 1985 TO OCTOBER 1987

Markets	Millet	Sorghum	Maize
Bamako-Sikasso	0.22	1.64	0.52
Bamako-Koutiala	2.81	4.67	5.39
Mopti-Sikasso	0.89	0.37	3.68
Mopti-Koutiala	0.08	0.29	4.03
Sikasso-Koutiala	0.72	0.15	0.93

Note: For the pairs of markets given above, the first market represents the demand region and the second the supply region.

Source: Calculated from the data collected by the CESA/MSU Food Security Project.

expenses on millet represent about 21 percent of the total cereals budget share in Bamako (Rogers and Lowdermilk, 1988). As such, Bamako is likely to import substantial amounts of millet from Sikasso. The imports of millet are facilitated by a major highway that also transmits information on market conditions.

In contrast, table 4.1 indicates than Bamako and Koutiala are poorly integrated. These results are strange and inconsistent with the correlation and margin analysis for reasons that remain unclear.

IV.2.1.2 Sorghum

The results presented in table 4.1 suggest that the wholesale sorghum marketing system is well integrated in the short-run. This is evidenced by the low indices of market connection between most markets. Both Sikasso and Koutiala are well connected to Mopti in the short-run, with an index of market connection 0.37 and 0.29 respectively. One may explain such a good connection between Mopti and these two cities by the imports of Mopti to satisfy its own demand. In fact, sorghum represents about 7 percent of cereals expenditure in Mopti (Rogers and Lowdermilk, 1988).

In contrast, Bamako is very poorly integrated with Sikasso and Koutiala. Although the result of the index of market connection between Bamako and Koutiala is strange, the poor connection between Bamako and both Koutiala and Sikasso may be explained by the fact that Bamako has additional sources of sorghum supply. In fact, given the good rainfalls during the period 1985-87, Bamako may have drawn some sorghum from Koulikoro and Segou, which are close by.

IV.2.1.3 Maize

Table 4.1 shows that the maize marketing system is very poorly integrated in the short-run between most markets, as most of the indices of market connection stand above one. Mopti is not well connected to either Sikasso or Koutiala, which are the surplus zone for maize. One reason for such a poor integration is the very low demand for maize in the north. The maize share in the cereals expenditure is almost equal to zero in urban areas of the north (Rogers and Lowdermilk, 1988).

Nonetheless, Koutiala and Sikasso are well connected in terms of price formation, as indicated by a low index of market connection between the two cities. The good connection between these two cities may be explained by not only their location in the main production zone, but also the proximity of the two cities. In addition, Koutiala and Sikasso are linked by a major highway, which facilitates the movement of maize and the transmission of information from one city to the other. The price formation in Sikasso is also well influenced by that in Bamako. Such a good connection between Bamako and Sikasso may be due to the good communication network between them. As mentioned early, even though the per capita consumption of maize is low in Bamako, Bamako has the ability to contribute to the price formation in Sikasso through the size of its population. The large index of market connection between Bamako and Koutiala indicates that these two markets do not have any relationship in terms of price formation. One may hypothesize that most of Bamako's imports of maize originate from Sikasso rather than Koutiala.

IV.2.2 Short-Run Market Connection at the Retail Level

IV.2.2.1 Millet

Presented in table 4.2, the results at the retail level seem to indicate that the millet marketing system is poorly integrated in the short-run. One of the major reasons for such a seemingly poor connection is the poor quality of the data, characterized by a lot of missing observations which attest that the data were not frequently collected and suggest that some of the observations may be unreliable. A second explanation of the poor connection may well be the collection of the retail data during the drought of 1983-85. During the drought, it is likely that little cereal was traded between regions.

The IMCs indicate that the Mopti millet market was very strongly connected with the Segou market in the short-run. As the redistribution center for agricultural commodities to the northern regions of the country, one would expect Mopti to be also well connected with Tombouctou and Gao. But, such is not the case. An explanation of this apparent poor connection between Mopti and both Tombouctou and Gao may be the poor quality of the data set. From the common pairs of markets between the wholesale and retail level data sets, Bamako-Sikasso and Mopti-Sikasso show good market integration at the wholesale level, but opposite results are generated at the retail level. The results of the regresion analysis using the wholesale-level data seem more in line with both the retail- and wholesale-level correlation analyses.

TABLE 4.2. INDICES OF MARKET CONNECTION FOR MILLET, SORGHUM, AND MAIZE AT THE RETAIL LEVEL FROM APRIL 1983 TO OCTOBER 1986

Markets	Millet	Sorghum	Maize
Bamako-Sikasso	21.20	94.00	7.58
Bamako-Segou	1.33	0.17	22.25
Bamako-Koulikoro	3.48	10.60	0.20
Mopti-Sikasso	33.67	0.74	6.08
Mopti-Segou	0.03	0.42	1.71
Mopti-Koulikoro	3.08	2.34	1.45
Segou-Sikasso	2.12	4.25	6.36
Tombouctou-Mopti	2.28	5.00	6.60
Tombouctou-Sikasso	22.67	5.85	98.00
Tombouctou-Segou	46.00	20.00	11.80
Gao-Mopti	1.39	0.69	5.00
Gao-Segou	4.41	0.29	1.39

Note: In the pairs of markets presented above, the first market represents the demand region and the second the supply region.

Source: Calculated from the data provided by OPAM, under funding from PRMC.

IV.2.2.2 Sorghum

In table 4.2, the results show that the price formation in Segou is highly influenced by that in Bamako, and Mopti. Segou, located between Bamako and Mopti, serves as a distribution center for these two cities. As such, it is likely that the price formation in these cities will affect that in Segou. The contribution of both Bamako and Mopti to the price formation in Segou is facilitated by the good communication network between these cities. Mopti also influences the price formation in Sikasso, a major sorghum surplus area.

IV.2.2.3 Maize

The indices of market connection in table 4.2 indicate that the maize marketing system is very poorly integrated, for almost all the indices stand above one. These results are expected, given the poor quality of the data set and the realities of the demand for maize. If these data are to be trusted, apparently, none of the other regions transmit their price formation to Sikasso. The production regions are not even well connected. The reason for the independence in the price formation seems to reflect the fact that maize demand is local to the production regions, as maize is used to break farmers' "hungry season." Thus, the movement of maize between surplus regions and deficit zones will be maintained at a minimum level. Along with the minimum movement of maize between cities, the flow of information will also be minimum. The poor connection between regions may also be due to the poor quality of the data collected at the retail level.

The price formation in Koulikoro is, nonetheless, strongly influenced by that of Bamako. The proximity of these two cities, coupled with the good communication network between them probably explains the good integration between these two cities.

IV.2.3 Long-Run Market Integration at the Wholesale Level

Before discussing the long-run market integration for millet, sorghum and maize, it is worth recalling that in Timmer's original presentation of his model, he argued that two markets are well integrated in the long-run when the coefficient of long-run integration is close to one. This means that a one percent increase in the price in the demand market leads to approximately a one percent increase in the price in the supply market. Timmer's standard assumes a constant percentage margin rather than a constant absolute margin between the supply market and the demand market. The same standard is used in this study.

IV.2.3.1 Millet

Table 4.3, which presents the coefficients of long-run market integration at the wholesale level, shows that the millet wholesale marketing system is, in general, well integrated in the long-run. Bamako strongly contributes to the price formation in Koutiala, a major wholesale grain market. With the regression coefficient of 1.32 between Bamako and Koutiala, one may hypothesize that there is an overshooting of prices in Koutiala. An explanation of this strong integration between Bamako and Koutiala is that the marketing margin between these two citie is relatively stable in absolute rather than

TABLE 4.3. COEFFICIENTS OF LONG-RUN MARKET INTEGRATION FOR MILLET, SORGHUM, AND MAIZE AT THE WHOLESALE LEVEL FROM OCTOBER 1985 TO OCTOBER 1987

Markets	Millet	Sorghum	Maize
Bamako-Sikasso	0.69	0.71	0.24*
Bamako-Koutiala	1.32	1.15	0.32*
Mopti-Sikasso	0.40	0.65	0.22*
Mopti-Koutiala	1.15	0.92	0.45*
Sikasso-Koutiala	0.81	0.92	0.33*
Koutiala-Sikasso	0.13*	0.36	0.14*

Note: For the pairs of markets given above, the first market represents the demand region and the second the supply region. The coefficients followed with * are not statistically significant at the five percent level.

Source: Calculated from the data collected by the CESA/MSU Food Security Project.

percentage terms.

In contrast, the data indicate that the market for millet in Koutiala does not influence the price formation in Sikasso in the long-run. However, Sikasso strongly influences the millet price formation in Koutiala, as a 100 percent increase in Sikasso's price results in about 92 percent price increase in Koutiala in the long-run, holding other factors constant. One may hypothesize that Sikasso imports millet from Koutiala to further export it to the northern part of Côte d'Ivoire and the south-west of Burkina Faso.

A comparative analysis of the short-run market connection and the long-run market integration indicates that Mopti and Sikasso strongly contribute to the price formation in Koutiala in both time frames. In contrast, Koutiala strongly influences the millet price formation in Sikasso in the short-run, but not in the long-run. Such a situation may happen where there is a temporary increase in the millet demand in Koutiala, due to a shortage of millet in a region such as Mopti. In doing so, Koutiala will strongly influence the millet price formation in Sikasso. But, soon after the demand for millet is satisfied, Koutiala will reduce its imports. Thus, Koutiala reduces its influence on the price formation in Sikasso.

IV.2.3.2 Sorghum

The results presented in table 4.3 suggest that the sorghum marketing system at the wholesale level is also well integrated in the long-run. Bamako strongly influences the sorghum price formation in Koutiala. Similarly, the price formation in Koutiala is strongly influenced by that in Mopti.

As with millet, Koutiala's contribution to the price formation in Sikasso is small, but Sikasso strongly inluences the sorghum price formation in Koutiala.

IV.2.3.3 Maize

The results presented in table 4.3 indicate that the maize marketing system is very poorly integrated in the long-run. The insignificance of the regression coefficients suggests that there is no relationship between the market pairs in the long-run. The fact that the demand for maize is, in general, local to the production area may explain such a poor relationship between markets.

IV.2.4 Long-Run Market Integration at the Retail Level

IV.2.4.1 Millet

The coefficients of long-run market integration presented in table 4.4 suggest that the wholesale millet marketing system is poorly integrated in the long-run. This seemingly poor connection may be due to the poor quality of the retail data set, which may have accounted for the insignificance of the regression coefficients. However, Bamako and Segou seem well connected.

IV.2.4.2 Sorghum

The very low and insignificant coefficients presented in table 4.4 indicate that the sorghum marketing system at the retail level seems to be very poorly integrated in the long-run. This may be explained by

TABLE 4.4. COEFFICIENTS OF LONG-RUN MARKET INTEGRATION FOR MILLET, SORGHUM, AND MAIZE AT THE RETAIL LEVEL FROM APRIL 1983 TO OCTOBER 1986

Markets	Millet	Sorghum	Maize
Bamako-Sikasso	0.36*	-0.51*	0.98
Bamako-Segou	1.11	0.48*	0.94
Mopti-Sikasso	0.11*	0.06*	0.04
Mopti-Segou	0.50	0.40*	0.03*
Mopti-Koulikoro	-0.09*	-0.67*	0.08*
Segou-Sikasso	0.55	0.32*	0.48
Tombouctou-Mopti	0.75	-0.18*	0.07*
Tombouctou-Sikasso	-0.01*	0.27*	0.22*
Tombouctou-Segou	-0.10*	0.05*	0.47
Gao-Mopti	0.64*	0.93	0.33*
Gao-Segou	0.10*	0.65*	0.30

Note: In the pairs of markets presented above, the first market represents the demand region and the second, the supply region. The coefficients followed with * are not statistically significant at the five percent level.

Source: Calculated from the data provided by OPAM, under funding from PRMC.

the poor quality of the data set.

IV.2.4.3 Maize

Table 4.4 shows that in the long-run, the maize marketing system at the retail level is poorly integrated. Nevertheless, Bamako market strongly influences the price formation for maize in Segou and Sikasso, a major surplus region.

IV.3 Summary

In summary, the regression analysis has provided us with results indicating that the millet and sorghum marketing systems are well integrated in the short-run at the wholesale level. For these two commodities, the analysis, if taken at face value, suggests that integration in the short-run is better at the wholesale level than at the retail level. This conclusion, however, may simply reflect the poor quality of the retail price data. Moreover, the wholesale maize marketing system is less well integrated in the short-run than the markets for millet and sorghum.

The results also indicated that the millet and sorghum marketing systems are better integrated in the long-run than the maize marketing system. In addition, the millet, sorghum, and maize marketing systems also appear better integrated in the long-run at the wholesale level than at the retail level. Again, this probably reflects the poor quality of the retail data and suggests that there is a need to collect more reliable data at the retail level in order to further assess the cereals marketing system.

CHAPTER V

CONCLUSION

The present study was undertaken to achieve several objectives. First, the study was designed to assess the degree of market integration of the cereal markets at both the wholesale and retail level. Second, this study was aimed at evaluating the differences and similarities of the various techniques of analysis, and the behavior of the different pairs of markets for the three commodities. Finally, this study was also intended to evaluate the degree of price interrelationships across commodities.

V.1 Differences Across Commodities at the Wholesale and Retail Levels

The different methods of analysis, namely the correlation method, the margin analysis, and the regression approach, have provided results showing that the performance of the cereals marketing system is different across commodities and market levels. Tables 5.1 and 5.2, which present the results of the different methods of analysis at the wholesale and retail levels, indicate that the millet and the sorghum marketing systems constitute strongly integrated systems. However, the degree of market integration appears stronger at the wholesale level than at the retail level. The quality of the two data sets, due to the method and frequency of the data collection (see Chapter 1), may be a very influential factor in explaining such a difference. A second factor may be the differing periods of data collection. Wholesale prices were collected between 1985 and 1987, a period of relatively

TABLE 5.1. SUMMARY OF THE RESULTS GENERATED BY THE DIFFERENT METHODS OF ANALYSIS AT THE WHOLESALE LEVEL FROM OCTOBER 1985 TO OCTOBER 1987

Markets	Products	C.C.	C.V.	IMC	CLI
Bamako-Sikasso	Millet	0.91	0.65	0.22	0.69
Bamako-Koutiala	Millet	0.91	0.30	2.81	1.32
Sikasso-Koutiala	Millet	0.88	0.56	0.72	0.81
Mopti-Koutiala	Millet	0.85	0.58	0.08	1.15
Mopti-Sikasso	Millet	0.77	2.13	0.89	0.40
Sikasso-Koutiala	Sorghum	0.94	0.60	0.15	0.92
Bamako-Sikasso	Sorghum	0.87	0.56	1.64	0.71
Bamako-Koutiala	Sorghum	0.86	0.35	4.67	1.15
Mopti-Koutiala	Sorghum	0.85	0.50	0.29	0.92
Mopti-Sikasso	Sorghum	0.85	0.87	0.37	0.65
Sikasso-Koutiala	Maize	0.90	0.50	0.93	0.33*
Bamako-Koutiala	Maize	0.81	0.41	5.39	0.32*
Bamako-Sikasso	Maize	0.81	0.91	0.52	0.24*
Mopti-Koutiala	Maize	0.43	1.10	4.03	0.45*
Mopti-Sikasso	Maize	0.41	14.60	3.68	0.22*

Note: C.C. represents the correlation coefficient, C.V. the coefficient of variation, IMC the index of market connection, and CLI the coefficient of long-run integration. The coefficients followed with * are not statistically significant at the five percent level.

Source: Calculated from the data provided by the CESA/MSU Food Security Project.

TABLE 5.2. SUMMARY OF THE RESULTS GENERATED BY THE DIFFERENT METHODS OF ANALYSIS AT THE RETAIL LEVEL FROM APRIL 1983 TO OCTOBER 1986

Markets	Cereals	C.C.	C.V.	IMC	CLI
Mopti-Segou	Millet	0.90	1.14	0.03	0.50
Segou-Sikasso	Millet	0.85	0.93	2.12	0.55
Gao-Mopti	Millet	0.83	0.60	1.39	0.64*
Mopti-Sikasso	Millet	0.82	0.75	33.67	0.11*
Bamako-Segou	Millet	0.79	0.63	1.33	1.11
Bamako-Sikasso	Millet	0.71	0.45	21.20	0.36*
Tombouctou-Mopti	Millet	0.60	1.19	2.28	0.75
Tombouctou-Segou	Millet	0.37*	0.97	46.00	-0.10*
Bamako-Segou	Sorghum	0.91	0.77	0.17	0.48*
Mopti-Segou	Sorghum	0.87	4.42	0.42	0.40*
Gao-Mopti	Sorghum	0.79	1.11	0.69	0.93
Mopti-Sikasso	Sorghum	0.76	0.83	0.74	0.06*
Bamako-Sikasso	Sorghum	0.68	0.57	94.00	-0.51*
Tombouctou-Mopti	Sorghum	0.51	2.79	5.00	-0.18*
Tombouctou-Segou	Sorghum	0.33*	1.95	20.00	0.05*
Bamako-Segou	Maize	0.75	0.93	22.25	0.94
Mopti-Segou	Maize	0.74	18.79	1.71	0.03*
Mopti-Sikasso	Maize	0.65	1.97	6.08	0.04
Bamako-Sikasso	Maize	0.63	0.58	7.58	0.98
Tombouctou-Mopti	Maize	0.63	1.86	6.60	0.07*
Tombouctou-Segou	Maize	0.44	1.96	11.80	0.47

Note: C.C. represents the correlation coefficient, S.V. the coefficient of variation, IMC the index of market connection, and the CLI the coefficient of long-run integration. The coefficients followed with * are not statistically significant at the five percent level.

Source: Calculated from the data collected by OPAM, under the funding from the PRMC.

high rainfall. Such large rainfall contributed to an increase of cereals production in the country. As cereals production increased, substantial quantities of cereals were marketed and exchanged between surplus and deficit regions. In contrast, the retail prices were collected from 1983 through 1986, which included two drought years.

The study also revealed that millet markets and sorghum markets are relatively better integrated than those of maize at both the wholesale and retail levels. Such a relatively poor connection in the maize marketing system is probably due to the low commercial demand for maize in the country, where farmers use maize to break the "hungry season" in the production areas. Consequently, relatively little maize enters commercial markets; therefore, the market for maize is much thinner than that of millet or sorghum. In addition, maize is harder to prepare for cooking than other types of cereals. One may hypothesize that increasing the demand for maize through the availability of a more easily prepared form of maize may improve demand and hence market integration in the maize sector by stimulating increased maize production for the market.

V.2 Methods of Analysis and Pairs of Markets at the Wholesale and Retail Levels

At the wholesale level, the different methods of analysis indicated that the markets located in the southern cereals surplus zone are, in general, well integrated both in the short-run and long-run. The three different methods suggested that Sikasso and Koutiala are well connected for the three types of cereal. All approaches also indicated that Mopti is well connected with Koutiala for millet and sorghum in the short and long run. However, the results suggested that these two cities are not well integrated for maize. Both the correlation analysis and the margin analysis showed that Bamako and Koutiala markets have a strong price interraltionship for the three commodities. In contrast, the regression analysis seems to suggest that these markets are not well integrated in the short-run for millet and sorghum, but well integrated in the long-run. Similarly, the methods of analysis generated the same results for the pair Bamako-Sikasso.

At the retail price level, the results of the correlation and margin methods indicated that the pair Bamako-Segou is well integrated for both millet and sorghum. In contrast, the regression approach showed that Bamako and Segou markets are well integrated for sorghum in the short-run, but these markets are not well connected in the long-run. In contrast, the markets for millet in these two cities appear to be poorly integrated in the short-run, but well integrated in the long-run. For maize, the correlation method and margin analysis suggested that these two cities are fairly well connected. The regression approach indicated that the two markets are not well integrated in both the short-run and long-run. The pair Bamako-Sikasso generated similar results to those for Bamako and Segou. The correlation method and regression analysis showed that the Mopti and Segou markets are well integrated in the short-run for both millet and sorghum, but the index of market connection seems to suggest that the two markets are not well connected in the short-run for maize. In contrast, the margin analysis suggested that the cereals markets of Mopti and Segou are not well integrated in the long-run.

In table 5.2, both the margin analysis and the regression method indicated that Tombouctou and Mopti cereals markets are poorly integrated. In contrast, the correlation analysis showed that these markets are fairly well integrated in terms of price formation.

In summary, the three different methods of analysis generated results that do not allow us to state conclusively which method of analysis is best. However, the correlation analysis did provide results that were more consistent across commodities for the same market pairs. For example, if the correlation analysis indicated that the markets for millet betweeen a given market pair were highly integrated, it usually also indicated, as one would expect, that the markets for sorghum were also well integrated. The other techniques did not always display such consistency. Furthermore, comparison of the regression results for the wholesale and retail data strongly suggests that the regression analysis was sensitive to the measurement errors in the retail price data. This suggests caution is needed in using the regression analysis when dealing with data sets of uncertain quality, as often exist in developing countries. Improving the quality of the information to policy makers about the performance of the cereals marketing system depends heavily on the quality of the data collected. The government of Mali, recognizing this need, has made considerable progress in this area since 1988, when a market information system was established within OPAM. Indications are that the retail price data collected by OPAM since late 1988 are of much higher quality than those analyzed in this study.

V.3 Price Interrelationship Across Commodities

The study of the price interrelationship between products to determine the degree of the price relation across commodities suggested that millet and sorghum prices are closely related in terms of price relationship. The two products appear to be close substitutes, although to make a firm conclusion requires cross-elasticities, which are not available in the present study. The results also suggest that maize is a close substitute for both millet and sorghum.

The study also indicated that millet, sorghum and maize prices are very poorly correlated to the rice price. Although cross-elasticities are required to make any conclusive statement, this may suggest that these coarse grains are poor substitutes for rice.

APPENDIX A

APPENDIX A: RETAIL AND WHOLESALE PRICE DATA

obs	MIL1	MIL2	MIL3	MIL4
1983.04	86.00000	85.00000	76.50000	94.00000
1983.05	95.50000	107.5000	82.50000	112.5000
1983.06	107.0000	107.5000	90.00000	112.5000
1983.07	132.5000	130.0000	97.50000	125.0000
1983.08	135.5000	130.0000	100.0000	137.5000
1983.09	136.0000	130.0000	97.50000	150.0000
1983.10	136.0000	95.00000	100.0000	150.0000
1983.11	127.0000	75.50000	NA	150.0000
1983.12	112.0000	97.50000	NA	150.0000
1984.01	120.0000	100.0000	100.0000	150.0000
1984.02	117.5000	NA	95.00000	150.0000
1984.03	125.5000	132.5000	97.50000	162.5000
1984.04	139.5000	125.0000	100.0000	162.5000
1984.05	144.0000	142.5000	100.0000	175.0000
1984.06	NA	150.0000	100.0000	150.0000
1984.07	156.0000	150.0000	110.0000	150.0000
1984.08	149.0000	150.0000	110.0000	150.0000
1984.09	151.0000	165.0000	100.0000	125.0000
1984.10	155.0000	140.0000	100.0000	110.0000
1984.11	122.0000	110.0000	NA	125.0000
1984.12	112.0000	115.0000	100.0000	90.00000
1985.01	111.0000	100.0000	100.0000	125.0000
1985.02	117.0000	125.0000	105.0000	125.0000
1985.03	121.0000	NA	105.0000	110.0000
1985.04	147.0000	NA	95.00000	140.0000
1985.05	146.0000	145.0000	110.0000	NA
1985.06	149.0000	150.0000	115.0000	145.0000
1985.07	150.0000	160.0000	108.0000	113.0000
1985.08	154.0000	160.0000	95.00000	113.0000
1985.09	157.5000	130.0000	NA	NA
1985.10	147.0000	90.00000	83.00000	NA
1985.11	106.5000	70.00000	70.00000	60.00000
1985.12	99.50000	70.00000	70.00000	NA
1986.01	98.50000	75.00000	65.00000	NA
1986.02	95.00000	70.00000	55.00000	NA

obs	MIL5	MIL6	MIL7	MIL8
1983.04	67.50000	105.0000	65.00000	112.5000
1983.05	87.50000	135.0000	NA	145.0000
1983.06	NA	135.0000	95.00000	NA
1983.07	NA	NA	105.0000	162.5000
1983.08	112.5000	150.0000	105.0000	NA
1983.09	100.0000	150.0000	100.0000	175.0000
1983.10	100.0000	137.5000	112.5000	140.0000
1983.11	82.50000	NA	90.00000	132.5000
1983.12	82.50000	117.5000	90.00000	112.5000
1984.01	100.0000	140.0000	95.00000	115.0000
1984.02	105.0000	150.0000	100.0000	NA
1984.03	125.0000	120.0000	110.0000	157.5000
1984.04	125.0000	120.0000	150.0000	162.5000
1984.05	125.0000	130.0000	150.0000	155.0000
1984.06	125.0000	150.0000	150.0000	160.0000
1984.07	135.0000	160.0000	150.0000	170.0000
1984.08	140.0000	190.0000	140.0000	180.0000
1984.09	135.0000	190.0000	110.0000	180.0000
1984.10	135.0000	200.0000	110.0000	180.0000
1984.11	85.00000	180.0000	NA	NA
1984.12	90.00000	150.0000	NA	NA
1985.01	120.0000	150.0000	NA	111.0000
1985.02	NA	160.0000	NA	117.0000
1985.03	125.0000	150.0000	NA	NA
1985.04	125.0000	NA	NA	NA
1985.05	125.0000	NA	NA	NA
1985.06	125.0000	325.0000	NA	NA
1985.07	120.0000	300.0000	NA	NA
1985.08	125.0000	NA	NA	NA
1985.09	125.0000	NA	NA	NA
1985.10	80.00000	NA	NA	NA
1985.11	70.00000	NA	70.00000	NA
1985.12	73.00000	NA	NA	105.0000
1986.01	75.00000	NA	NA	NA
1986.02	70.00000	NA	NA	NA

obs	SORG1	SORG2	SORG3	SORG4
1983.04	77.50000	75.00000	74.00000	81.50000
1983.05	89.50000	105.0000	75.00000	110.0000
1983.06	95.50000	105.0000	87.50000	112.5000
1983.07	124.5000	125.0000	87.50000	125.0000
1983.08	128.5000	125.0000	NA	137.5000
1983.09	133.5000	125.0000	97.50000	150.0000
1983.10	133.5000	92.50000	NA	150.0000
1983.11	126.0000	85.00000	NA	162.5000
1983.12	123.0000	92.50000	NA	162.5000
1984.01	125.0000	100.0000	NA	150.0000
1984.02	125.5000	NA	95.00000	150.0000
1984.03	131.5000	137.5000	NA	162.5000
1984.04	146.0000	130.0000	NA	162.5000
1984.05	147.0000	140.0000	100.0000	162.5000
1984.06	NA	125.0000	100.0000	150.0000
1984.07	150.0000	130.0000	NA	150.0000
1984.08	152.0000	140.0000	110.0000	150.0000
1984.09	155.0000	160.0000	90.00000	125.0000
1984.10	154.0000	135.0000	90.00000	110.0000
1984.11	123.0000	105.0000	NA	125.0000
1984.12	106.0000	100.0000	100.0000	90.00000
1985.01	107.0000	90.00000	100.0000	120.0000
1985.02	117.0000	110.0000	NA	125.0000
1985.03	121.0000	NA	NA	115.0000
1985.04	131.0000	NA	95.00000	140.0000
1985.05	140.0000	140.0000	120.0000	NA
1985.06	130.0000	145.0000	115.0000	145.0000
1985.07	134.0000	145.0000	108.0000	113.0000
1985.08	137.0000	140.0000	95.00000	113.0000
1985.09	138.0000	110.0000	NA	NA
1985.10	128.0000	85.00000	83.00000	NA
1985.11	101.0000	70.00000	70.00000	75.00000
1985.12	96.00000	75.00000	70.00000	NA
1986.01	94.00000	80.00000	65.00000	NA
1986.02	91.00000	80.00000	55.00000	NA

obs	MAIS1	MAIS2	MAIS3	MAIS4
1983.04	71.50000	65.00000	65.00000	60.00000
1983.05	78.00000	100.0000	70.00000	75.00000
1983.06	86.50000	100.0000	70.00000	75.00000
1983.07	95.50000	112.5000	87.50000	125.0000
1983.08	105.0000	112.5000	85.00000	100.0000
1983.09	105.5000	125.0000	86.50000	112.5000
1983.10	105.5000	NA	90.00000	150.0000
1983.11	110.0000	75.00000	NA	137.5000
1983.12	108.0000	90.00000	NA	137.5000
1984.01	112.0000	95.00000	85.00000	162.5000
1984.02	113.0000	NA	75.00000	125.0000
1984.03	119.5000	137.5000	92.50000	150.0000
1984.04	132.5000	125.0000	85.00000	162.5000
1984.05	130.0000	140.0000	85.00000	150.0000
1984.06	NA	110.0000	85.00000	150.0000
1984.07	123.0000	120.0000	90.00000	150.0000
1984.08	121.0000	110.0000	90.00000	150.0000
1984.09	119.0000	110.0000	90.00000	110.0000
1984.10	122.0000	100.0000	90.00000	110.0000
1984.11	110.0000	100.0000	NA	70.00000
1984.12	96.00000	90.00000	100.0000	80.00000
1985.01	98.00000	75.00000	100.0000	115.0000
1985.02	104.0000	90.00000	105.0000	115.0000
1985.03	110.0000	NA	100.0000	95.00000
1985.04	118.0000	NA	95.00000	120.0000
1985.05	121.0000	100.0000	100.0000	NA
1985.06	124.0000	110.0000	95.00000	120.0000
1985.07	123.0000	120.0000	95.00000	85.00000
1985.08	126.0000	110.0000	95.00000	85.00000
1985.09	123.0000	100.0000	NA	NA
1985.10	107.0000	80.00000	78.00000	NA
1985.11	88.00000	70.00000	65.00000	NA
1985.12	86.00000	25.00000	65.00000	NA
1986.01	89.00000	25.00000	60.00000	NA
1986.02	89.00000	35.00000	50.00000	NA

obs	MAIS5	MAIS6	MAIS7	MAIS8
1983.04	62.50000	70.00000	52.50000	94.00000
1983.05	82.50000	72.50000	NA	125.0000
1983.06	NA	72.50000	NA	NA
1983.07	NA	NA	90.00000	87.50000
1983.08	90.00000	NA	95.00000	NA
1983.09	82.50000	NA	90.00000	125.0000
1983.10	80.00000	112.5000	95.00000	100.0000
1983.11	77.50000	NA	90.00000	95.00000
1983.12	77.50000	79.00000	90.00000	105.0000
1984.01	87.50000	NA	100.0000	87.50000
1984.02	95.00000	NA	100.0000	NA
1984.03	122.5000	NA	105.0000	100.0000
1984.04	122.5000	NA	145.0000	100.0000
1984.05	122.5000	NA	145.0000	110.0000
1984.06	110.0000	NA	145.0000	125.0000
1984.07	125.0000	NA	140.0000	130.0000
1984.08	125.0000	NA	120.0000	125.0000
1984.09	125.0000	100.0000	100.0000	150.0000
1984.10	130.0000	175.0000	100.0000	150.0000
1984.11	80.00000	100.0000	NA	NA
1984.12	85.00000	83.00000	NA	NA
1985.01	115.0000	83.00000	NA	NA
1985.02	NA	150.0000	NA	NA
1985.03	100.0000	150.0000	NA	NA
1985.04	95.00000	NA	NA	NA
1985.05	100.0000	213.0000	NA	NA
1985.06	95.00000	250.0000	NA	NA
1985.07	95.00000	325.0000	NA	NA
1985.08	95.00000	NA	NA	NA
1985.09	NA	NA	NA	NA
1985.10	78.00000	NA	70.00000	NA
1985.11	65.00000	NA	NA	28.00000
1985.12	65.00000	NA	NA	NA
1986.01	60.00000	50.00000	NA	NA
1986.02	50.00000	40.00000	75.00000	NA

obs	RICE1	RICE2	RICE3	RICE4
1983.04	150.0000	150.0000	150.0000	150.0000
1983.05	150.0000	145.0000	150.0000	162.5000
1983.06	150.0000	145.0000	152.5000	187.5000
1983.07	150.0000	192.5000	162.5000	162.5000
1983.08	150.0000	192.5000	150.0000	150.0000
1983.09	150.0000	169.0000	150.0000	162.5000
1983.10	150.0000	170.0000	NA	150.0000
1983.11	150.0000	195.0000	NA	175.0000
1983.12	150.0000	165.0000	NA	187.5000
1984.01	150.0000	137.5000	175.0000	175.0000
1984.02	150.0000	NA	175.0000	175.0000
1984.03	150.0000	190.0000	NA	175.0000
1984.04	164.0000	150.0000	175.0000	162.5000
1984.05	168.5000	180.0000	150.0000	162.5000
1984.06	172.0000	140.0000	150.0000	163.0000
1984.07	165.0000	175.0000	150.0000	163.0000
1984.08	158.0000	150.0000	175.0000	163.0000
1984.09	164.0000	150.0000	175.0000	165.0000
1984.10	163.0000	145.0000	175.0000	150.0000
1984.11	161.0000	140.0000	NA	155.0000
1984.12	159.0000	150.0000	NA	135.0000
1985.01	155.0000	140.0000	175.0000	140.0000
1985.02	161.5000	135.0000	NA	140.0000
1985.03	167.5000	NA	NA	150.0000
1985.04	156.5000	NA	NA	150.0000
1985.05	164.0000	150.0000	NA	NA
1985.06	163.5000	160.0000	NA	138.0000
1985.07	167.0000	160.0000	NA	150.0000
1985.08	170.5000	165.0000	NA	150.0000
1985.09	167.0000	160.0000	NA	NA
1985.10	165.0000	150.0000	NA	NA
1985.11	163.0000	NA	NA	150.0000
1985.12	165.5000	140.0000	NA	NA
1986.01	164.5000	140.0000	NA	NA
1986.02	164.0000	NA	NA	NA

obs	RICE5	RICE6	RICE7	RICE8
1983.04	150.0000	NA	142.5000	175.0000
1983.05	137.5000	NA	NA	187.5000
1983.06	NA	NA	150.0000	NA
1983.07	NA	NA	162.5000	187.5000
1983.08	162.5000	NA	162.5000	NA
1983.09	150.0000	NA	NA	NA
1983.10	NA	NA	NA	175.0000
1983.11	150.0000	NA	137.5000	175.0000
1983.12	162.5000	150.0000	137.5000	NA
1984.01	125.0000	175.0000	150.0000	190.0000
1984.02	150.0000	175.0000	150.0000	NA
1984.03	150.0000	185.0000	150.0000	225.0000
1984.04	150.0000	175.0000	187.5000	225.0000
1984.05	150.0000	175.0000	162.5000	NA
1984.06	150.0000	175.0000	165.0000	175.0000
1984.07	150.0000	175.0000	165.0000	175.0000
1984.08	150.0000	175.0000	150.0000	180.0000
1984.09	160.0000	175.0000	150.0000	200.0000
1984.10	160.0000	175.0000	140.0000	200.0000
1984.11	150.0000	NA	NA	NA
1984.12	145.0000	NA	NA	NA
1985.01	160.0000	187.5000	NA	NA
1985.02	NA	NA	NA	NA
1985.03	150.0000	NA	NA	NA
1985.04	150.0000	NA	NA	NA
1985.05	150.0000	NA	NA	NA
1985.06	165.0000	NA	NA	NA
1985.07	150.0000	NA	NA	NA
1985.08	150.0000	NA	NA	NA
1985.09	150.0000	NA	NA	NA
1985.10	165.0000	NA	NA	NA
1985.11	130.0000	NA	NA	NA
1985.12	130.0000	NA	NA	NA
1986.01	135.0000	NA	NA	NA
1986.02	125.0000	NA	160.0000	NA

obs	MIL1	MIL2	MIL3	MIL9
1985.10	70.90000	100.4000	56.20000	49.30000
1985.11	66.80000	70.60000	56.10000	50.70000
1985.12	68.10000	70.00000	59.80000	54.50000
1986.01	66.10000	69.30000	59.70000	54.40000
1986.02	69.00000	67.10000	60.30000	53.70000
1986.03	72.10000	65.20000	62.10000	55.30000
1986.04	61.30000	63.70000	62.40000	48.60000
1986.05	64.80000	59.60000	53.00000	49.50000
1986.06	61.60000	60.40000	56.40000	44.80000
1986.07	68.80000	67.90000	59.70000	53.60000
1986.08	65.50000	67.30000	56.90000	57.10000
1986.09	68.60000	60.20000	62.10000	44.00000
1986.10	60.70000	46.20000	50.30000	33.90000
1986.11	47.60000	37.10000	50.60000	23.50000
1986.12	46.10000	37.60000	37.70000	26.70000
1987.01	43.20000	34.50000	34.70000	23.70000
1987.02	42.60000	34.90000	34.00000	22.90000
1987.03	45.80000	37.90000	35.80000	27.70000
1987.04	44.80000	37.50000	40.90000	32.30000
1987.05	45.20000	44.20000	43.90000	33.00000
1987.06	48.80000	52.50000	45.20000	37.70000
1987.07	52.80000	62.90000	53.90000	45.80000
1987.08	62.50000	63.10000	56.90000	46.90000
1987.09	63.20000	60.00000	59.34000	49.00000
1987.10	67.40000	58.60000	61.60000	51.32000

obs	SORG1	SORG2	SORG3	SORG9
1985.10	64.20000	100.6000	56.10000	50.40000
1985.11	69.50000	73.00000	55.90000	52.10000
1985.12	70.70000	70.90000	59.30000	53.70000
1986.01	NA	75.00000	59.20000	54.20000
1986.02	63.90000	66.60000	59.30000	53.50000
1986.03	66.40000	69.10000	60.50000	55.40000
1986.04	64.60000	63.70000	57.70000	47.60000
1986.05	64.60000	60.40000	50.00000	46.50000
1986.06	62.30000	60.10000	54.50000	44.20000
1986.07	69.80000	67.70000	61.70000	53.30000
1986.08	66.70000	61.90000	52.90000	54.30000
1986.09	68.10000	56.60000	47.00000	42.70000
1986.10	60.60000	49.70000	45.10000	33.20000
1986.11	48.40000	39.60000	41.50000	23.90000
1986.12	47.10000	39.80000	32.10000	26.70000
1987.01	44.70000	37.50000	34.60000	24.00000
1987.02	42.80000	38.70000	32.20000	22.70000
1987.03	41.40000	42.50000	35.30000	27.50000
1987.04	40.30000	37.40000	32.90000	31.30000
1987.05	39.70000	44.00000	40.10000	35.00000
1987.06	45.50000	52.40000	43.10000	35.10000
1987.07	51.10000	62.40000	50.10000	43.40000
1987.08	62.60000	62.50000	50.30000	42.20000
1987.09	63.90000	65.30000	49.20000	45.20000
1987.10	67.70000	56.00000	49.00000	48.10000

obs	MAIS1	MAIS2	MAIS3	MAIS9
1985.10	60.40000	77.70000	55.70000	47.40000
1985.11	70.70000	49.60000	55.60000	50.70000
1985.12	69.80000	50.00000	58.80000	52.70000
1986.01	66.90000	50.00000	59.80000	53.30000
1986.02	65.30000	50.00000	57.90000	50.40000
1986.03	64.50000	60.00000	59.70000	42.00000
1986.04	57.60000	NA	56.30000	37.20000
1986.05	54.50000	48.50000	43.10000	40.80000
1986.06	54.60000	39.00000	53.10000	36.10000
1986.07	63.10000	45.60000	44.30000	37.60000
1986.08	60.40000	50.00000	46.90000	37.00000
1986.09	62.50000	50.00000	36.60000	25.00000
1986.10	57.60000	35.00000	37.00000	22.80000
1986.11	36.50000	NA	38.00000	17.40000
1986.12	40.10000	NA	26.50000	20.80000
1987.01	30.00000	NA	30.70000	20.40000
1987.02	34.80000	NA	27.70000	20.00000
1987.03	25.30000	NA	30.20000	21.50000
1987.04	36.00000	NA	32.20000	28.70000
1987.05	NA	NA	35.90000	27.90000
1987.06	NA	NA	40.20000	33.30000
1987.07	47.90000	NA	42.80000	29.40000
1987.08	50.00000	NA	45.10000	34.20000
1987.09	56.30000	NA	48.60000	35.10000
1987.10	57.40000	50.00000	37.60000	31.60000

APPENDIX B

APPENDIX B: CORRELATIONS ACROSS MARKETS AND COMMODITIES AT THE RETAIL AND WHOLESALE LEVELS

SMPL 1983.04 - 1986.02
30 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL1	127.98333	21.264542	156.00000	86.000000
MIL3	94.416667	14.497374	115.00000	55.000000

	Covariance	Correlation
MIL1,MIL1	437.10806	1.0000000
MIL1,MIL3	211.03194	0.7081513
MIL3,MIL3	203.16806	1.0000000

SMPL 1983.04 - 1986.02
28 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL1	129.08929	19.164519	156.00000	86.000000
MIL4	130.80357	25.540215	175.00000	60.000000

	Covariance	Correlation
MIL1,MIL1	354.16167	1.0000000
MIL1,MIL4	198.17825	0.4198825
MIL4,MIL4	629.00606	1.0000000

SMPL 1983.04 - 1986.02
31 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL1	129.08065	21.337017	157.50000	86.000000
MIL5	106.14516	23.391307	140.00000	67.500000

	Covariance	Correlation
MIL1,MIL1	440.58221	1.0000000
MIL1,MIL5	383.02055	0.7930021
MIL5,MIL5	529.50312	1.0000000

SMPL 1983.04 - 1986.02
18 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL1	129.77778	18.979263	156.00000	86.000000
MIL7	108.19444	25.173012	150.00000	65.000000

	Covariance	Correlation
MIL1,MIL1	340.20062	1.0000000
MIL1,MIL7	356.54321	0.7901712
MIL7,MIL7	598.47608	1.0000000

SMPL 1983.04 - 1986.02
28 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL2	120.35714	29.982358	165.00000	70.000000
MIL3	94.196429	14.922230	115.00000	55.000000

	Covariance	Correlation
MIL2,MIL2	866.83673	1.0000000
MIL2,MIL3	354.39413	0.8214503
MIL3,MIL3	214.72034	1.0000000

SMPL 1983.04 - 1986.02
29 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL2	117.94828	30.797827	165.00000	70.000000
MIL5	105.53448	23.939631	140.00000	67.500000

	Covariance	Correlation
MIL2,MIL2	915.79905	1.0000000
MIL2,MIL5	637.77765	0.8959252
MIL5,MIL5	553.34364	1.0000000

SMPL 1983.04 - 1986.02
22 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL2	125.79545	23.291455	165.00000	85.000000
MIL6	163.40909	54.316891	325.00000	105.00000

	Covariance	Correlation
MIL2,MIL2	517.83316	1.0000000
MIL2,MIL6	718.59504	0.5950536
MIL6,MIL6	2816.2190	1.0000000

SMPL 1983.04 - 1986.02
18 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL2	120.86111	28.171641	165.00000	70.000000
MIL7	110.97222	26.914064	150.00000	65.000000

	Covariance	Correlation
MIL2,MIL2	749.55015	1.0000000
MIL2,MIL7	529.16281	0.7389609
MIL7,MIL7	684.12423	1.0000000

SMPL 1983.04 - 1986.02
19 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL2	119.50000	27.714316	165.00000	70.000000
MIL8	145.94737	26.884989	180.00000	105.00000

	Covariance	Correlation
MIL2,MIL2	727.65789	1.0000000
MIL2,MIL8	587.77632	0.8326819
MIL8,MIL8	684.76039	1.0000000

SMPL 1983.04 - 1986.02
28 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL3	94.285714	14.888119	115.00000	55.000000
MIL5	108.58929	23.319065	140.00000	67.500000

	Covariance	Correlation
MIL3,MIL3	213.73980	1.0000000
MIL3,MIL5	284.08163	0.8485676
MIL5,MIL5	524.35810	1.0000000

SMPL 1983.04 - 1986.02
22 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL3	99.636364	8.5414700	115.00000	76.500000
MIL6	163.52273	53.422502	325.00000	105.00000

	Covariance	Correlation
MIL3,MIL3	69.640496	1.0000000
MIL3,MIL6	274.00826	0.6290863
MIL6,MIL6	2724.2381	1.0000000

SMPL 1983.04 - 1986.02
17 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL3	96.852941	10.705963	110.00000	70.000000
MIL8	148.70588	26.904379	180.00000	105.00000

	Covariance	Correlation
MIL3,MIL3	107.87543	1.0000000
MIL3,MIL8	145.41263	0.5363921
MIL8,MIL8	681.26644	1.0000000

SMPL 1983.04 - 1986.02
22 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL5	112.04545	20.304767	140.00000	67.500000
MIL6	163.63636	54.114777	325.00000	105.00000

	Covariance	Correlation
MIL5,MIL5	393.54339	1.0000000
MIL5,MIL6	392.27789	0.3740101
MIL6,MIL6	2795.2996	1.0000000

SMPL 1983.04 - 1986.02
17 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL5	109.70588	23.616109	140.00000	67.500000
MIL7	111.61765	27.541746	150.00000	65.000000

	Covariance	Correlation
MIL5,MIL5	524.91349	1.0000000
MIL5,MIL7	504.88754	0.8247528
MIL7,MIL7	713.92734	1.0000000

SMPL 1983.04 - 1986.02
17 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL5	109.29412	24.057911	140.00000	67.500000
MIL8	146.67647	27.259712	180.00000	105.00000

	Covariance	Correlation
MIL5,MIL5	544.73702	1.0000000
MIL5,MIL8	475.22751	0.7699302
MIL8,MIL8	699.38062	1.0000000

SMPL 1983.04 - 1986.02
16 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL6	147.18750	27.731976	200.00000	105.00000
MIL8	148.31250	26.819691	180.00000	111.00000

	Covariance	Correlation
MIL6,MIL6	720.99609	1.0000000
MIL6,MIL8	403.14453	0.5781691
MIL8,MIL8	674.33984	1.0000000

SMPL 1983.04 - 1986.02
22 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG1	120.40909	23.592592	155.00000	77.500000
SORG3	90.113636	16.722477	120.00000	55.000000

	Covariance	Correlation
SORG1,SORG1	531.30992	1.0000000
SORG1,SORG3	257.55579	0.6839092
SORG3,SORG3	266.93027	1.0000000

SMPL 1983.04 - 1986.02
28 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG1	125.87500	19.456326	155.00000	77.500000
SORG4	131.25000	25.169978	162.50000	75.000000

	Covariance	Correlation
SORG1,SORG1	365.02902	1.0000000
SORG1,SORG4	282.58482	0.5984108
SORG4,SORG4	610.90179	1.0000000

SMPL 1983.04 - 1986.02
21 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG1	124.09524	23.118509	155.00000	77.500000
SORG5	109.66667	26.152597	150.00000	70.000000

	Covariance	Correlation
SORG1,SORG1	509.01474	1.0000000
SORG1,SORG5	522.04365	0.9066120
SORG5,SORG5	651.38889	1.0000000

SMPL 1983.04 - 1986.02
17 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG1	128.23529	22.629570	155.00000	77.500000
SORG7	108.97059	25.709599	150.00000	67.500000

	Covariance	Correlation
SORG1,SORG1	481.97405	1.0000000
SORG1,SORG7	409.87457	0.7485285
SORG7,SORG7	622.10208	1.0000000

SMPL 1983.04 - 1986.02
21 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG2	113.57143	28.815918	160.00000	70.000000
SORG3	90.119048	17.208214	120.00000	55.000000

	Covariance	Correlation
SORG2,SORG2	790.81633	1.0000000
SORG2,SORG3	356.83673	0.7555977
SORG3,SORG3	282.02154	1.0000000

SMPL 1983.04 - 1986.02
21 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG2	113.21429	28.604445	160.00000	70.000000
SORG5	110.02381	26.315621	150.00000	70.000000

	Covariance	Correlation
SORG2,SORG2	779.25170	1.0000000
SORG2,SORG5	624.68537	0.8713718
SORG5,SORG5	659.53515	1.0000000

SMPL 1983.04 - 1986.02
16 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG2	117.18750	26.090787	160.00000	70.000000
SORG8	135.65625	33.249420	180.00000	53.000000

	Covariance	Correlation
SORG2,SORG2	638.18359	1.0000000
SORG2,SORG8	641.68945	0.7890097
SORG8,SORG8	1036.4287	1.0000000

SMPL 1983.04 - 1986.02
17 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG3	91.588235	18.644902	120.00000	55.000000
SORG5	110.02941	27.754769	150.00000	70.000000

	Covariance	Correlation
SORG3,SORG3	327.18339	1.0000000
SORG3,SORG5	384.80623	0.7900841
SORG5,SORG5	725.01384	1.0000000

SMPL 1983.04 - 1986.02
13 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG3	99.961538	11.889178	120.00000	74.000000
SORG6	157.46154	71.944846	325.00000	92.500000

	Covariance	Correlation
SORG3,SORG3	130.47929	1.0000000
SORG3,SORG6	516.44083	0.6540804
SORG6,SORG6	4777.9024	1.0000000

SMPL 1983.04 - 1986.02
10 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG3	89.400000	13.080520	110.00000	70.000000
SORG8	141.55000	40.205341	180.00000	53.000000

	Covariance	Correlation
SORG3,SORG3	153.99000	1.0000000
SORG3,SORG8	352.08000	0.7438581
SORG8,SORG8	1454.8225	1.0000000

SMPL 1983.04 - 1986.02
16 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG5	118.12500	20.986107	150.00000	75.000000
SORG6	150.37500	66.680707	325.00000	92.500000

	Covariance	Correlation
SORG5,SORG5	412.89063	1.0000000
SORG5,SORG6	430.54688	0.3281838
SORG6,SORG6	4168.4219	1.0000000

SMPL 1983.04 - 1986.02
11 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG5	117.72727	26.326188	150.00000	70.000000
SORG7	113.40909	28.597918	150.00000	67.500000

	Covariance	Correlation
SORG5,SORG5	630.06198	1.0000000
SORG5,SORG7	590.70248	0.8630562
SORG7,SORG7	743.49174	1.0000000

SMPL 1983.04 - 1986.02
10 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG5	117.75000	27.750125	150.00000	70.000000
SORG8	134.90000	40.038037	180.00000	53.000000

	Covariance	Correlation
SORG5,SORG5	693.06250	1.0000000
SORG5,SORG8	849.65000	0.8496887
SORG8,SORG8	1442.7400	1.0000000

SMPL 1983.04 - 1986.02
12 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG6	120.87500	33.774738	190.00000	92.500000
SORG8	143.41667	28.128628	180.00000	106.00000

	Covariance	Correlation
SORG6,SORG6	1045.6719	1.0000000
SORG6,SORG8	592.11458	0.6799137
SORG8,SORG8	725.28472	1.0000000

SMPL 1983.04 - 1986.02
30 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS1	107.28333	16.368959	132.50000	71.500000
MAIS3	84.650000	13.815377	105.00000	50.000000

	Covariance	Correlation
MAIS1,MAIS1	259.01139	1.0000000
MAIS1,MAIS3	138.02417	0.6313855
MAIS3,MAIS3	184.50250	1.0000000

SMPL 1983.04 - 1986.02
27 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS1	109.87037	15.093677	132.50000	71.500000
MAIS4	115.83333	30.279150	162.50000	60.000000

	Covariance	Correlation
MAIS1,MAIS1	219.38134	1.0000000
MAIS1,MAIS4	250.75617	0.5697749
MAIS4,MAIS4	882.87037	1.0000000

SMPL 1983.04 - 1986.02
30 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS1	108.68333	15.696740	132.50000	71.500000
MAIS5	92.850000	22.327171	130.00000	50.000000

	Covariance	Correlation
MAIS1,MAIS1	238.17472	1.0000000
MAIS1,MAIS5	254.70250	0.7518190
MAIS5,MAIS5	481.88583	1.0000000

SMPL 1983.04 - 1986.02
18 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS1	110.50000	14.816525	132.50000	71.500000
MAIS7	100.13889	24.621730	145.00000	52.500000

	Covariance	Correlation
MAIS1,MAIS1	207.33333	1.0000000
MAIS1,MAIS7	300.00000	0.8707228
MAIS7,MAIS7	572.55015	1.0000000

SMPL 1983.04 - 1986.02
27 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS2	96.018519	30.565655	140.00000	25.000000
MAIS3	83.870370	13.942597	105.00000	50.000000

	Covariance	Correlation
MAIS2,MAIS2	899.65706	1.0000000
MAIS2,MAIS3	266.42833	0.6492223
MAIS3,MAIS3	187.19616	1.0000000

SMPL 1983.04 - 1986.02
27 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS2	94.629630	30.639841	140.00000	25.000000
MAIS5	93.537037	23.625657	130.00000	50.000000

	Covariance	Correlation
MAIS2,MAIS2	904.02949	1.0000000
MAIS2,MAIS5	518.85631	0.7443327
MAIS5,MAIS5	537.49863	1.0000000

SMPL 1983.04 - 1986.02
15 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS2	87.333333	26.983240	120.00000	25.000000
MAIS6	124.20000	82.273889	325.00000	40.000000

	Covariance	Correlation
MAIS2,MAIS2	679.55556	1.0000000
MAIS2,MAIS6	1306.8667	0.6307226
MAIS6,MAIS6	6317.7267	1.0000000

SMPL 1983.04 - 1986.02
17 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS2	102.50000	27.113765	140.00000	35.000000
MAIS7	103.08824	27.550088	145.00000	52.500000

	Covariance	Correlation
MAIS2,MAIS2	691.91176	1.0000000
MAIS2,MAIS7	484.19118	0.6887046
MAIS7,MAIS7	714.35986	1.0000000

SMPL 1983.04 - 1986.02
16 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS2	105.31250	22.414188	140.00000	65.000000
MAIS8	108.56250	29.336482	150.00000	28.000000

	Covariance	Correlation
MAIS2,MAIS2	470.99609	1.0000000
MAIS2,MAIS8	265.52734	0.4307318
MAIS8,MAIS8	806.83984	1.0000000

SMPL 1983.04 - 1986.02
28 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS3	84.357143	13.465908	100.00000	50.000000
MAIS5	95.017857	22.756962	130.00000	50.000000

	Covariance	Correlation
MAIS3,MAIS3	174.85459	1.0000000
MAIS3,MAIS5	201.58291	0.6821785
MAIS5,MAIS5	499.38361	1.0000000

SMPL 1983.04 - 1986.02
15 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS3	85.333333	17.471065	105.00000	50.000000
MAIS6	129.76667	81.273319	325.00000	40.000000

	Covariance	Correlation
MAIS3,MAIS3	284.88889	1.0000000
MAIS3,MAIS6	783.24444	0.5910078
MAIS6,MAIS6	6164.9956	1.0000000

SMPL 1983.04 - 1986.02
15 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS3	83.766667	9.2270307	92.500000	65.000000
MAIS8	109.13333	30.214984	150.00000	28.000000

	Covariance	Correlation
MAIS3,MAIS3	79.462222	1.0000000
MAIS3,MAIS8	142.34778	0.5470532
MAIS8,MAIS8	852.08222	1.0000000

SMPL 1983.04 - 1986.02
15 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS5	89.166667	22.964776	130.00000	50.000000
MAIS6	126.86667	81.118623	325.00000	40.000000

	Covariance	Correlation
MAIS5,MAIS5	492.22222	1.0000000
MAIS5,MAIS6	771.30556	0.4436157
MAIS6,MAIS6	6141.5489	1.0000000

SMPL 1983.04 - 1986.02
18 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS5	97.944444	25.097392	130.00000	50.000000
MAIS7	103.19444	26.621055	145.00000	52.500000

	Covariance	Correlation
MAIS5,MAIS5	594.88580	1.0000000
MAIS5,MAIS7	481.77469	0.7635082
MAIS7,MAIS7	669.30941	1.0000000

SMPL 1983.04 - 1986.02
16 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS5	99.843750	24.773453	130.00000	62.500000
MAIS8	109.34375	28.901395	150.00000	28.000000

	Covariance	Correlation
MAIS5,MAIS5	575.36621	1.0000000
MAIS5,MAIS8	415.60059	0.6191552
MAIS8,MAIS8	783.08496	1.0000000

SMPL 1983.04 - 1986.02
6 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS6	101.50000	39.661064	175.00000	70.000000
MAIS8	120.66667	24.993332	150.00000	94.000000

	Covariance	Correlation
MAIS6,MAIS6	1310.8333	1.0000000
MAIS6,MAIS8	491.91667	0.5955034
MAIS8,MAIS8	520.55556	1.0000000

SMPL 1985.10 - 1987.10
25 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL1	58.972000	10.227639	72.100000	42.600000
MIL3	52.381600	9.4416079	62.400000	34.000000

	Covariance	Correlation
MIL1,MIL1	100.42043	1.0000000
MIL1,MIL3	84.165404	0.9079062
MIL3,MIL3	85.578201	1.0000000

SMPL 1985.10 - 1987.10
25 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL1	58.972000	10.227639	72.100000	42.600000
MIL9	42.796800	11.411160	57.100000	22.900000

	Covariance	Correlation
MIL1,MIL1	100.42043	1.0000000
MIL1,MIL9	101.52063	0.9061036
MIL9,MIL9	125.00600	1.0000000

SMPL 1985.10 - 1987.10
25 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL2	57.148000	15.481525	100.40000	34.500000
MIL3	52.381600	9.4416079	62.400000	34.000000

	Covariance	Correlation
MIL2,MIL2	230.09050	1.0000000
MIL2,MIL3	108.10672	0.7704098
MIL3,MIL3	85.578201	1.0000000

SMPL 1985.10 - 1987.10
25 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL2	57.148000	15.481525	100.40000	34.500000
MIL9	42.796800	11.411160	57.100000	22.900000

	Covariance	Correlation
MIL2,MIL2	230.09050	1.0000000
MIL2,MIL9	144.29655	0.8508268
MIL9,MIL9	125.00600	1.0000000

SMPL 1985.10 - 1987.10
25 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL3	52.381600	9.4416079	62.400000	34.000000
MIL9	42.796800	11.411160	57.100000	22.900000

	Covariance	Correlation
MIL3,MIL3	85.578201	1.0000000
MIL3,MIL9	91.500819	0.8846632
MIL9,MIL9	125.00600	1.0000000

SMPL 1985.10 - 1987.10
24 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG1	57.774999	10.958429	70.700000	39.700000
SORG3	47.933333	9.5851185	61.700000	32.100000

	Covariance	Correlation
SORG1,SORG1	115.08353	1.0000000
SORG1,SORG3	87.440836	0.8686642
SORG3,SORG3	88.046393	1.0000000

SMPL 1985.10 - 1987.10
24 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG1	57.774999	10.958429	70.700000	39.700000
SORG9	41.333333	10.940458	55.400000	22.700000

	Covariance	Correlation
SORG1,SORG1	115.08353	1.0000000
SORG1,SORG9	99.222080	0.8635907
SORG9,SORG9	114.70639	1.0000000

SMPL 1985.10 - 1987.10
25 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG2	58.136000	14.952839	100.60000	37.400000
SORG3	48.384000	9.6500728	61.700000	32.100000

	Covariance	Correlation
SORG2,SORG2	214.64390	1.0000000
SORG2,SORG3	117.85937	0.8508219
SORG3,SORG3	89.398949	1.0000000

SMPL 1985.10 - 1987.10
25 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG2	58.136000	14.952839	100.60000	37.400000
SORG9	41.848000	11.014919	55.400000	22.700000

	Covariance	Correlation
SORG2,SORG2	214.64390	1.0000000
SORG2,SORG9	133.83307	0.8464226
SORG9,SORG9	116.47530	1.0000000

SMPL 1985.10 - 1987.10
25 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG3	48.384000	9.6500728	61.700000	32.100000
SORG9	41.848000	11.014919	55.400000	22.700000

	Covariance	Correlation
SORG3,SORG3	89.398949	1.0000000
SORG3,SORG9	95.533572	0.9362092
SORG9,SORG9	116.47530	1.0000000

SMPL 1985.10 - 1987.10
23 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS1	53.139130	13.213621	70.700000	25.300000
MAIS3	44.530434	11.077842	59.800000	26.500000

	Covariance	Correlation
MAIS1,MAIS1	167.00848	1.0000000
MAIS1,MAIS3	113.12055	0.8079224
MAIS3,MAIS3	117.38298	1.0000000

SMPL 1985.10 - 1987.10
23 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS1	53.139130	13.213621	70.700000	25.300000
MAIS9	34.439130	11.365248	53.300000	17.400000

	Covariance	Correlation
MAIS1,MAIS1	167.00848	1.0000000
MAIS1,MAIS9	116.66848	0.8121906
MAIS9,MAIS9	123.55282	1.0000000

SMPL 1985.10 - 1987.10
13 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS2	50.415384	10.135814	77.700000	35.000000
MAIS3	49.700000	9.1026557	59.800000	36.600000

	Covariance	Correlation
MAIS2,MAIS2	94.832060	1.0000000
MAIS2,MAIS3	34.661541	0.4069895
MAIS3,MAIS3	76.484622	1.0000000

SMPL 1985.10 - 1987.10
13 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS2	50.415384	10.135814	77.700000	35.000000
MAIS9	40.569231	10.154588	53.300000	22.800000

	Covariance	Correlation
MAIS2,MAIS2	94.832060	1.0000000
MAIS2,MAIS9	40.606631	0.4274036
MAIS9,MAIS9	95.183677	1.0000000

SMPL 1985.10 - 1987.10
25 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS3	44.012000	10.774828	59.800000	26.500000
MAIS9	34.132000	10.960943	53.300000	17.400000

	Covariance	Correlation
MAIS3,MAIS3	111.45305	1.0000000
MAIS3,MAIS9	101.83202	0.8981623
MAIS9,MAIS9	115.33658	1.0000000

SMPL 1983.04 - 1986.02
34 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL1	128.17647	20.798777	157.50000	86.000000
SORG1	123.86765	20.270634	155.00000	77.500000

	Covariance	Correlation
MIL1,MIL1	419.86592	1.0000000
MIL1,SORG1	377.48659	0.9224894
SORG1,SORG1	398.81337	1.0000000

SMPL 1983.04 - 1986.02
32 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL2	118.21875	29.435533	165.00000	70.000000
SORG2	112.57813	25.276570	160.00000	70.000000

	Covariance	Correlation
MIL2,MIL2	839.37402	1.0000000
MIL2,SORG2	692.48291	0.9607432
SORG2,SORG2	618.93921	1.0000000

SMPL 1983.04 - 1986.02
23 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL3	91.956522	15.646604	115.00000	55.000000
SORG3	90.543478	16.467539	120.00000	55.000000

	Covariance	Correlation
MIL3,MIL3	234.17202	1.0000000
MIL3,SORG3	237.58885	0.9640120
SORG3,SORG3	259.38941	1.0000000

SMPL 1983.04 - 1986.02
29 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL4	131.46552	25.332056	175.00000	60.000000
SORG4	131.89655	24.960461	162.50000	75.000000

	Covariance	Correlation
MIL4,MIL4	619.58502	1.0000000
MIL4,SORG4	595.03092	0.9746674
SORG4,SORG4	601.54102	1.0000000

SMPL 1983.04 - 1986.02
22 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL5	106.95455	25.474034	140.00000	67.500000
SORG5	110.36364	25.730833	150.00000	70.000000

	Covariance	Correlation
MIL5,MIL5	619.42975	1.0000000
MIL5,SORG5	601.97107	0.9621160
SORG5,SORG5	631.98140	1.0000000

SMPL 1983.04 - 1986.02
20 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL6	165.75000	56.382738	325.00000	105.00000
SORG6	134.72500	60.217255	325.00000	92.500000

	Covariance	Correlation
MIL6,MIL6	3020.0625	1.0000000
MIL6,SORG6	2931.2687	0.9087929
SORG6,SORG6	3444.8119	1.0000000

SMPL 1983.04 - 1986.02
16 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL7	113.43750	26.502751	150.00000	65.000000
SORG7	116.09375	24.186235	150.00000	67.500000

	Covariance	Correlation
MIL7,MIL7	658.49609	1.0000000
MIL7,SORG7	586.86523	0.9765801
SORG7,SORG7	548.41309	1.0000000

SMPL 1983.04 - 1986.02
15 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL8	153.33333	24.525254	180.00000	112.50000
SORG8	141.16667	25.767273	180.00000	106.00000

	Covariance	Correlation
MIL8,MIL8	561.38889	1.0000000
MIL8,SORG8	518.19444	0.8785652
SORG8,SORG8	619.68889	1.0000000

SMPL 1983.04 - 1986.02
34 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL1	128.17647	20.798777	157.50000	86.000000
RICE1	158.73529	7.2249938	170.50000	150.00000

	Covariance	Correlation
MIL1,MIL1	419.86592	1.0000000
MIL1,RICE1	54.796713	0.3757026
RICE1,RICE1	50.665225	1.0000000

SMPL 1983.04 - 1986.02
30 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL2	121.43333	27.480317	165.00000	70.000000
RICE2	157.71667	18.045289	195.00000	135.00000

	Covariance	Correlation
MIL2,MIL2	729.99556	1.0000000
MIL2,RICE2	78.106111	0.1629381
RICE2,RICE2	314.77806	1.0000000

SMPL 1983.04 - 1986.02
16 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL3	97.437500	8.5281397	110.00000	76.500000
RICE3	161.87500	12.332207	175.00000	150.00000

	Covariance	Correlation
MIL3,MIL3	68.183594	1.0000000
MIL3,RICE3	34.726563	0.3522049
RICE3,RICE3	142.57813	1.0000000

SMPL 1983.04 - 1986.02
29 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL4	131.46552	25.332056	175.00000	60.000000
RICE4	158.60345	13.723272	187.50000	135.00000

	Covariance	Correlation
MIL4,MIL4	619.58502	1.0000000
MIL4,RICE4	144.07253	0.4292329
RICE4,RICE4	181.83413	1.0000000

SMPL 1983.04 - 1986.02
31 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL5	106.95161	23.602385	140.00000	67.500000
RICE5	148.79032	10.760092	165.00000	125.00000

	Covariance	Correlation
MIL5,MIL5	539.10250	1.0000000
MIL5,RICE5	117.56243	0.4783405
RICE5,RICE5	112.04475	1.0000000

SMPL 1983.04 - 1986.02
12 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL6	151.45833	28.810871	200.00000	117.50000
RICE6	174.79167	8.9479767	187.50000	150.00000

	Covariance	Correlation
MIL6,MIL6	760.89410	1.0000000
MIL6,RICE6	43.012153	0.1820114
RICE6,RICE6	73.394097	1.0000000

SMPL 1983.04 - 1986.02
16 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL7	113.43750	26.502751	150.00000	65.000000
RICE7	153.90625	13.037406	187.50000	137.50000

	Covariance	Correlation
MIL7,MIL7	658.49609	1.0000000
MIL7,RICE7	231.10352	0.7134329
RICE7,RICE7	159.35059	1.0000000

SMPL 1983.04 - 1986.02
13 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL8	153.65385	23.197867	180.00000	112.50000
RICE8	190.00000	17.998843	225.00000	175.00000

	Covariance	Correlation
MIL8,MIL8	496.74556	1.0000000
MIL8,RICE8	115.86538	0.3006237
RICE8,RICE8	299.03846	1.0000000

SMPL 1983.04 - 1986.02
34 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG1	123.86765	20.270634	155.00000	77.500000
RICE1	158.73529	7.2249938	170.50000	150.00000

	Covariance	Correlation
SORG1,SORG1	398.81337	1.0000000
SORG1,RICE1	37.494377	0.2637705
RICE1,RICE1	50.665225	1.0000000

SMPL 1983.04 - 1986.02
30 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG2	115.08333	24.028390	160.00000	75.000000
RICE2	157.71667	18.045289	195.00000	135.00000

	Covariance	Correlation
SORG2,SORG2	558.11806	1.0000000
SORG2,RICE2	103.19028	0.2461918
RICE2,RICE2	314.77806	1.0000000

SMPL 1983.04 - 1986.02
12 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG3	92.208333	10.515051	110.00000	74.000000
RICE3	161.66667	12.262903	175.00000	150.00000

	Covariance	Correlation
SORG3,SORG3	101.35243	1.0000000
SORG3,RICE3	44.027778	0.3724866
RICE3,RICE3	137.84722	1.0000000

SMPL 1983.04 - 1986.02
29 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG4	131.89655	24.960461	162.50000	75.000000
RICE4	158.60345	13.723272	187.50000	135.00000

	Covariance	Correlation
SORG4,SORG4	601.54102	1.0000000
SORG4,RICE4	162.56243	0.4915298
RICE4,RICE4	181.83413	1.0000000

SMPL 1983.04 - 1986.02
22 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG5	110.36364	25.730833	150.00000	70.000000
RICE5	147.61364	11.661834	165.00000	125.00000

	Covariance	Correlation
SORG5,SORG5	631.98140	1.0000000
SORG5,RICE5	173.70868	0.6064628
RICE5,RICE5	129.81663	1.0000000

SMPL 1983.04 - 1986.02
12 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG6	122.29167	32.840149	190.00000	94.500000
RICE6	174.79167	8.9479767	187.50000	150.00000

	Covariance	Correlation
SORG6,SORG6	988.60243	1.0000000
SORG6,RICE6	21.935764	0.0814350
RICE6,RICE6	73.394097	1.0000000

SMPL 1983.04 - 1986.02
17 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG7	113.67647	25.450897	150.00000	67.500000
RICE7	154.26471	12.709639	187.50000	137.50000

	Covariance	Correlation
SORG7,SORG7	609.64533	1.0000000
SORG7,RICE7	193.87976	0.6368323
RICE7,RICE7	152.03287	1.0000000

SMPL 1983.04 - 1986.02
12 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG8	141.25000	25.523162	180.00000	106.00000
RICE8	191.25000	18.200275	225.00000	175.00000

	Covariance	Correlation
SORG8,SORG8	597.14583	1.0000000
SORG8,RICE8	-17.187500	-0.0403635
RICE8,RICE8	303.64583	1.0000000

SMPL 1983.04 - 1986.02
34 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS1	107.92647	15.588036	132.50000	71.500000
RICE1	158.73529	7.2249938	170.50000	150.00000

	Covariance	Correlation
MAIS1,MAIS1	235.84018	1.0000000
MAIS1,RICE1	43.362889	0.3966928
RICE1,RICE1	50.665225	1.0000000

SMPL 1983.04 - 1986.02
29 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS2	98.362069	26.886633	140.00000	25.000000
RICE2	157.29310	18.212298	195.00000	135.00000

	Covariance	Correlation
MAIS2,MAIS2	697.96373	1.0000000
MAIS2,RICE2	211.08353	0.4464709
RICE2,RICE2	320.25030	1.0000000

SMPL 1983.04 - 1986.02
16 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS3	83.687500	9.1503643	100.00000	65.000000
RICE3	161.87500	12.332207	175.00000	150.00000

	Covariance	Correlation
MAIS3,MAIS3	78.496094	1.0000000
MAIS3,RICE3	46.445313	0.4390272
RICE3,RICE3	142.57813	1.0000000

SMPL 1983.04 - 1986.02
28 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS4	117.05357	30.406608	162.50000	60.000000
RICE4	158.91071	13.873138	187.50000	135.00000

	Covariance	Correlation
MAIS4,MAIS4	891.54177	1.0000000
MAIS4,RICE4	137.90657	0.3390288
RICE4,RICE4	185.59024	1.0000000

SMPL 1983.04 - 1986.02
30 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS5	93.850000	22.403490	130.00000	50.000000
RICE5	148.75000	10.941656	165.00000	125.00000

	Covariance	Correlation
MAIS5,MAIS5	485.18583	1.0000000
MAIS5,RICE5	117.14583	0.4943692
RICE5,RICE5	115.72917	1.0000000

SMPL 1983.04 - 1986.02
4 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS6	109.25000	44.768851	175.00000	79.000000
RICE6	171.87500	15.728822	187.50000	150.00000

	Covariance	Correlation
MAIS6,MAIS6	1503.1875	1.0000000
MAIS6,RICE6	107.03125	0.2026643
RICE6,RICE6	185.54688	1.0000000

SMPL 1983.04 - 1986.02
16 Observations

Series	Mean	S.D.	Maximum	Minimum
MAIS7	105.78125	26.797368	145.00000	52.500000
RICE7	154.53125	13.077294	187.50000	137.50000

	Covariance	Correlation
MAIS7,MAIS7	673.21777	1.0000000
MAIS7,RICE7	204.66309	0.6229572
RICE7,RICE7	160.32715	1.0000000

SMPL 1983.04 - 1986.02
34 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG1	123.86765	20.270634	155.00000	77.500000
MAIS1	107.92647	15.588036	132.50000	71.500000

	Covariance	Correlation
SORG1,SORG1	398.81337	1.0000000
SORG1,MAIS1	281.82850	0.9189485
MAIS1,MAIS1	235.84018	1.0000000

SMPL 1983.04 - 1986.02
31 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG2	113.22581	25.423034	160.00000	70.000000
MAIS2	95.403226	28.745266	140.00000	25.000000

	Covariance	Correlation
SORG2,SORG2	625.48127	1.0000000
SORG2,MAIS2	575.51379	0.8137715
MAIS2,MAIS2	799.63580	1.0000000

SMPL 1983.04 - 1986.02
23 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG3	90.543478	16.467539	120.00000	55.000000
MAIS3	82.260870	14.514781	100.00000	50.000000

	Covariance	Correlation
SORG3,SORG3	259.38941	1.0000000
SORG3,MAIS3	202.20605	0.8844232
MAIS3,MAIS3	201.51890	1.0000000

SMPL 1983.04 - 1986.02
28 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG4	133.92857	22.845582	162.50000	81.500000
MAIS4	117.05357	30.406608	162.50000	60.000000

	Covariance	Correlation
SORG4,SORG4	503.28061	1.0000000
SORG4,MAIS4	576.97704	0.8613558
MAIS4,MAIS4	891.54177	1.0000000

SMPL 1983.04 - 1986.02
21 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG5	109.66667	26.152597	150.00000	70.000000
MAIS5	93.571429	24.578591	130.00000	50.000000

	Covariance	Correlation
SORG5,SORG5	651.38889	1.0000000
SORG5,MAIS5	574.70238	0.9387728
MAIS5,MAIS5	575.34014	1.0000000

SMPL 1983.04 - 1986.02
11 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG6	160.63636	75.294120	325.00000	92.500000
MAIS6	144.59091	84.689084	325.00000	70.000000

	Covariance	Correlation
SORG6,SORG6	5153.8223	1.0000000
SORG6,MAIS6	5779.1694	0.9969414
MAIS6,MAIS6	6520.2190	1.0000000

SMPL 1983.04 - 1986.02
17 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG7	112.20588	27.255767	150.00000	67.500000
MAIS7	103.67647	27.359266	145.00000	52.500000

	Covariance	Correlation
SORG7,SORG7	699.17820	1.0000000
SORG7,MAIS7	670.19896	0.9549263
MAIS7,MAIS7	704.49827	1.0000000

SMPL 1983.04 - 1986.02
16 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG8	135.65625	33.249420	180.00000	53.000000
MAIS8	108.56250	29.336482	150.00000	28.000000

	Covariance	Correlation
SORG8,SORG8	1036.4287	1.0000000
SORG8,MAIS8	805.89648	0.8812840
MAIS8,MAIS8	806.83984	1.0000000

SMPL 1985.10 - 1987.10
24 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL1	58.675000	10.336902	72.100000	42.600000
SORG1	57.774999	10.958429	70.700000	39.700000

	Covariance	Correlation
MIL1,MIL1	102.39939	1.0000000
MIL1,SORG1	104.56896	0.9632689
SORG1,SORG1	115.08353	1.0000000

SMPL 1985.10 - 1987.10
25 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL2	57.148000	15.481525	100.40000	34.500000
SORG2	58.136000	14.952839	100.60000	37.400000

	Covariance	Correlation
MIL2,MIL2	230.09050	1.0000000
MIL2,SORG2	218.83707	0.9847189
SORG2,SORG2	214.64390	1.0000000

SMPL 1985.10 - 1987.10
25 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL3	52.381600	9.4416079	62.400000	34.000000
SORG3	48.384000	9.6500728	61.700000	32.100000

	Covariance	Correlation
MIL3,MIL3	85.578201	1.0000000
MIL3,SORG3	78.799787	0.9009014
SORG3,SORG3	89.398949	1.0000000

SMPL 1985.10 - 1987.10
25 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL9	42.796800	11.411160	57.100000	22.900000
SORG9	41.848000	11.014919	55.400000	22.700000

	Covariance	Correlation
MIL9,MIL9	125.00600	1.0000000
MIL9,SORG9	119.40839	0.9895836
SORG9,SORG9	116.47530	1.0000000

SMPL 1985.10 - 1987.10
23 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL1	60.013043	9.9828178	72.100000	42.600000
MAIS1	53.139130	13.213621	70.700000	25.300000

	Covariance	Correlation
MIL1,MIL1	95.323753	1.0000000
MIL1,MAIS1	117.95689	0.9348749
MAIS1,MAIS1	167.00848	1.0000000

SMPL 1985.10 - 1987.10
13 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL2	66.369231	12.211838	100.40000	46.200000
MAIS2	50.415384	10.135814	77.700000	35.000000

	Covariance	Correlation
MIL2,MIL2	137.65752	1.0000000
MIL2,MAIS2	100.06816	0.8758270
MAIS2,MAIS2	94.832060	1.0000000

SMPL 1985.10 - 1987.10
25 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL3	52.381600	9.4416079	62.400000	34.000000
MAIS3	44.012000	10.774828	59.800000	26.500000

	Covariance	Correlation
MIL3,MIL3	85.578201	1.0000000
MIL3,MAIS3	77.277175	0.7912681
MAIS3,MAIS3	111.45305	1.0000000

SMPL 1985.10 - 1987.10
25 Observations

Series	Mean	S.D.	Maximum	Minimum
MIL9	42.796800	11.411160	57.100000	22.900000
MAIS9	34.132000	10.960943	53.300000	17.400000

	Covariance	Correlation
MIL9,MIL9	125.00600	1.0000000
MIL9,MAIS9	101.27410	0.8434308
MAIS9,MAIS9	115.33658	1.0000000

SMPL 1985.10 - 1987.10
22 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG1	59.154545	10.334303	70.700000	40.300000
MAIS1	52.513636	13.171445	70.700000	25.300000

	Covariance	Correlation
SORG1,SORG1	101.94338	1.0000000
SORG1,MAIS1	123.12425	0.9476160
MAIS1,MAIS1	165.60118	1.0000000

SMPL 1985.10 - 1987.10
13 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG2	66.738461	12.563076	100.60000	49.700000
MAIS2	50.415384	10.135814	77.700000	35.000000

	Covariance	Correlation
SORG2,SORG2	145.69005	1.0000000
SORG2,MAIS2	99.457858	0.8461485
MAIS2,MAIS2	94.832060	1.0000000

SMPL 1985.10 - 1987.10
25 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG3	48.384000	9.6500728	61.700000	32.100000
MAIS3	44.012000	10.774828	59.800000	26.500000

	Covariance	Correlation
SORG3,SORG3	89.398949	1.0000000
SORG3,MAIS3	91.787391	0.9195405
MAIS3,MAIS3	111.45305	1.0000000

SMPL 1985.10 - 1987.10
25 Observations

Series	Mean	S.D.	Maximum	Minimum
SORG9	41.848000	11.014919	55.400000	22.700000
MAIS9	34.132000	10.960943	53.300000	17.400000

	Covariance	Correlation
SORG9,SORG9	116.47530	1.0000000
SORG9,MAIS9	101.60607	0.8766358
MAIS9,MAIS9	115.33658	1.0000000

APPENDIX C

APPENDIX C: STANDARD DEVIATIONS AND MEANS OF THE MARKETING MARGINS AT THE RETAIL AND WHOLESALE LEVELS

SMPL 1983.04 - 1986.02
27 Observations

Series	Mean	S.D.	Maximum	Minimum
MMI13	34.925926	14.877515	64.000000	9.5000000
MMI15	21.018519	14.449835	67.000000	-9.0000000

	Covariance	Correlation
MMI13,MMI13	213.14266	1.0000000
MMI13,MMI15	121.18656	0.5853985
MMI15,MMI15	201.06447	1.0000000

SMPL 1983.04 - 1986.02
19 Observations

Series	Mean	S.D.	Maximum	Minimum
MMI16	-35.394737	49.357139	19.500000	-176.00000
MMI23	27.263158	18.405440	65.000000	-5.0000000

	Covariance	Correlation
MMI16,MMI16	2307.9100	1.0000000
MMI16,MMI23	-233.52770	-0.2713459
MMI23,MMI23	320.93075	1.0000000

SMPL 1983.04 - 1986.02
22 Observations

Series	Mean	S.D.	Maximum	Minimum
MMI25	13.772727	15.040997	40.000000	-20.000000
MMI41	1.2500000	26.816728	38.000000	-46.500000

	Covariance	Correlation
MMI25,MMI25	215.94835	1.0000000
MMI25,MMI41	-142.71591	-0.3706750
MMI41,MMI41	686.44886	1.0000000

SMPL 1983.04 - 1986.02
18 Observations

Series	Mean	S.D.	Maximum	Minimum
MMI53	15.027778	14.458330	35.000000	-10.000000
MMI62	37.500000	48.666029	175.00000	-12.500000

	Covariance	Correlation
MMI53,MMI53	197.42978	1.0000000
MMI53,MMI62	-120.13889	-0.1807853
MMI62,MMI62	2236.8056	1.0000000

SMPL 1983.04 - 1986.02
20 Observations

Series	Mean	S.D.	Maximum	Minimum
MMI63	65.275000	50.749507	210.00000	20.000000
MMI65	50.250000	51.656125	200.00000	-5.0000000

	Covariance	Correlation
MMI63,MMI63	2446.7369	1.0000000
MMI63,MMI65	2400.7437	0.9639812
MMI65,MMI65	2534.9375	1.0000000

SMPL 1983.04 - 1986.02
15 Observations

Series	Mean	S.D.	Maximum	Minimum
MMI73	17.400000	21.018019	50.000000	-11.500000
MMI75	1.1666667	16.525593	25.000000	-25.000000

	Covariance	Correlation
MMI73,MMI73	412.30667	1.0000000
MMI73,MMI75	233.70000	0.7208968
MMI75,MMI75	254.88889	1.0000000

SMPL 1983.04 - 1986.02
15 Observations

Series	Mean	S.D.	Maximum	Minimum
MMI83	53.633333	21.815351	80.000000	11.000000
MMI85	37.033333	18.471471	75.000000	-9.0000000

	Covariance	Correlation
MMI83,MMI83	444.18222	1.0000000
MMI83,MMI85	281.51222	0.7485086
MMI85,MMI85	318.44889	1.0000000

SMPL 1983.04 - 1986.02
8 Observations

Series	Mean	S.D.	Maximum	Minimum
MMI86	-1.4375000	22.394893	25.000000	-39.000000
MSO13	34.875000	24.293959	65.000000	3.5000000

	Covariance	Correlation
MMI86,MMI86	438.83984	1.0000000
MMI86,MSO13	3.0390625	0.0063839
MSO13,MSO13	516.42188	1.0000000

SMPL 1983.04 - 1986.02
15 Observations

Series	Mean	S.D.	Maximum	Minimum
MSO15	12.900000	11.119802	31.000000	-13.000000
MSO23	23.533333	22.019039	70.000000	-10.000000

	Covariance	Correlation
MSO15,MSO15	115.40667	1.0000000
MSO15,MSO23	33.786667	0.1478472
MSO23,MSO23	452.51556	1.0000000

SMPL 1983.04 - 1986.02
15 Observations

Series	Mean	S.D.	Maximum	Minimum
MSO25	3.3333333	15.688561	25.000000	-30.000000
MSO26	-32.600000	54.690101	35.000000	-180.00000

	Covariance	Correlation
MSO25,MSO25	229.72222	1.0000000
MSO25,MSO26	-364.91667	-0.4556854
MSO26,MSO26	2791.6067	1.0000000

SMPL 1983.04 - 1986.02
11 Observations

Series	Mean	S.D.	Maximum	Minimum
MSO63	68.227273	64.924327	217.00000	10.000000
MSO25	5.0000000	16.431677	25.000000	-30.000000

	Covariance	Correlation
MSO63,MSO63	3831.9711	1.0000000
MSO63,MSO25	583.86364	0.6020253
MSO25,MSO25	245.45455	1.0000000

SMPL 1983.04 - 1986.02
15 Observations

Series	Mean	S.D.	Maximum	Minimum
MMI83	53.633333	21.815351	80.000000	11.000000
MMI85	37.033333	18.471471	75.000000	-9.0000000

	Covariance	Correlation
MMI83,MMI83	444.18222	1.0000000
MMI83,MMI85	281.51222	0.7485086
MMI85,MMI85	318.44889	1.0000000

SMPL 1983.04 - 1986.02
16 Observations

Series	Mean	S.D.	Maximum	Minimum
MMI86	1.1250000	25.066246	42.500000	-43.000000
MMI86	1.1250000	25.066246	42.500000	-43.000000

	Covariance	Correlation
MMI86,MMI86	589.04688	1.0000000
MMI86,MMI86	589.04688	1.0000000
MMI86,MMI86	589.04688	1.0000000

SMPL 1983.04 - 1986.02
16 Observations

Series	Mean	S.D.	Maximum	Minimum
MSO13	30.625000	18.536900	65.000000	3.5000000
MSO15	12.593750	10.812368	31.000000	-13.000000

	Covariance	Correlation
MSO13,MSO13	322.14063	1.0000000
MSO13,MSO15	67.175781	0.3575062
MSO15,MSO15	109.60059	1.0000000

SMPL 1983.04 - 1986.02
16 Observations

Series	Mean	S.D.	Maximum	Minimum
MSO23	23.625000	21.275573	70.000000	-10.000000
MSO25	5.4375000	13.798400	25.000000	-30.000000

	Covariance	Correlation
MSO23,MSO23	424.35938	1.0000000
MSO23,MSO25	151.85156	0.5517445
MSO25,MSO25	178.49609	1.0000000

SMPL 1983.04 - 1986.02
12 Observations

Series	Mean	S.D.	Maximum	Minimum
MSO26	-36.041667	62.226295	35.000000	-180.00000
MSO63	62.333333	65.183076	217.00000	-2.5000000

	Covariance	Correlation
MSO26,MSO26	3549.4358	1.0000000
MSO26,MSO63	-3502.0486	-0.9418938
MSO63,MSO63	3894.7639	1.0000000

SMPL 1983.04 - 1986.02
7 Observations

Series	Mean	S.D.	Maximum	Minimum
MSO65	7.7857143	30.580300	50.000000	-30.000000
MSO73	24.785714	19.113383	50.000000	-6.5000000

	Covariance	Correlation
MSO65,MSO65	801.56122	1.0000000
MSO65,MSO73	-79.938776	-0.1595603
MSO73,MSO73	313.13265	1.0000000

SMPL 1983.04 - 1986.02
16 Observations

Series	Mean	S.D.	Maximum	Minimum
MSO82	18.468750	20.428305	50.000000	-17.500000
MSO82	18.468750	20.428305	50.000000	-17.500000

	Covariance	Correlation
MSO82,MSO82	391.23340	1.0000000
MSO82,MSO82	391.23340	1.0000000
MSO82,MSO82	391.23340	1.0000000

SMPL 1983.04 - 1986.02
27 Observations

Series	Mean	S.D.	Maximum	Minimum
MMA13	24.277778	12.619683	47.500000	-4.0000000
MMA15	14.148148	14.609543	39.000000	-17.000000

	Covariance	Correlation
MMA13,MMA13	153.35802	1.0000000
MMA13,MMA15	42.838477	0.2412900
MMA15,MMA15	205.53361	1.0000000

SMPL 1983.04 - 1986.02
14 Observations

Series	Mean	S.D.	Maximum	Minimum
MMA17	8.9285714	15.319491	37.000000	-17.000000
MMA23	22.000000	19.348027	55.000000	-15.000000

	Covariance	Correlation
MMA17,MMA17	217.92347	1.0000000
MMA17,MMA23	-165.66071	-0.6018984
MMA23,MMA23	347.60714	1.0000000

SMPL 1983.04 - 1986.02
11 Observations

Series	Mean	S.D.	Maximum	Minimum
MMA25	-6.3636364	22.174412	25.000000	-40.000000
MMA63	49.681818	84.069695	230.00000	-17.000000

	Covariance	Correlation
MMA25,MMA25	447.00413	1.0000000
MMA25,MMA63	909.45248	0.5366376
MMA63,MMA63	6425.1942	1.0000000

SMPL 1983.04 - 1986.02
5 Observations

Series	Mean	S.D.	Maximum	Minimum
MMA65	10.000000	28.993534	45.000000	-25.000000
MMA83	42.800000	22.398661	60.000000	10.000000

	Covariance	Correlation
MMA65,MMA65	672.50000	1.0000000
MMA65,MMA83	-189.50000	-0.3647506
MMA83,MMA83	401.36000	1.0000000

SMPL 1983.04 - 1986.02
6 Observations

Series	Mean	S.D.	Maximum	Minimum
MMA85	27.750000	8.4779125	42.500000	20.000000
MMA86	19.166667	31.891483	52.500000	-25.000000

	Covariance	Correlation
MMA85,MMA85	59.895833	1.0000000
MMA85,MMA86	168.50000	0.7478552
MMA86,MMA86	847.55556	1.0000000

SMPL 1985.10 - 1987.10
25 Observations

Series	Mean	S.D.	Maximum	Minimum
MMI13	6.5903995	4.2899853	14.700000	-3.0000000
MMI19	16.175200	4.8288586	26.800000	7.0000000

	Covariance	Correlation
MMI13,MMI13	17.667815	1.0000000
MMI13,MMI19	6.2352036	0.3135300
MMI19,MMI19	22.385160	1.0000000

SMPL 1985.10 - 1987.10
25 Observations

Series	Mean	S.D.	Maximum	Minimum
MMI23	4.7663999	10.178371	44.200000	-13.500000
MMI29	14.351200	8.3231224	51.100000	5.2000010

	Covariance	Correlation
MMI23,MMI23	99.455258	1.0000000
MMI23,MMI29	69.188040	0.8507369
MMI29,MMI29	66.503391	1.0000000

SMPL 1985.10 - 1987.10
25 Observations

Series	Mean	S.D.	Maximum	Minimum
MMI39	9.5848003	5.3602091	27.100000	-0.1999969
MMI39	9.5848003	5.3602091	27.100000	-0.1999969

	Covariance	Correlation
MMI39,MMI39	27.582567	1.0000000
MMI39,MMI39	27.582567	1.0000000
MMI39,MMI39	27.582567	1.0000000

SMPL 1985.10 - 1987.10
24 Observations

Series	Mean	S.D.	Maximum	Minimum
MSO13	9.8416672	5.4292214	21.100000	-0.3999977
MSO19	16.441667	5.7191455	27.400000	4.7000010

	Covariance	Correlation
MSO13,MSO13	28.248260	1.0000000
MSO13,MSO19	22.136180	0.7439049
MSO19,MSO19	31.345766	1.0000000

SMPL 1985.10 - 1987.10
25 Observations

Series	Mean	S.D.	Maximum	Minimum
MSO23	9.7520001	8.4362868	44.500000	-1.9000020
MSO29	16.288000	8.1300019	50.200000	6.1000020

	Covariance	Correlation
MSO23,MSO23	68.324097	1.0000000
MSO23,MSO29	58.485024	0.8882423
MSO29,MSO29	63.453054	1.0000000

SMPL 1985.10 - 1987.10
25 Observations

Series	Mean	S.D.	Maximum	Minimum
MSO39	6.5359999	3.9273483	17.600000	-1.3999980
MSO39	6.5359999	3.9273483	17.600000	-1.3999980

	Covariance	Correlation
MSO39,MSO39	14.807102	1.0000000
MSO39,MSO39	14.807102	1.0000000
MSO39,MSO39	14.807102	1.0000000

SMPL 1985.10 - 1987.10
23 Observations

Series	Mean	S.D.	Maximum	Minimum
MMA13	8.6086957	7.7970224	25.900000	-4.9000020
MMA19	18.700000	7.7346916	37.500000	3.7999990

	Covariance	Correlation
MMA13,MMA13	58.150360	1.0000000
MMA13,MMA19	45.411304	0.7872222
MMA19,MMA19	57.224348	1.0000000

SMPL 1985.10 - 1987.10
13 Observations

Series	Mean	S.D.	Maximum	Minimum
MMA23	0.7153844	10.511569	22.000000	-14.100000
MMA29	9.8461537	10.856766	30.300000	-3.2999990

	Covariance	Correlation
MMA23,MMA23	101.99361	1.0000000
MMA23,MMA29	95.110825	0.9028676
MMA29,MMA29	108.80249	1.0000000

SMPL 1985.10 - 1987.10
25 Observations

Series	Mean	S.D.	Maximum	Minimum
MMA39	9.8800001	4.9080718	20.600000	2.2999990
MMA39	9.8800001	4.9080718	20.600000	2.2999990

	Covariance	Correlation
MMA39,MMA39	23.125602	1.0000000
MMA39,MMA39	23.125602	1.0000000
MMA39,MMA39	23.125602	1.0000000

APPENDIX D

APPENDIX D: REGRESSIONS AT THE RETAIL AND WHOLESALE LEVELS

SMPL 1983.04 - 1986.02
25 Observations
LS // Dependent Variable is LMIL3

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0519466	0.5303151	-0.0979543	0.923
LMIL3L	1.0606553	0.2000936	5.3007960	0.000
LMIL1D	0.3583995	0.2606152	1.3752055	0.184
LMIL1L	-0.0506333	0.1838163	-0.2754562	0.786
DUMISO	0.0183742	0.0817800	0.2246788	0.825

R-squared	0.849788	Mean of dependent var	4.534586
Adjusted R-squared	0.819745	S.D. of dependent var	0.180182
S.E. of regression	0.076499	Sum of squared resid	0.117041
F-statistic	28.28619	Log likelihood	31.57784

SMPL 1983.04 - 1986.02
20 Observations
LS // Dependent Variable is LMIL3

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.1847812	0.6479764	-0.2851665	0.779
LMIL3L	1.0063226	0.3057103	3.2917525	0.005
LMIL2D	0.1070117	0.1583724	0.6756967	0.510
LMIL2L	0.0311380	0.1950060	0.1596771	0.875
DUMISO	0.0256298	0.0917350	0.2793899	0.784

R-squared	0.855983	Mean of dependent var	4.531741
Adjusted R-squared	0.817579	S.D. of dependent var	0.183655
S.E. of regression	0.078441	Sum of squared resid	0.092294
F-statistic	22.28868	Log likelihood	25.40634

SMPL 1983.04 - 1986.02
27 Observations
LS // Dependent Variable is LMIL5

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1.1917900	0.9464173	1.2592649	0.221
LMIL5L	0.4301869	0.2886882	1.4901435	0.150
LMIL1D	1.1052618	0.4638866	2.3826121	0.026
LMIL1L	0.3024404	0.4188470	0.7220784	0.478
DUMISO	-0.0504045	0.0865844	-0.5821432	0.566

R-squared	0.759552	Mean of dependent var	4.635178
Adjusted R-squared	0.715834	S.D. of dependent var	0.228003
S.E. of regression	0.121542	Sum of squared resid	0.324995
F-statistic	17.37393	Log likelihood	21.35571

SMPL 1983.04 - 1986.02
23 Observations
LS // Dependent Variable is LMIL5

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1.3532511	0.4682885	2.8897810	0.010
LMIL5L	-0.0202099	0.2328684	-0.0867866	0.932
LMIL2D	0.5041530	0.1452997	3.4697449	0.003
LMIL2L	0.7166517	0.2101212	3.4106582	0.003
DUMISO	-0.0963608	0.0591425	-1.6292995	0.121

R-squared	0.835935	Mean of dependent var	4.637726
Adjusted R-squared	0.799476	S.D. of dependent var	0.229886
S.E. of regression	0.102943	Sum of squared resid	0.190749
F-statistic	22.92812	Log likelihood	22.47574

SMPL 1983.04 - 1986.02
17 Observations
LS // Dependent Variable is LMIL5

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	2.6285066	0.6787036	3.8728346	0.002
LMIL5L	0.4639554	0.1385895	3.3476951	0.006
LMIL6D	-0.1001039	0.2558183	-0.3913087	0.702
LMIL6L	-0.0084699	0.1274918	-0.0664345	0.948
DUMISO	-0.2957557	0.0891470	-3.3176172	0.006

R-squared	0.713696	Mean of dependent var	4.731134
Adjusted R-squared	0.618261	S.D. of dependent var	0.165273
S.E. of regression	0.102114	Sum of squared resid	0.125128
F-statistic	7.478359	Log likelihood	17.62693

SMPL 1983.04 - 1986.02
12 Observations
LS // Dependent Variable is LMIL5

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	2.1019321	0.7134327	2.9462234	0.022
LMIL5L	0.7485117	0.1586212	4.7188625	0.002
LMIL8D	0.1372266	0.1929361	0.7112539	0.500
LMIL8L	-0.1710627	0.2559150	-0.6684356	0.525
DUMISO	-0.2085353	0.0515145	-4.0480922	0.005

R-squared	0.960756	Mean of dependent var	4.720832
Adjusted R-squared	0.938330	S.D. of dependent var	0.205403
S.E. of regression	0.051008	Sum of squared resid	0.018213
F-statistic	42.84250	Log likelihood	21.91589

SMPL 1983.04 - 1986.02
14 Observations
LS // Dependent Variable is LMIL7

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	2.3320270	2.1864064	1.0666027	0.314
LMIL7L	0.7272103	0.3334564	2.1808261	0.057
LMIL1D	0.2923569	0.7687427	0.3803053	0.713
LMIL1L	-0.2110693	0.6428234	-0.3283472	0.750
DUMISO	-0.1275954	0.1354030	-0.9423383	0.371

R-squared	0.637302	Mean of dependent var	4.704219
Adjusted R-squared	0.476103	S.D. of dependent var	0.169929
S.E. of regression	0.122996	Sum of squared resid	0.136152
F-statistic	3.953514	Log likelihood	12.56615

SMPL 1983.04 - 1986.02
14 Observations
LS // Dependent Variable is LMIL7

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	2.2401812	1.3663314	1.6395591	0.136
LMIL7L	0.7966641	0.2885995	2.7604488	0.022
LMIL2D	-0.0943557	0.2982725	-0.3163406	0.759
LMIL2L	-0.2556823	0.4222114	-0.6055790	0.560
DUMISO	-0.2778928	0.1828470	-1.5198109	0.163

R-squared	0.708759	Mean of dependent var	4.755335
Adjusted R-squared	0.579318	S.D. of dependent var	0.199377
S.E. of regression	0.129316	Sum of squared resid	0.150503
F-statistic	5.475559	Log likelihood	11.86466

SMPL 1983.04 - 1986.02
17 Observations
LS // Dependent Variable is LMIL2

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.8066208	0.9744090	0.8278052	0.424
LMIL2L	0.5721493	0.2172522	2.6335717	0.022
LMIL6D	0.7515733	0.4265552	1.7619602	0.104
LMIL6L	0.2459357	0.1777077	1.3839340	0.192
DUMISO	-0.0242636	0.1237346	-0.1960935	0.848

R-squared	0.613817	Mean of dependent var	4.835458
Adjusted R-squared	0.485089	S.D. of dependent var	0.178906
S.E. of regression	0.128378	Sum of squared resid	0.197771
F-statistic	4.768332	Log likelihood	13.73586

SMPL 1983.04 - 1986.02
14 Observations
LS // Dependent Variable is LSO3

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.1499104	0.9403196	0.1594249	0.877
LSO3L	0.9449091	0.3112555	3.0357992	0.014
LSO1D	0.5135924	0.4761575	1.0786186	0.309
LSO1L	0.0115472	0.3069158	0.0376233	0.971
DUMISO	0.0228789	0.1337235	0.1710910	0.868

R-squared	0.771614	Mean of dependent var	4.450907
Adjusted R-squared	0.670109	S.D. of dependent var	0.226378
S.E. of regression	0.130023	Sum of squared resid	0.152153
F-statistic	7.601734	Log likelihood	11.78834

SMPL 1983.04 - 1986.02
14 Observations
LS // Dependent Variable is LSO3

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.4550316	0.7306688	0.6227604	0.549
LSO3L	0.7787511	0.2873327	2.7102765	0.024
LSO2D	0.0591343	0.2663577	0.2220109	0.829
LSO2L	0.1055145	0.2411969	0.4374622	0.672
DUMISO	-0.0362053	0.1109620	-0.3262856	0.752

R-squared	0.819070	Mean of dependent var	4.437884
Adjusted R-squared	0.738656	S.D. of dependent var	0.210191
S.E. of regression	0.107453	Sum of squared resid	0.103916
F-statistic	10.18572	Log likelihood	14.45746

SMPL 1983.04 - 1986.02
10 Observations
LS // Dependent Variable is LSO3

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.3482755	0.6487397	-0.5368494	0.614
LSO3L	0.8538414	0.3010510	2.8362017	0.036
LSO5D	0.3193582	0.3564649	0.8959036	0.411
LSO5L	0.1992465	0.2610591	0.7632235	0.480
DUMISO	0.1093303	0.1060555	1.0308783	0.350

R-squared	0.927214	Mean of dependent var	4.462112
Adjusted R-squared	0.868986	S.D. of dependent var	0.239405
S.E. of regression	0.086655	Sum of squared resid	0.037545
F-statistic	15.92374	Log likelihood	13.73461

SMPL 1983.04 - 1986.02
16 Observations
LS // Dependent Variable is LSO5

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.9131883	0.9885127	-0.9238003	0.375
LSO5L	-0.2307784	0.3363161	-0.6861948	0.507
LSO1D	1.3911138	0.4798825	2.8988635	0.014
LSO1L	1.3915550	0.4803472	2.8969772	0.015
DUMISO	-0.1424451	0.0712258	-1.9999076	0.071

R-squared	0.874489	Mean of dependent var	4.687855
Adjusted R-squared	0.828848	S.D. of dependent var	0.241701
S.E. of regression	0.099993	Sum of squared resid	0.109984
F-statistic	19.16035	Log likelihood	17.13704

SMPL 1983.04 - 1986.02
16 Observations
LS // Dependent Variable is LSO5

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1.1982637	0.7081848	1.6920213	0.119
LSO5L	0.2240252	0.3772051	0.5939082	0.565
LSO2D	0.4025889	0.3316054	1.2140600	0.250
LSO2L	0.5224288	0.3813028	1.3701152	0.198
DUMISO	-0.1761081	0.0906739	-1.9422134	0.078

R-squared	0.803329	Mean of dependent var	4.691723
Adjusted R-squared	0.731812	S.D. of dependent var	0.243530
S.E. of regression	0.126117	Sum of squared resid	0.174959
F-statistic	11.23271	Log likelihood	13.42331

SMPL 1983.04 - 1986.02
12 Observations
LS // Dependent Variable is LSO7

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	2.4807842	2.4446787	1.0147690	0.344
LSO7L	0.5339727	0.4073666	1.3107915	0.231
LSO1D	-0.0456191	0.7469644	-0.0610726	0.953
LSO1L	-0.0461964	0.7466751	-0.0618695	0.952
DUMISO	-0.1362335	0.1438704	-0.9469176	0.375

R-squared	0.585719	Mean of dependent var	4.782916
Adjusted R-squared	0.348987	S.D. of dependent var	0.157651
S.E. of regression	0.127201	Sum of squared resid	0.113261
F-statistic	2.474186	Log likelihood	10.95056

SMPL 1983.04 - 1986.02
11 Observations
LS // Dependent Variable is LSO7

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	2.9871526	1.7109540	1.7458989	0.131
LSO7L	0.6817197	0.2846980	2.3945366	0.054
LSO2D	-0.6678551	0.5551336	-1.2030530	0.274
LSO2L	-0.2908837	0.4506309	-0.6455032	0.542
DUMISO	-0.1889762	0.1830050	-1.0326290	0.342

R-squared	0.685895	Mean of dependent var	4.816563
Adjusted R-squared	0.476492	S.D. of dependent var	0.173897
S.E. of regression	0.125821	Sum of squared resid	0.094986
F-statistic	3.275479	Log likelihood	10.52724

SMPL 1983.04 - 1986.02
15 Observations
LS // Dependent Variable is LSO2

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.7474742	1.0673443	0.7003122	0.500
LSO2L	0.7045911	0.2573895	2.7374502	0.021
LSO6D	-0.1821060	0.1670702	-1.0899970	0.301
LSO6L	0.1405970	0.1151534	1.2209544	0.250
DUMISO	-0.2303611	0.1055865	-2.1817293	0.054

R-squared	0.699168	Mean of dependent var	4.806681
Adjusted R-squared	0.578836	S.D. of dependent var	0.181507
S.E. of regression	0.117793	Sum of squared resid	0.138752
F-statistic	5.810296	Log likelihood	13.83931

SMPL 1983.04 - 1986.02
10 Observations
LS // Dependent Variable is LSO2

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1.3249935	0.8997942	1.4725518	0.201
LSO2L	0.2880141	0.2139644	1.3460840	0.236
LSO8D	0.9272807	0.6941116	1.3359244	0.239
LSO8L	0.4240275	0.2817519	1.5049678	0.193
DUMISO	0.0231928	0.2103211	0.1102735	0.916

R-squared	0.860644	Mean of dependent var	4.821346
Adjusted R-squared	0.749159	S.D. of dependent var	0.171916
S.E. of regression	0.086103	Sum of squared resid	0.037068
F-statistic	7.719814	Log likelihood	13.79850

SMPL 1983.04 - 1986.02
25 Observations
LS // Dependent Variable is LMA3

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.1768102	0.5755826	-0.3071847	0.762
LMA3L	0.9061557	0.1622192	5.5859956	0.000
LMA1D	0.9808553	0.3922972	2.5002867	0.021
LMA1L	0.1181844	0.1745062	0.6772500	0.506
DUMA	0.0507125	0.0499609	1.0150445	0.322

R-squared	0.810396	Mean of dependent var	4.425631
Adjusted R-squared	0.772475	S.D. of dependent var	0.185447
S.E. of regression	0.088457	Sum of squared resid	0.156493
F-statistic	21.37076	Log likelihood	27.94676

SMPL 1983.04 - 1986.02
21 Observations
LS // Dependent Variable is LMA3

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.3682813	0.5428208	0.6784584	0.507
LMA3L	0.7883356	0.1539311	5.1213544	0.000
LMA2D	0.0354521	0.0717889	0.4938381	0.628
LMA2L	0.1259007	0.0534159	2.3569886	0.031
DUMA	-0.0358353	0.0456477	-0.7850422	0.444

R-squared	0.855753	Mean of dependent var	4.403549
Adjusted R-squared	0.819691	S.D. of dependent var	0.188745
S.E. of regression	0.080146	Sum of squared resid	0.102774
F-statistic	23.73025	Log likelihood	26.05957

SMPL 1983.04 - 1986.02
22 Observations
LS // Dependent Variable is LMA3

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.1419135	0.4177264	-0.3397283	0.738
LMA3L	0.8856830	0.1355717	6.5329498	0.000
LMA5D	0.4772091	0.1150825	4.1466690	0.001
LMA5L	0.1363396	0.0863316	1.5792553	0.133
DUMA	0.0296270	0.0326446	0.9075613	0.377

R-squared	0.898815	Mean of dependent var	4.416424
Adjusted R-squared	0.875006	S.D. of dependent var	0.184022
S.E. of regression	0.065060	Sum of squared resid	0.071957
F-statistic	37.75215	Log likelihood	31.73331

SMPL 1983.04 - 1986.02
25 Observations
LS // Dependent Variable is LMA5

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.7197843	1.1310520	0.6363848	0.532
LMA5L	0.8895284	0.2439761	3.6459657	0.002
LMA1D	0.9358825	0.5805351	1.6121034	0.123
LMA1L	-0.0431041	0.4080713	-0.1056289	0.917
DUMA	-0.0518702	0.0717714	-0.7227130	0.478

R-squared	0.732230	Mean of dependent var	4.505105
Adjusted R-squared	0.678675	S.D. of dependent var	0.252872
S.E. of regression	0.143342	Sum of squared resid	0.410938
F-statistic	13.67271	Log likelihood	15.87890

SMPL 1983.04 - 1986.02
21 Observations
LS // Dependent Variable is LMA5

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1.1273551	0.5735632	1.9655288	0.067
LMA5L	0.4848098	0.1901418	2.5497280	0.021
LMA2D	0.0252270	0.1197757	0.2106192	0.836
LMA2L	0.2775241	0.1080729	2.5679350	0.021
DUMA	-0.1276241	0.0660841	-1.9312356	0.071

R-squared	0.795360	Mean of dependent var	4.519194
Adjusted R-squared	0.744200	S.D. of dependent var	0.276354
S.E. of regression	0.139771	Sum of squared resid	0.312573
F-statistic	15.54649	Log likelihood	14.38040

SMPL 1983.04 - 1986.02
8 Observations
LS // Dependent Variable is LMA5

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	2.0415874	2.1601274	0.9451236	0.414
LMA5L	0.5948175	0.6856336	0.8675442	0.449
LMA6D	0.4661936	0.2996507	1.5557903	0.218
LMA6L	-0.0479637	0.2678950	-0.1790390	0.869
DUMA	-0.0099892	0.2823889	-0.0353738	0.974

R-squared	0.677759	Mean of dependent var	4.483715
Adjusted R-squared	0.248104	S.D. of dependent var	0.285178
S.E. of regression	0.247283	Sum of squared resid	0.183447
F-statistic	1.577448	Log likelihood	3.749574

SMPL 1983.04 - 1986.02
13 Observations
LS // Dependent Variable is LMA7

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-2.4810405	1.4787783	-1.6777637	0.132
LMA7L	0.2504681	0.2735850	0.9155040	0.387
LMA1D	1.6137667	0.6997814	2.3061011	0.050
LMA1L	1.2629091	0.4690687	2.6923752	0.027
DUMA	-0.0783076	0.0541463	-1.4462229	0.186

R-squared	0.870545	Mean of dependent var	4.647906
Adjusted R-squared	0.805817	S.D. of dependent var	0.164965
S.E. of regression	0.072694	Sum of squared resid	0.042275
F-statistic	13.44936	Log likelihood	18.78908

SMPL 1983.04 - 1986.02
11 Observations
LS // Dependent Variable is LMA7

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1.0238481	1.4350661	0.7134501	0.502
LMA7L	0.4670841	0.2151386	2.1710841	0.073
LMA2D	0.0843134	0.4014759	0.2100085	0.841
LMA2L	0.3294937	0.3312932	0.9945682	0.358
DUMA	-0.1484931	0.0811097	-1.8307674	0.117

R-squared	0.817718	Mean of dependent var	4.729849
Adjusted R-squared	0.696197	S.D. of dependent var	0.203586
S.E. of regression	0.112213	Sum of squared resid	0.075551
F-statistic	6.729024	Log likelihood	11.78634

SMPL 1983.04 - 1986.02
10 Observations
LS // Dependent Variable is LMA2

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1.1699675	0.6411913	1.8246779	0.128
LMA2L	0.6560887	0.1931622	3.3965683	0.019
LMA6D	0.0701444	0.1836411	0.3819644	0.718
LMA6L	0.0951647	0.1467818	0.6483414	0.545
DUMA	-0.0938064	0.1379716	-0.6798961	0.527

R-squared	0.864210	Mean of dependent var	4.478111
Adjusted R-squared	0.755578	S.D. of dependent var	0.347687
S.E. of regression	0.171893	Sum of squared resid	0.147736
F-statistic	7.955398	Log likelihood	6.885189

SMPL 1983.04 - 1986.02
10 Observations
LS // Dependent Variable is LMA2

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	3.2402701	1.1502140	2.8171018	0.037
LMA2L	0.3991270	0.1567402	2.5464238	0.051
LMA8D	0.3325477	0.2817043	1.1804850	0.291
LMA8L	-0.0849413	0.2729282	-0.3112222	0.768
DUMA	-0.0873737	0.0828176	-1.0550127	0.340

R-squared	0.694891	Mean of dependent var	4.692292
Adjusted R-squared	0.450805	S.D. of dependent var	0.133886
S.E. of regression	0.099220	Sum of squared resid	0.049223
F-statistic	2.846903	Log likelihood	12.38049

SMPL 1985.10 - 1987.10
24 Observations
LS // Dependent Variable is LMIL3

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.2501261	0.4028082	-0.6209559	0.542
LMIL3L	0.1880399	0.2336528	0.8047834	0.431
LMIL1D	0.6917669	0.2410767	2.8694889	0.010
LMIL1L	0.8514298	0.2611778	3.2599618	0.004
DUMISO	-0.0223709	0.0500744	-0.4467529	0.660

R-squared	0.859178	Mean of dependent var	3.937101
Adjusted R-squared	0.829531	S.D. of dependent var	0.202393
S.E. of regression	0.083564	Sum of squared resid	0.132676
F-statistic	28.98050	Log likelihood	28.32029

SMPL 1985.10 - 1987.10
24 Observations
LS // Dependent Variable is LMIL3

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.4668554	0.3341984	1.3969409	0.179
LMIL3L	0.4144360	0.1484770	2.7912462	0.012
LMIL2D	0.4024646	0.1513072	2.6599172	0.015
LMIL2L	0.4625868	0.1081062	4.2790043	0.000
DUMISO	-0.0256005	0.0454537	-0.5632210	0.580

R-squared	0.887710	Mean of dependent var	3.937101
Adjusted R-squared	0.864070	S.D. of dependent var	0.202393
S.E. of regression	0.074620	Sum of squared resid	0.105794
F-statistic	37.55111	Log likelihood	31.03722

SMPL 1985.10 - 1987.10
24 Observations
LS // Dependent Variable is LMIL3

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1.4144939	0.2985271	4.7382422	0.000
LMIL3L	0.0524238	0.1457216	0.3597528	0.723
LMIL9D	0.1321198	0.0876375	1.5075717	0.148
LMIL9L	0.6230414	0.0950062	6.5579011	0.000
DUMISO	0.0404704	0.0362278	1.1171093	0.278

R-squared	0.929798	Mean of dependent var	3.937101
Adjusted R-squared	0.915018	S.D. of dependent var	0.202393
S.E. of regression	0.059001	Sum of squared resid	0.066141
F-statistic	62.91157	Log likelihood	36.67368

SMPL 1985.10 - 1987.10
24 Observations
LS // Dependent Variable is LMIL9

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0562404	0.9802486	-0.0573736	0.955
LMIL9L	0.7338812	0.2805533	2.6158354	0.017
LMIL1D	1.3235186	0.3799633	3.4832798	0.002
LMIL1L	0.2567195	0.4799542	0.5348833	0.599
DUMISO	0.0363661	0.0733245	0.4959608	0.626

R-squared	0.894191	Mean of dependent var	3.708399
Adjusted R-squared	0.871916	S.D. of dependent var	0.307402
S.E. of regression	0.110016	Sum of squared resid	0.229967
F-statistic	40.14225	Log likelihood	21.71997

SMPL 1985.10 - 1987.10
24 Observations
LS // Dependent Variable is LMIL9

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.8653930	0.2514720	-3.4413096	0.003
LMIL9L	0.0859537	0.1642150	0.5234218	0.607
LMIL2D	1.1541783	0.1508925	7.6490106	0.000
LMIL2L	1.0709227	0.1840081	5.8199763	0.000
DUMISO	-0.0587653	0.0507838	-1.1571677	0.262

R-squared	0.954546	Mean of dependent var	3.708399
Adjusted R-squared	0.944976	S.D. of dependent var	0.307402
S.E. of regression	0.072108	Sum of squared resid	0.098791
F-statistic	99.75049	Log likelihood	31.85909

SMPL 1985.10 - 1987.10
24 Observations
LS // Dependent Variable is LMIL9

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.5321364	1.0840153	-0.4908938	0.629
LMIL9L	0.4623044	0.4062968	1.1378490	0.269
LMIL3D	0.8086561	0.5363965	1.5075717	0.148
LMIL3L	0.6445740	0.6303580	1.0225522	0.319
DUMISO	-0.0688825	0.0911642	-0.7555866	0.459

R-squared	0.813737	Mean of dependent var	3.708399
Adjusted R-squared	0.774524	S.D. of dependent var	0.307402
S.E. of regression	0.145968	Sum of squared resid	0.404826
F-statistic	20.75163	Log likelihood	14.93370

SMPL 1985.10 - 1987.10
22 Observations
LS // Dependent Variable is LSO3

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.4631834	0.4480377	1.0338047	0.316
LSO3L	0.5368421	0.2946193	1.8221554	0.086
LSO1D	0.7112923	0.3532693	2.0134565	0.060
LSO1L	0.3256981	0.3100784	1.0503734	0.308
DUMISO	-0.0363589	0.0587125	-0.6192700	0.544

R-squared	0.817957	Mean of dependent var	3.830290
Adjusted R-squared	0.775124	S.D. of dependent var	0.212564
S.E. of regression	0.100800	Sum of squared resid	0.172732
F-statistic	19.09619	Log likelihood	22.10099

SMPL 1985.10 - 1987.10
24 Observations
LS // Dependent Variable is LSO3

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.1831115	0.2567420	0.7132122	0.484
LSO3L	0.2527143	0.1570940	1.6086817	0.124
LSO2D	0.6504701	0.1423231	4.5703773	0.000
LSO2L	0.6730298	0.1397400	4.8162993	0.000
DUMISO	-0.0235331	0.0401875	-0.5855821	0.565

R-squared	0.922304	Mean of dependent var	3.851246
Adjusted R-squared	0.905947	S.D. of dependent var	0.215164
S.E. of regression	0.065986	Sum of squared resid	0.082730
F-statistic	56.38585	Log likelihood	33.98818

SMPL 1985.10 - 1987.10
24 Observations
LS // Dependent Variable is LSO3

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1.1248170	0.3333815	3.3739634	0.003
LSO3L	0.0813131	0.2134934	0.3808694	0.708
LSO9D	0.3601617	0.1176851	3.0603860	0.006
LSO9L	0.6534661	0.1589882	4.1101544	0.001
DUMISO	0.0205350	0.0456037	0.4502926	0.658

R-squared	0.903312	Mean of dependent var	3.851246
Adjusted R-squared	0.882956	S.D. of dependent var	0.215164
S.E. of regression	0.073611	Sum of squared resid	0.102953
F-statistic	44.37700	Log likelihood	31.36390

SMPL 1985.10 - 1987.10
22 Observations
LS // Dependent Variable is LSO9

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.4908884	0.6477177	0.7578741	0.459
LSO9L	0.7025292	0.2258045	3.1112277	0.006
LSO1D	1.1456365	0.4008549	2.8579830	0.011
LSO1L	0.1464501	0.3272959	0.4474547	0.660
DUMISO	-0.0029003	0.0713572	-0.0406445	0.968

R-squared	0.868257	Mean of dependent var	3.658952
Adjusted R-squared	0.837259	S.D. of dependent var	0.294804
S.E. of regression	0.118927	Sum of squared resid	0.240443
F-statistic	28.00983	Log likelihood	18.46280

SMPL 1985.10 - 1987.10
24 Observations
LS // Dependent Variable is LSO9

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.8943554	0.3705479	-2.4136028	0.026
LSO9L	0.2605639	0.1905426	1.3674841	0.187
LSO2D	0.9162216	0.2014288	4.5486123	0.000
LSO2L	0.9057404	0.2283264	3.9668673	0.001
DUMISO	-0.0567249	0.0639213	-0.8874185	0.386

R-squared	0.916166	Mean of dependent var	3.686221
Adjusted R-squared	0.898517	S.D. of dependent var	0.296464
S.E. of regression	0.094443	Sum of squared resid	0.169469
F-statistic	51.90984	Log likelihood	25.38314

SMPL 1985.10 - 1987.10
24 Observations
LS // Dependent Variable is LSO9

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-1.0423711	0.6286655	-1.6580696	0.114
LSO9L	0.1594564	0.2904544	0.5489895	0.589
LSO3D	0.9167635	0.2995581	3.0603860	0.006
LSO3L	1.0780778	0.4097756	2.6308979	0.016
DUMISO	-0.0741733	0.0711382	-1.0426637	0.310

R-squared	0.870364	Mean of dependent var	3.686221
Adjusted R-squared	0.843072	S.D. of dependent var	0.296464
S.E. of regression	0.117442	Sum of squared resid	0.262059
F-statistic	31.89095	Log likelihood	20.15235

SMPL 1985.10 - 1987.10
21 Observations
LS // Dependent Variable is LMA3

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.2827724	0.4390785	0.6440133	0.529
LMA3L	0.3092454	0.2883699	1.0723914	0.299
LMA1D	0.2417259	0.2549475	0.9481401	0.357
LMA1L	0.5968998	0.2730651	2.1859251	0.044
DUMA	-0.1407524	0.0647791	-2.1728046	0.045

R-squared	0.805056	Mean of dependent var	3.752737
Adjusted R-squared	0.756320	S.D. of dependent var	0.268501
S.E. of regression	0.132543	Sum of squared resid	0.281080
F-statistic	16.51869	Log likelihood	15.49548

SMPL 1985.10 - 1987.10
10 Observations
LS // Dependent Variable is LMA3

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0838386	1.4930768	-0.0561515	0.957
LMA3L	0.8134822	0.4708908	1.7275390	0.145
LMA2D	-0.2185283	0.4886150	-0.4472403	0.673
LMA2L	0.2198646	0.5979744	0.3676824	0.728
DUMA	-0.1672558	0.1138063	-1.4696530	0.202

R-squared	0.720336	Mean of dependent var	3.915353
Adjusted R-squared	0.496604	S.D. of dependent var	0.192294
S.E. of regression	0.136433	Sum of squared resid	0.093070
F-statistic	3.219646	Log likelihood	9.195552

SMPL 1985.10 - 1987.10
24 Observations
LS // Dependent Variable is LMA3

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1.2424157	0.3188483	3.8965724	0.001
LMA3L	0.0178681	0.1817912	0.0982894	0.923
LMA9D	0.1378480	0.1454394	0.9478039	0.355
LMA9L	0.7011993	0.1408332	4.9789354	0.000
DUMA	-0.0116846	0.0460798	-0.2535728	0.803

R-squared	0.884600	Mean of dependent var	3.743276
Adjusted R-squared	0.860305	S.D. of dependent var	0.253048
S.E. of regression	0.094579	Sum of squared resid	0.169958
F-statistic	36.41106	Log likelihood	25.34858

SMPL 1985.10 - 1987.10
21 Observations
LS // Dependent Variable is LMA9

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.8070087	0.5007328	1.6116554	0.127
LMA9L	0.9723460	0.2246647	4.3279866	0.001
LMA1D	0.3203966	0.2489593	1.2869434	0.216
LMA1L	-0.1782383	0.2935362	-0.6072108	0.552
DUMA	-0.0576765	0.0746313	-0.7728187	0.451

R-squared	0.889944	Mean of dependent var	3.470962
Adjusted R-squared	0.862430	S.D. of dependent var	0.352373
S.E. of regression	0.130697	Sum of squared resid	0.273306
F-statistic	32.34507	Log likelihood	15.78999

SMPL 1985.10 - 1987.10
10 Observations
LS // Dependent Variable is LMA9

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.1070421	1.9947053	0.0536631	0.959
LMA9L	1.2860347	0.4057750	3.1693292	0.025
LMA2D	-0.4486290	0.5577339	-0.8043782	0.458
LMA2L	-0.3198157	0.7690691	-0.4158478	0.695
DUMA	-0.0503512	0.1501042	-0.3354414	0.751

R-squared	0.831559	Mean of dependent var	3.669399
Adjusted R-squared	0.696805	S.D. of dependent var	0.302569
S.E. of regression	0.166604	Sum of squared resid	0.138784
F-statistic	6.170977	Log likelihood	7.197706

SMPL 1985.10 - 1987.10
24 Observations
LS // Dependent Variable is LMA9

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.2702392	0.6562884	-0.4117689	0.685
LMA9L	0.4963653	0.3086338	1.6082659	0.124
LMA3D	0.3275064	0.3455424	0.9478039	0.355
LMA3L	0.5431315	0.4284944	1.2675347	0.220
DUMA	-0.0924611	0.0679108	-1.3615086	0.189

R-squared	0.839206	Mean of dependent var	3.462724
Adjusted R-squared	0.805355	S.D. of dependent var	0.330431
S.E. of regression	0.145782	Sum of squared resid	0.403795
F-statistic	24.79089	Log likelihood	14.96431

BIBLIOGRAPHY

Bates, Robert H., Markets and States in Tropical Africa: The Political Basis of Agricultural Policies, Berkeley: University of California Press, 1981.

Berg, Elliot, "Reforming Grain Marketing Systems in West Africa: A Case study of Mali". In Proceedings, International Workshop on Constraints to Developmaent of Semi-Arid Tropical Agriculture, Pantancheru, India, 19-23 February 1979, pp.147-72. Hyderabad, India: ICRISAT, 1979.

Bhattacharyya, G.K. and R.A. Johnson, Statistical Concepts and Methods, New York: John Wiley and Sons, 1977.

Bigman, David, Food Policies and Food Security Under Instability, Lexington: D.C. Health and Company, 1985.

Dembélé, Niama N., Josué Dioné and John Staatz, "Description et Analyse de la Structure du Marché des Céréales (Mil, Sorgho, Maïs) au Mali," Projet Sécurité Alimentaire, Document de Travail 86-04 (Bamako: Ministère de l'Agriculture, Institut d'Economie Rurale, Sécrétariat Technique de la CESA, September 1986a).

Dembélé, Niama N., Josué Dioné and John Staatz, "Description et Analyse du Comportement et de la Performance du Marché de Gros des Céréales (Mil-Sorgho-Mais) au Mali," Projet Securité Alimentaire, Document de Travail 86-05 (Bamako: Ministère de l'Agriculture, Institut d'Economie Rurale, Sécrétariat Technique de la CESA, September 1986b).

Dioné, Josué and Dembélé Niama N., "Description des Circuits Céréaliers au Mali et Analyse des Données Secondaires de Prix des Céréales (Mil-Mais-Sorgho)," Projet Securité Alimentaire, Document de Travail 86-02 (Bamako: Ministère de l'Agriculture, Institut d'Economie Rurale, Sécrétariat Technique de la CESA, March 1986a).

Dioné, Josué and Dembélé Niama N., "Analyse Provisoire de la Campagne de Commercialisation 1985/86 des Céréales (Mil-Sorgho-Mais) au Mali," Projet Securité Alimentaire, Document de Travail 86-03 (Bamako: Ministère de l'Agriculture, Institut d'Economie Rurale, Sécrétariat Technique de la CESA, August 1986b).

Dioné, Josué and Niama N. Dembélé, "Le Programme de Restructuration du Marché Céréalier au Mali (PRMC): Une Analyse de ses Objectifs, son Fonctionnement et ses Réalisations," Projet Securité Alimentaire, Document de Travail 87-01 (Bamako: Ministère de l'Agriculture, Institut d'Economie Rurale, Sécrétariat Technique de la CESA, February 1987).

Dioné, Josué, "Quelques Interactions et Complémentarités Importantes dans la Politique Céréalière du Mali," Paper prepared for the National Seminar on "Cereals Policy in Mali", Bamako, Mali, 1987.

Direction Nationale de la Statistique et de l'Information (DNSI), Mali, Statistique Agricole: Enquête Agricole Annuelle (Campagne 1983-84). Bamako: FAO/Projet PADEM, Ministère du Plan, République du Mali, 1984.

EEC, "Statistiques de Base: Agriculture et Elevage". Office Statistique des Communautés Européennes, Bamako, 1988.

Eicher, Carl and John Staatz eds., Agricultural Development in The Third World, Baltimore: The John Hopkins University Press, 1984.

Goetz, Stephan, "A Review of Basic Price Analysis Techniques with Emphasis on Interpretation and Data Limitations in Third World Food System Applications", unpublished Plan B Research Paper, Michigan State University, 1986.

Harriss, Barbara, "There is Method in my Madness: Or is it Vice Versa? Measuring Agricultural Market Performance", Food Research Institute Studies, Vol. XVII, No. 2, pp 197-218, 1979.

Humphreys, Charles P., "Cereal Policy Reform in Mali," Draft Report (Washington D.C.: The World Bank, 1986).

Jones, W.O. "Regional Analysis and Agricultural Marketing Research in Tropical Africa: Concepts and Experience", Food Research Institute Studies, Vol.13, pp 3-28, 1974.

Kmenta, Jan, Elements of Econometrics, New York: Mcmillan Publishing Company, 1986.

Lele, Uma, Food Grain Marketing in India, Ithaca: Cornell University Press, 1971.

Linehan, Andrew, "Negociations and Reforms: The Case of Mali Cereal Marketing Reform," Draft Report. Princeton, N.J.: Woodrow Wilson School, Princeton University, 1983.

Nicholson, Walter, Microeconomic Theory: Basic Principles and Extensions, Chicago: The Dryden Press, 1984.

Ravallion, Martin, "Testing Market Integration", American Journal of Agricultural Economics, Vol. 68 , pp.102-09, 1986.

République du Mali, "Une Approche Intégrée pour Renforcer la Mise en Oeuvre de la Stratégie Alimentaire du Mali". CESA/Ministère de l'Agriculture/Ministère du Plan, Bamako, 1985.

Rogers, Beatrice L. and Melanee L. Lowdermilk, "Food Prices and Consumption in Urban Mali". Final Report of the Tufts/DNSI/USAID Food Price Project, Medford, Mass.: School of Nutrition, Tufts University, 1988.

Schmitz, Andrew, "Commodity Price Stabilization: The Theory and its Applications", World Bank Staff Papers, No. 668, Washington, D.C., 1984.

Sen, Amartya, Poverty and Famines: An Essay on Entitlement and Deprivation, Oxford: Clarendon Press, 1981.

Shaffer, James, Harold Riley, Michael Weber and John Staatz, "Designing Marketing Systems to Promote Development in The Third World Countries". Paper presented at the ICRISAT International Workshop on "Agricultural Markets in the Semi-Arid Tropics". 24-28 October 1983, ICRISAT Center, India, 1983.

Shepherd, G.S., Agricultural Price Analysis, Ames, Iowa: Iowa State University Press, 5th Edition, 1963.

Southworth, R. "Food Crop Marketing in Atebubu District, Ghana", unpublished Ph.D. Thesis, Stanford University, 1981.

Timmer, C. Peter, Getting Prices Right: The Scope and Limits of Agricultural Price Policy, Ithaca: Cornell University Press, 1986.

Timmer, C. Peter (editor), The Corn Economy Of Indonesia, Ithaca: Cornell University Press, 1986.

Timmer, C. Peter, "A Model of Rice Marketing Margins in Indonesia", Food Research Institute Studies, Vol. XIII, No. 2, pp 145-167, 1974.

Timmer, C. Peter, W.P. Falcon and S.R. Pearon, Food Policy Analysis, Baltimore: The John Hopkins University Press, 1983.

Tomek, William G. and Kenneth L. Robinson, Agricultural Product Prices, Ithaca: Cornell University Press, 1981.

USAID, "Mali: Cereals Market Restructuring Project", Program Paper, Bamako, 1984.