THE CANADIAN BEEF AND DAIRY CATTLE INDUSTRY

A MODEL OF THE CANADIAN BEEF AND DAIRY CATTLE INDUSTRY BASED ON MARKOV CHAIN TECHNIQUES

BY

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ABSTRACT

Like any livestock supply, the supply of Canadian beef and dairy cattle is characterized by a cyclical pattern in terms of the number of cattle on farm, the number of cattle slaughtered, the price of cattle, and the income of the beef and dairy cattle producers. In this study, we try to investigate the causes of such cyclical movements. To achieve this objective, semi-annual flow matrices are constructed for both Western and Eastern Canada for the period 1958 to 1972. The flow matrices are constructed according to the biological sequences of beef and dairy cattle. (Due to the limitation of the available data series, beef and dairy cattle are, in some instances, treated as homogeneous. Distinctions between the two types of cattle are made within the flow matrices whenever possible.) The flow matrices allow us to trace the movement of cattle from one age category to another. The age categories are not published according to the actual ages of the cattle, but rather under the categories of calves (under 1 year of age), yearling heifers (female cattle 1 year and older, but which have not given birth to calves), steers (castrated males), cows (female cattle that have already given birth to calves), and bulls (male cattle 1 year old or older).

Using the flow matrices, transition matrices are formed. The transition probability matrices are constructed by dividing

each row element in the matrix by its corresponding row total. These probabilities are treated as dependent variables to be explained by a set of relevant economic variables.

Consistent with the evidence, fertility rates of cows in both regions are assumed constant, and based on these rates the number of calves born in each region is projected. Import functions of beef and dairy cattle are estimated. The introduction of the new-born calves and the estimated importation of cattle make the entire matrix endogenous. This enables us to predict the behaviour of the beef and dairy cattle industry in the long run.

Finally, simulations are carried out using the transition probability matrices. In particular, attempts are made to simulate the consequences of changes in some of the important exogenous variables, for instance, the price of choice steers and personal disposable income.

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I alone, of course, am responsible for any remaining errors.

TABLE OF CONTENTS

LIST OF DIAGRAMS

LIST OF TABLES

CHAPTER 1 -- INTRODUCTION

1.1 Review of the Canadian Cattle Industry

Like most developed countries, Canada is experiencing an upward trend in the per capita consumption of beef. This increase in beef consumption is reflected in an increased number of cattle on farm, the increase in the number of cattle slaughtered, the increase in the weight of the slaughter cattle, and a decrease in the number of cattle exported.[1]

The Canadian beef cattle industry exhibits two important features. The first of these is the regional imbalance in beef supply and beef consumption. In Canada, three-quarters of the population is located in a fairly concentrated area in Eastern Canada which includes Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick, Quebec and Ontario, with the balance spread out in Western Canada, which includes Saskatchewan, Manitoba, Alberta and British Columbia. The production of beef, on the other hand, is heavily concentrated in Western Canada. It is estimated that over half of the federally inspected slaughter is originated in Western Canada and over 80 percent of Canadian beef cows are to be found in Western Canada. As a result, a signigicant number of feeder cattle is moved from West to East to cover the deficit in production.

The second important feature of the Canadian domestic cattle industry is the periodic increase and decrease in the number of cattle and beef output. This is referred to as the cattle cycle. The cycle is generally caused by the cattle producers' response to the level of beef prices in light of economic opportunities that they might have. This is particularly the case in Western Canada, where beef producers can divert their resources to either cattle production or cash grain production, according to profitability. This particular way of explaining the cattle cycle phenomenon is usually referred as the 'internal approach'. Among those who are responsible for this approach are Lorie and Ezekiel.[2]

To visualize this internal approach explanation, we can consider, for instance, a situation in which the number of beef cattle on farm is relatively low. This will result in an increase in the price of beef and an anticipation that the price will go even higher. Heifers and cows will be further retained and this will stimulate some further increase in price. The spiral will continue until production from expanded inventories satisfies demand. Prices, of course, will begin to level off, and cattleman will interpret this levelling off as a signal to reduce inventories. Consequently, additional stock of cattle will be available in the market. Prices will then decrease, and this will cause a new spiral, which will continue until a new low is reached.

Another way of looking at the cattle cycle is by focusing on the exogenous factors like rainfalls, feed supply and pasture conditions which cause the supply schedule for beef to shift in such a way as to generate some sort of fluctuations. This is referred to as the 'external approach' in analysing the beef cattle cycle. Among those who are responsible for this approach are Burmeister and Pearson.[3]

Besides the domestic supply of beef, Canada also relies on trade in cattle and beef. The trading relationships for cattle and beef can be broken down into two categories. The trading of live cattle, which include slaughter cattle, feeder cattle and calves, is largely between Canada and the United States. The trading of beef, on the other hand, comes mainly from countries outside the North American continent, although there is a certain amount of higher quality table beef coming into Canada from the United States and a certain amount of lower quality beef going to United States from Canada. The lower quality manufacturing beef exported from Canada to the United States originates mostly in the Oceanic countries and is transhipped through Canada. Canada has long been a net exporter in the trading of live cattle and calves for beef and veal purposes. From 1950 to 1973, the only year in which Canada experienced a deficit in the trading of live cattle and calves was 1971, when there was a deficit of 5.6 million dollars. The total number of cattle and calves exported to the United States has declined in recent years because of an increase domestic demand. In order to look at the trading of live cattle and calves more closely, a disaggregation of the cattle by weight will be most appropriate at this point.

<u>Export of calves of 200 pounds or less</u>: In the last two decades the ·ts of calves very in an

trend. Exports of calves mostly originate in Eastern Canada as a by-product of the dairy cattle industry. Calves exported to the United States are primarily for veal purposes. In recent years calves for further feeding have also been exported. Western Europe is an importer of Canadian calves too, as a result of increasing demand for fed beef.

Export of cattle of weight between 200-700 pounds : Cattle belonging to this category are usually referred as feeder cattle. Traditionally, Canada has been a net exporter of feeder cattle. Exports of feeder cattle usually originate in Western Canada. The number of cattle exported in this category is rather irregular. In the mid 1960's the exports of feeder cattle to the United States were valued at about 30 million dollars per year. This figure dropped to a record low in 1970, when only one million dollar worth of feeder cattle were shipped to the United States. A new upsurge of feeder cattle exports occurred in 1972, as a result of the increase in the calf crop size in Western Canada and a strong United States feedlot demand for replacement. Exports of feeder cattle to the United States establish a general feeder price in Canada, and this price is referred as the 'floor price' for feeder cattle in Western Canada.

Exports of cattle 700 pounds and over : Exports of this category can be sub-divided into three main groups : heavy feeder cattle for further feeding, low grade slaughter cattle for boneless beef, and live fed cattle for slaughtering. Trading of slaughter cattle occurs whenever there is a price differential between the United States and Canada large enough to permit such trading. This is also true for low grade slaughter cattle. Importation of fed cattle from the United States for immediate slaughter has occurred almost entirely in Eastern Canada.

The Canadian cattle industry, like other industries, is subject to government controls and regulations. In the case of the cattle industry we can see that regulations are such that they can be regarded as internal forces that affect the cattle cycle itself.[4] It is therefore crucial to discuss all the major government policies relating to the cattle industry. Like the production of beef cattle, feed grains are produced largely in Western Canada. In order to assist the beef cattle producers in Eastern Canada, a government feed grain subsidy program was set up. Being the feed grain producing area, Western Canada can move the feed grain in three different ways --- to the world export market, to Eastern Canada and British Columbia, and to the non-Board markets of Western Canada, as designated by the Wheat Board. Before 1972, wheat producers had two options in selling their grain. They could either sell the wheat to the Wheat Board for eventual sale on the world market, to Eastern Canada or British Columbia, or they could sell the grain to the livestock feeders of their own province. A third option was to use the grain to raise their own livestock.

The Wheat Board had relied on a differential pricing system in selling the grain and, as far as Eastern Canada was concerned, grain was sold at a price competitive with United States corn landed in Eastern Canada. It is, therefore, not surprising to find that the price of grain in Eastern Canada is approximately equal to the Chicago corn price plus transportation and a tariff of eight cents per bushel.[5] Exports of grain outside of Canada are competitive with the world export market and are often sold at prices at or below the Eastern Canada prices. In an attempt to equalize the rates charged on grain for export with the rates charged for Eastern Canada and British Columbia, the Freight Equalization Policy (FEP) was proposed in the 1930's and was formally established in 1941. In 1966 the Canadian Livestock Feed Board was established for the continuous administration of the objectives of the FEP. It also functions as a medium to ensure the availability of feed grains, reasonable stability of feed grain prices, availability of adequate storage space for livestock producers in Eastern Canada, and a fair equalization of feed grain prices in Eastern Canada and British Columbia. This was certainly an improvement to the original FEP, but livestock producers in Eastern Canada and British Columbia still felt that they were being discriminated against because they did not have access to the cheaper non-Board grain which was available to Western feedlot operators. Western Canada also complained that feed-freight assistance discriminated against their region. If the market forces were unhindered, they said, Western Canada farmers would convert their feed grains into livestock. Slaughter and packing operations would then be based in Western Canada. In view of all these facts, an interim policy was established by the Federal Government in August 1972 and was eventually replaced by a permanent policy, in August 1974. The permanent policy called for an equalization of feed grain prices for all livestock producers in Canada, aside from differences associated with natural transportation advantages.

In a move aimed at encouraging long-term development of the Praire livestock industry where feed grains are produced but livestock is not, the government announced a reduction in its feed-freight assistance program starting in August of 1976. The 20-million-dollar-a-year transport susidy will be eliminated in the movement of Prairie feed grain into Ontario, and reduced for traffic to Quebec and British Columbia.

Beef and cattle importations are subject to a tariff system as a protection for domestic producers. Traditionally, the Canadian tariffs on the importation of beef and cattle were relatively simple and were quite similar in structure to the United States tariff on beef and cattle. As a comparison, a table showing the tariff structure for livestock, beef and veal in Canada and the United States is listed below.[6]

Table 1.1 Canada and the United States Tariffs on Livestock, and Veal in Effect in Recent Years

	Canadian rates on imports		U.S. rates on imports
	From U.S.	From Australia & New Zealand	
	(cents per pound)		(cents per pound)
Purebred for breeding	free	free	free
Dairy cows over 700 lbs.	1.2	free	1.3
Calves under 200 lbs.	1.5	free	1.5 on first 200,000 per fiscal year 2.5 thereafter
Calves 200 to 699 lbs.	1.5	free	2.5
Cattle 700 lbs. and over	1.5	free	1.5 on first 120,000 per quarter and 400,000 per fiscal year 2.5 therefore
Beef and veal, fresh chilled or frozen	3.0	3.0	3.0 subject to quota

In recent years, the Canadian government has instituted a number of measures designed to reduce imports and increase returns to domestic producers of beef and veal. Between November 1973 and January 1974, a temporary tariff surcharge of 3 cents per pound on live cattle and 6 cents per pound on beef was imposed on all imports. This was eliminated in February 1974.

In March 1974, the government instituted a beef subsidy program which involved a 5 cents per pound payment to producers by processors who in turn, were reimbursed by the government. This subsidy program was phased out by August 24, 1974 and was replaced by a deficiency payment scheme. The new scheme involved a price support level of at least $45.42 a hundredweight for grades A, B, and C cattle sold for slaughter. This was calculated by the use of a formula based on the average producer prices over the past five years and the expected change in the Farm Input Price Index in the coming year. If, at the end of twelve months, the national average price for certain classes of slaughter stock is below the support level, the government will pay the deficit amount directly to the individual producers.

New import quotas on live cattle and beef were also introduced by the Canadian government in August 1974. Under the new quota system, the total number of live beef cattle imported was limited to 82,835 heads per year, and the total poundage of beef and veal imports was limited to 125.8 million pounds in a twelve month period. In an attempt to prevent short-term market disruption, the government also restricted the total amount of imports in any quarter to be not more than 30 percent of the annual quota. Since the United States has always been Canada's biggest trading partner of beef cattle, a similar restriction on imports of cattle and beef from Canada to the United States was imposed in retaliation, in 1974. In the early part of 1976, the quota restrictions on beef and cattle importation were lifted.

An additional feature of the beef and cattle export and import situation was the banning by the Canadian government of diethylstilbestrol (DES), a growth hormone, in the raising of cattle. This came into effect in January 1973 and was extended to imports in April 1974. The result of the ban was an almost complete cessation of United States shipments into Canada. As a result, prices for Canadian fed cattle moved upward relative to their United Syates counterparts. In August 1974, agreement was reached to allow certified DES-free herds to be imported into Canada.

1.2 Review of Literature

The literature relating to the cattle industry, especially the Canadian cattle industry, is quite limited. Traditionally, the study of the cattle industry has centered around the study of the demand for beef, the supply of cattle, or the cattle cycle.[7] Studies relating demand and supply can be found in the work of Yankowsky and Shefrin.[8] Langemeir and Thompson, also did a study, for the U.S., relating demand, supply and price in a simultaneous system.[9] It was, however, only in 1973 that Kulshreshtha and Wilson published the first beef cattle model for the Canadian economy.[10] This is an econometric model in which simultaneous relations among demand, supply, prices and exports are discussed. The model covers the period from 1949 to 1969 and predictions were made about the Canadian beef economy to the year 1975.

A more recent approach to the study of the cattle industry involves the treatment of cattle as capital good. Producers hold cattle as long as their capital value in production exceeds their slaughter value. Based on this assumption, Jarvis developed a micro-model to determine the optimum slaughter age and feed input for a steer, given the growth function for the animal, the price of beef, the interest cost and the cost of other input.[11] Carvalby, in another study, formulated a quadratic profit function for the cattle producers to be maximized by a set of biological constraints on the cattle herd.[12] Basically, the reproduction herd is considered as a capital good, and the supply and inventory conditions are examined.

The study of the Canadian cattle industry is high-lighted by two recent doctoral dissertations, by Meek and MacAulay.[13] In Meek's study, he developed a dynamic demographic model of the Canadian cattle herd, based on the biological growth and production processes as experienced in Canada. The model separates cattle into beef and dairy, male and female components. It involved disaggregation into three regions, namely Eastern Canada, Western Canada and the rest of the world. The model does not consider price determination and trading mechanisms within the regions. The prime objective of Meek's dissertation is basically data and information assessment. The MacAulay model involves as application of quadratic programming which takes account of cattle production, cattle trading, consumption of beef and veal, and the determination of prices among the Western Canada region, the Eastern Canada region and the United States. Policy simulations of three variants of a deficiency payments scheme are also reported in the dissertation.

1.3 Outline of the Present Study

The basic purpose of this study is to experiment with a new approach, involving the use of transition matrices, in the study of the beef and dairy cattle industries. The reasons for incorporating both dairy and beef industries into the analysis are : First, in many instances, because of the way the data have been compiled, it is virtually impossible to separate cattle into the two categories. (This point will be considered further in Chapter 2 when we discuss the assumptions and adjustments being made in reconciling the data series for this study.) Secondly, about 90 percent of veal supply and 30 percent of the total beef supply are from the 'over-aged' dairy herds and herds of dairy steers and heifers.[14]

The study is divided into six chapters. In this first chapter, we have presented a brief description of the cattle industry, and the present state of the art in the study of this industry.

Chapter 2 describes the biological nature of cattle and how transition matrices can be estimated by utilizing information gathered regarding the biological sequences of cattle. The transition matrices allow us to trace the movements of cattle and calves from one category to another from one period to the next. (Because of the structure of the Canadian cattle industry, separate transition matrices are constructed for Eastern and Western Canada). The last section of Chapter 2 discusses the data used, and the adjustments made to the data series in constructing the transition matrices.

Chapter 3 discusses the procedures and assumptions used in constructing the transition matrices. Chapter 3 also acts as a bridge between the mechanical procedures involved in constructing the matrices and the economic explanations of the movements of cattle from one category to another. An economic model of the cattle supply and inventory is thus developed. This model allows us to single out the important economic variables that affect the supply side of the cattle industry. The demand side of the cattle industry is also taken account of in specifying the model. (The transition probabilities are assumed to be generated in accordance with the equilibration of demand and supply.) Empirical results are also presented in this chapter.

In Chapter 4, we estimate the number of births of calves and the imports of cattle into Western and Eastern Canada. As a result of this, we are able to move the system (the transition matrices and the associated state variables) forward in time, from one period to the next. This allows us to simulate the effects of certain economic variables on the system.

The final chapter is reserved for concluding remarks and suggestions for future research.

FOOTNOTES TO CHAPTER 1

1. A discussion of result developments of the Canadian beef cattle industry can be found in the works by Marshall (1974).

2. Lorie (1970) and Ezekiel (1938), pp. 225-280.

3. Burmeister (1949) and Pearson (1953).

4. In the internal-approach explanation of the cattle cycle, the cycle is produced as a result of the producers' response to the level of beef prices as compared to other opportunities. In the case of government regulations and interventions beef prices and other opportunities can all be under the control of the government.

5. Food Prices Review Board (1974).

6. The Table is taken from the Report of the Federal Task Force on Agriculture (1969), p.153.

7. The study of demand can be found in the work by Yeh (1961). The supply of cattle is illustrated in the work by Kerr (1968), Lohoar (1964), pp.1-8, and Tryfos (1974), pp.107-113. The cattle cycle is discussed by Marshall (1964).

8. Yankowsky and Shefrin (1968).

9. Langemeier and Thompson (1967), pp.169-185.

10. Kulshreshtha and Wilson (1972), pp. 84-91.

12. Carvalby (1975).

13. Meek (1975) and MacAulay (1976).

14. See, for example, Agriculture Canada, Publication Number 1439 (1971).

CHAPTER 2 -- METHODOLOGY FOR COMPILING TRANSITION TABLES

2.1 Biological Sequences of Cattle[1]

The anatomical structures of beef cattle and dairy cattle are identical. It is, in fact, impossible to distinguish between the skeleton of beef steer and a dairy cow. The difference between beef and dairy cattle is in the degree of fleshiness and in the development of the udder. Beef cattle are bred to be blocky with smooth muscles covering the angularity of their bones. Dairy cattle are much thinner in their fleshing. Their shoulder bone, ribs, and hip bones are usually more prominent.

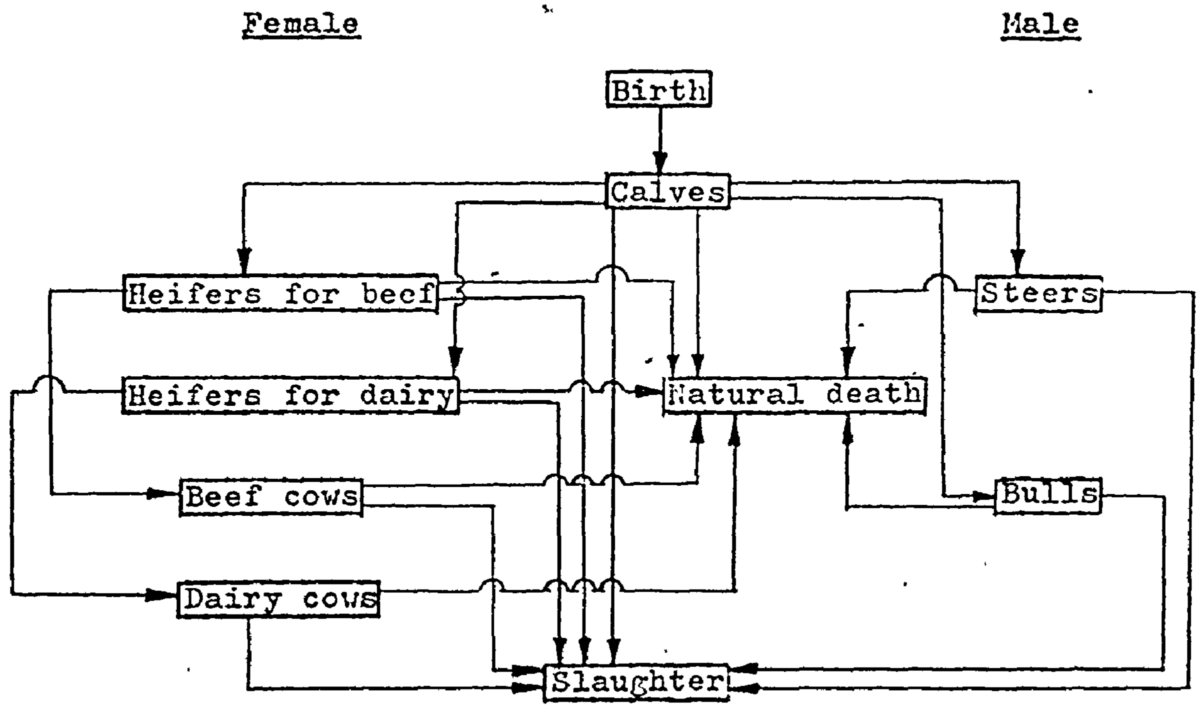
The principles of breeding, however, are the same for both beef and dairy cattle. The gestation period of cattle is about 280 days. The usual objective is for each cow to have one calf a year. This means that the cow must be mated in the third month subsequent to calving.[2] Once a calf is born, it has to rely on its mother's milk for at least three days. It is then fed whole milk from the herd until it is 5 days old. After that it can be continued on whole or gradually shifted to commercial replacers, and it can be offered hay and grain. The initial 20 days of the calf's life is the most critical period. After the calf is 20 days old it begins to eat increasing amounts of grain and hay. At 3 months of age it can be weaned entirely from milk or milk replacers. Dehorning, castration, marking, branding, and vaccination are all done at the time of round-up.

Beef calves are usually born in the spring, and beef cattle producers speak of the calves born in any one year as their 'calf crop'. Dairy calves, on the other hand, are born more evenly throughout the year. Generally speaking, there is slight difference between the methods of raising a dairy calf and the method of raising a beef calf. In raising a dairy calf, the calf is usually fed the same feeds as are given to the dairy herd after weaning. This will allow the calf to grow very rapidly if it is given all the high quality hay and silage or pasture that it can eat. Beef calves of the same group are generally fed to a level where they will grow satisfactorily until the fattening period. The normal age of maturity for both dairy and beef calves is around 18 months. At 18 months of age, the cattle are physically matured for reproduction. At a rate of giving birth to one calf every year, the cow usually reaches its peak production age at 6 or 7 years.[3] This does not mean that cows will be replaced after reaching 7 years of age, because the cost of producing replacement heifers is something that must be taken account of in calculating production costs. Every calf a cow produces reduces this overhead cost against her.

About 90 percent of all veal originates from the dairy herds with the remaining 10 percent coming from the beef calves.[4] The veal calves are usually sold at weights between 100 and 200 pounds, with some reaching over 300 pounds. Dairy cows, when no longer productive as milk producers, are usually sent directly to slaughter without further fattening. The same procedure holds for beef cows, dairy and beef bulls. Beef from 'over-aged' dairy cows and bulls, together with the growing practice of raising dairy steers and heifers and fattening them for beef purposes, accounts for over 30 percent of the beef supply in Canada. The fattening of beef or dairy heifers and steers for beef purposes can be described as follows. Young calves designated for beef purposes may be fattened on pasture or may be sold as feeders to cattlemen who specialize in fattening them for slaughter. The peak sales of such feeder cattle occur in the fall, because cattlemen are looking for feeders to consume the already harvested crops of hay, silage and feed grains. They buy the feeders directly from the cattle raisers, at the auction market, or through agents who buy for them. The feeder cattle are fed with hay, silage and possibly pasture, if the weather permits, throughout the first winter. They are pastured the following summer and then fattened by feeding them heavily for 60 to 100 days. With this procedure, the cattle reach the market at 18 to 20 months of age and weigh approximately 1000 pounds. At this age and weight, the animals are considered to be finished cattle, and are ready for sale to meat packers, through public auction, or to slaughterhouses.

Based on the foregoing discussion, we can now construct a diagram indicating the biological sequences of cattle, from birth to death.[5]

Diagram 2.1 The Biological Sequences of Cattle



The above diagram indicates the typical life cycles. A male calf can either be slaughtered at a young age or raised as a steer and slaughtered later. It can also be retained as a bull for reproduction purposes. It will then be slaughtered when it reaches the age when its reproductive capacity has declined to such a stage that it is no longer economical to keep it. This sequence of alternatives for males is true for both beef and dairy cattle.

The story for a female calf is somewhat different. A female calf can be either a dairy calf or a beef calf. Female calves can be raised and fattened as feeder cattle and later slaughtered as slaughter cattle. They can also be retained as replacement cattle for reproduction purposes. The major biological difference between a male calf and a female calf is that once a male calf is castrated to become a steer it can no longer serve the purpose of a bull. On the other hand, a replacement heifer, for either beef purposes or dairy purposes, can be retained for reproduction or slaughtered. Normally speaking, however, it is usually decided ahead of time whether a female calf is to be for replacement or fattened. The decision can, of course, be revised under changed economic conditions.

The discussion of the biological sequences of cattle refers strictly to the different stages from birth to slaughter. It should be pointed out that cattle at any particular stage of life can die from natural causes. Cattle at different ages can also be exported or imported to any part of the world, but this will not change any of the biological sequences of the animals themselves.

2.2 Basic Components of the Transition Tables

Based upon the biological sequences of cattle, as discussed in the previous section, and the availability of the data series, as discussed in the next, we will establish a series of transition matrices. The basic concept of a transition matrix is derived from the simple Markov chain process, which was introduced in 1907.[6] The concept has been applied in many different aspects of economic analysis. Solow used the probabilistic approach in the analysis of income distributions.[7] Champernowne used the same approach in the analysis of wage distributions.[8] Hart and Prais used the technique in the study of business concentration.[9] Judge and Swanson used the technique to study the past and potential size distribution of a sample of hog-producing firms in central Illinois.[10] In recent years the same technique has been used by Tracz and O'Mahong to study the educational system and develop planning technique.[11] David and Otsuki, Denton, and Dawson and Denton have utilized the technique in the study of labour force behavior.[12] Lazar, in a more recent article, has used the technique in the study of regional unemployment.[13] The foregoing are merely examples and by no means constitute an exhaustive list of applications.[14]

Strangely enough, despite keen interest shown by agricultural economists in examining how some economic processes and institutions have changed through time, and the simple nature of the Markov chain process, this approach has not been used extensively in the field of agricultural economics.[15]

Without pursuing the concepts underlying the Markov chain process, we present the following definition, as given by Kemeny et al.

> "A Markov chain process is determined by specifying the following information : There is given a set of states (s_1, s_2, ..., s_r). The process can be in one and only one of these states at a given time and it moves successively from one state to another. Each move is called a step. The probability that the process moves from s_i to s_j depends only on the state s_i that it occupied before the step. The transition probability p_{ij} which gives the probability that the process will move from s_i to s_j is given for every pair of states. Also an initial starting state is specified at which the process is assumed to begin."[16]

With this basic definition, we can define the different Markov states as various stages of the beef and dairy cattle life cycles. For simplicity, we will first restrict ourselves to the transition matrix for male cattle. A male can be in any one of the following categories during any particular period of time. It can be born during that period of time, it can be a calf on farm, it can be a steer on farm, or it can be a bull on farm. The male can also die in that particular period or it can be exported (in our case, to either one of the two other regions). That is, if we are dealing with a transition table for Western Canada, cattle in any one of the above three categories can be exported to Eastern

Canada, or to the rest of the world (in practice, mostly to the U.S.). At the same time, cattle in any one of the three categories can be imported from the other two regions. Because of the nature of the available data series, we will specify all of our transition tables for semi-annual periods. Each time period an animal that is in any one of the above mentioned categories at the end of one particular period can be either in the same category or in a different category six months later -- subject, of course, to the biological and natural constraints that prevent a bull from becoming a calf again, or a steer from becoming a bull. With all these pieces of information a transition or flow table for males can be specified as in Table 2.1. We may think of this as the matrix for region 1 (which can be thought of as Western Canada) in our three-region model.

The transition table is by no means self-explanatory and a detailed discussion of it is appropriate. The basic function of the transition table is to present the flows of cattle from one category to another, if such flows can (or indeed do) actually occur. For instance, the element in the first row and first column cell (a_{11}) indicates the number of male calves that are born during t+1 and remain on farm at the end of t+1. The 'a_{14}' cell indicates the flow of calves that are born in t+1 and are slaughtered within the same period. (Any male calf that is born in t+1 can also die or be exported in the same period.) The symbol '✓' indicates a possible flow, while '-' indicates an impossible flow. The 'a_{21}'

TABLE 2.1 Transition Table for the Male Cattle Population of Region 1 (Western Canada)

(All stocks are as of the end of the period)

t \ t+1	ON FARM: CALVES (col. 1)	ON FARM: STEERS (col 2)	ON FARM: BULLS (col. 3)	SLAUGHTERS: CALVES (col 4)	SLAUGHTERS: STEERS (col 5)	SLAUGHTERS: BULLS (col. 6)	DEATHS: CALVES (col 7)	DEATHS: CATTLE (col 8)	EXPORTS: CALVES TO 2 (col 9)	EXPORTS: CALVES TO 3 (col 10)	EXPORTS: STEERS TO 2 (col 11)	EXPORTS: STEERS TO 3 (col 12)	EXPORTS: BULLS TO 2 (col 13)	EXPORTS: BULLS TO 3 (col 14)	TOTAL
MALE CALVES BORN t+1 (ROW 1)	✓ (a_{11})	—	—	✓ (a_{14})	—	—	✓ (a_{17})	—	✓ (a_{19})	✓ ($a_{1\,10}$)	—	—	—	—	MALE CALVES BORN t+1
MALE CALVES ON FARM t (ROW 2)	✓ (a_{21})	✓ (a_{22})	✓ (a_{23})	✓ (a_{24})	✓ (a_{25})	?	✓ (a_{27})	✓ (a_{28})	✓ (a_{29})	✓ ($a_{2\,10}$)	✓ ($a_{2\,11}$)	✓ ($a_{2\,12}$)	✓ ($a_{2\,13}$)	✓ ($a_{2\,14}$)	MALE CALVES ON FARM t
STEERS ON FARM t (ROW 3)	—	✓ (a_{32})	—	—	✓ (a_{35})	—	—	✓ (a_{38})	—	—	✓ ($a_{3\,11}$)	✓ ($a_{3\,12}$)	✓ ($a_{3\,13}$)	✓ ($a_{3\,14}$)	STEERS ON FARM t
BULLS ON FARM t (ROW 4)	—	—	✓ (a_{43})	—	—	✓ (a_{46})	—	✓ (a_{48})	—	—	—	—	✓ ($a_{4\,13}$)	✓ ($a_{4\,14}$)	BULLS ON FARM t
IMPORTS (t+1) CALVES FROM 2 (ROW 5)	✓ (a_{51})	✓ (a_{52})	✓ (a_{53})	✓ (a_{54})	✓ (a_{55})	?	✓ (a_{57})	✓ (a_{58})	✓ (a_{59})	✓ ($a_{5\,10}$)	✓ ($a_{5\,11}$)	✓ ($a_{5\,12}$)	✓ ($a_{5\,13}$)	✓ ($a_{5\,14}$)	CALVES IMPORTED FROM 2 t+1
IMPORTS (t+1) CALVES FROM 3 (ROW 6)	✓ (a_{61})	✓ (a_{62})	✓ (a_{63})	✓ (a_{64})	✓ (a_{65})	?	✓ (a_{67})	✓ (a_{68})	—	—	✓ ($a_{6\,11}$)	✓ ($a_{6\,12}$)	—	—	CALVES IMPORTED FROM 3 t+1
IMPORTS (t+1) STEERS FROM 2 (ROW 7)	—	✓ (a_{72})	—	—	✓ (a_{75})	—	—	✓ (a_{78})	—	—	✓ ($a_{7\,11}$)	✓ ($a_{7\,12}$)	—	—	STEERS IMPORTED FROM 2 t+1
IMPORTS (t+1) STEERS FROM 3 (ROW 8)	—	✓ (a_{82})	—	—	✓ (a_{85})	—	—	✓ (a_{88})	—	—	✓ ($a_{8\,11}$)	✓ ($a_{8\,12}$)	—	—	STEERS IMPORTED FROM 3 t+1
IMPORTS (t+1) BULLS FROM 2 (ROW 9)	—	—	✓ (a_{93})	—	—	✓ (a_{96})	—	✓ (a_{98})	—	—	—	—	✓ ($a_{9\,13}$)	✓ ($a_{9\,14}$)	BULLS IMPORTED FROM 2 t+1
IMPORTS (t+1) BULLS FROM 3 (ROW 10)	—	—	✓ ($a_{10\,3}$)	—	—	✓ ($a_{10,6}$)	—	✓ ($a_{10\,8}$)	—	—	—	—	✓ ($a_{10\,13}$)	✓ ($a_{10\,14}$)	BULLS IMPORTED FROM 3 t+1
TOTAL	CALVES ON FARM t+1	STEERS ON FARM t+1	BULLS ON FARM t+1	CALVES SLAUGHTERED t+1	STEERS SLAUGHTERED t+1	BULLS SLAUGHTERED t+1	CALVES DIED t+1	CATTLE DIED t+1	CALVES EXPORTED TO 2 t+1	CALVES EXPORTED TO 3 t+1	STEERS EXPORTED TO 2 t+1	STEERS EXPORTED TO 3 t+1	BULLS EXPORTED TO 2 t+1	BULLS EXPORTED TO 3 t+1	

cell indicates male calves at the end of period t which remain as calves at the end of period t+1. A calf may remain a calf at the end of t+1 (a_{21}), it may become a steer (a_{22}), or it may become a bull (a_{23}); alternatively, it may be slaughtered as a calf during t+1 (a_{24}) or slaughtered as a steer (a_{25}). It is doubtful that a young bull would actually be slaughtered, and for simplicity we will assume that no young bulls are in fact slaughtered[17], therefore, we have a '-' sign in the 'a_{26}' cell, indicating an impossible flow. A male calf on farm at the end of t can, if it dies, die as a calf, as a steer, or as a bull during t+1. Given the data constraints, we include deaths of steers and bulls in the single category of deaths of cattle. Finally, male calves on farm at the end of period t can be exported to either of the other two regions as calves, steers or bulls during t+1. All such export flows are indicated by the cell entries in 'a_{29}' to '$a_{2,14}$'.

In similar fashion, we can establish cell entries for rows 3 and 4. In row 3, we denote the flows of steers that were on farm at the end of period t. A steer on farm at the end of t can still be on farm at the end of t+1, can be slaughtered as a steer, can die of natural causes or can be exported to either of the other two regions. Bulls on farm at the end of t can still be bulls at the end of t+1, can be slaughtered, can die of natural causes, or can be exported to either of the other two regions. These possible flows for bulls are represented by the cells in row 4.

Row 5 and 6 represent imports of calves from regions 2 and

3, respectively, during period t+1. The possible flows of such imports to the different categories are similar to those of domestic calves on farm as discussed above. It should be pointed out that we are assuming that imports of calves from another region can be re-exported within the same period to either the original region or to a third region, as calves, steers, or young bulls.[18] Rows 7 and 8 represent imports of steers into region 1 during t+1. Rows 9 and 10 represent imports of bulls. The flows of imported steers and bulls are analogous to those of domestic steers and bulls. Row totals represent the stocks of the different categories of cattle on farm at the end of period t and the flows of calves born and imports during period t+1. Column totals represent the corresponding stocks of the different categories of cattle at the end of period t+1.

With the knowledge acquired in specifying the transition table for the male cattle population, we can now proceed with constructing a transition table for the entire population. Again, the transition table presented here is for region 1 (which can be thought of as Western Canada). All trading of cattle and calves will therefore be between region 1 and regions 2 and 3. Basically, the transition table presented here can be used to represent any one of the three regions, because it depicts only biological sequences. This enlarged table appears as Table 2.2.

The 'complete' transition table is structurally similar to the one discussed previously. Besides incorporating both male and female cattle into it, we have also utilized the available information regarding slaughter so that the slaughter of cattle contains separate information on male and female calves, steers, heifers, cows and bulls. In the class of uninspected slaughter, we have only two categories : calves and cattle.[19] Exports and imports are classified into four different categories, namely, calves (male and female), heifers and steers, dairy cattle, and bulls. In the actual estimation of the transition tables we can eliminate the category of exports and imports of bulls. This decision is based upon the fact that there is no trading of bulls as a separate entity among the three regions. It is for the sake of completeness that we allow for such trading here.

Once the theoretical table is constructed, the initial task is to compute the flows of cattle or calves from one category to another. As there is no published or available information relating to such flows, we have to rely on assumptions in order to make the cells of the table consistent with the known row and column totals. There is, of course, no guarantee that such consistency can be achieved by our initial assumptions. To ensure that all the rows and columns do add to their specified totals, we adjust the initial flow table using the so-called RAS method which has been employed for a similar purpose in the estimation of input-output tables.[20] When the transition tables are formally constructed, it is then possible to estimate transition probabilities, on which the subsequent analysis is based. The derivation of the transition probabilities is discussed in Chapter 3.

TABLE 2.2 Transition Table for Beef and Dairy Cattle of Region 1 (Western Canada)

(All stocks are as of the end of the period)

		ON FARM (t+1)							SLAUGHTERS (t+1)								DEATHS (t+1)		EXPORTS (t+1)								TOTAL
		CALVES (col. 1)	STEERS (col. 2)	DAIRY HEIFERS (col. 3)	BEEF HEIFERS (col. 4)	DAIRY COWS (col. 5)	BEEF HEIFERS (col. 6)	BULLS (col. 7)	MALE CALVES (INSPECTED) (col. 8)	FEMALE CALVES (INSPECTED) (col. 9)	CALVES UNINSPECTED (col. 10)	STEERS (INSPECTED) (col. 11)	HEIFERS (INSPECTED) (col. 12)	COWS (INSPECTED) (col. 13)	BULLS (INSPECTED) (col. 14)	CATTLE UNINSPECTED (col. 15)	CALVES (col. 16)	CATTLE (col. 17)	CALVES TO 2 (col 18)	CALVES TO 3 (col 19)	HEIFERS + STEERS TO 2 (col 20)	HEIFERS + STEERS TO 3 (col. 21)	DAIRY MALE FEMALE TO 2 (col 22)	DAIRY MALE FEMALE TO 3 (col 23)	TO 2 (col 24)	TO 3 (col 25)	
CALVES BORN t+1	ROW 1	✓	—	—	—	—	—	—	✓	✓	✓	—	—	—	—	—	✓	—	✓	✓	—	—	—	—	—	—	✓
ON FARM (t) — CALVES ON	ROW 2	✓	✓	✓	✓	—	—	✓	✓	✓	✓	✓	✓	—	?	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ON FARM (t) — STEERS	ROW 3	—	✓	—	—	—	—	—	—	—	—	✓	—	—	—	✓	—	✓	—	—	✓	✓	—	—	—	—	✓
ON FARM (t) — DAIRY HEIFERS	ROW 4	—	—	✓	—	✓	—	—	—	—	—	—	✓	✓	—	✓	—	✓	—	—	✓	✓	✓	✓	—	—	✓
ON FARM (t) — BEEF HEIFERS	ROW 5	—	—	—	✓	—	✓	—	—	—	—	—	✓	✓	—	✓	—	✓	—	—	✓	✓	—	—	—	—	✓
ON FARM (t) — DAIRY COWS	ROW 6	—	—	—	—	✓	—	—	—	—	—	—	—	✓	—	✓	—	✓	—	—	—	—	✓	✓	—	—	✓
ON FARM (t) — BEEF COWS	ROW 7	—	—	—	—	—	✓	—	—	—	—	—	—	✓	—	✓	—	✓	—	—	—	—	—	—	—	—	✓
ON FARM (t) — BULLS	ROW 8	—	—	—	—	—	—	✓	—	—	—	—	—	—	✓	✓	—	✓	—	—	—	—	✓	✓	✓	✓	✓
IMPORTS (t+1) — CALVES — FROM 2	ROW 9	✓	✓	✓	✓	—	—	✓	✓	✓	✓	✓	✓	—	?	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IMPORTS (t+1) — CALVES — FROM 3	ROW 10	✓	✓	✓	✓	—	—	✓	✓	✓	✓	✓	✓	—	?	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IMPORTS (t+1) — HEIFERS, STEERS — FROM 2	ROW 11	—	✓	—	✓	—	✓	✓	—	—	—	—	✓	✓	✓	✓	—	✓	—	—	✓	✓	—	—	—	—	✓
IMPORTS (t+1) — HEIFERS, STEERS — FROM 3	ROW 12	—	✓	—	✓	—	✓	✓	—	—	—	—	✓	✓	✓	✓	—	✓	—	—	✓	✓	—	—	—	—	✓
IMPORTS (t+1) — DAIRY MALE, FEMALE — FROM 2	ROW 13	—	—	✓	—	✓	—	✓	—	—	—	—	✓	✓	✓	✓	—	✓	—	—	—	—	✓	✓	✓	✓	✓
IMPORTS (t+1) — DAIRY MALE, FEMALE — FROM 3	ROW 14	—	—	✓	—	✓	—	✓	—	—	—	—	✓	✓	✓	✓	—	✓	—	—	—	—	✓	✓	✓	✓	✓
IMPORTS (t+1) — BULLS — FROM 2	ROW 15	—	—	—	—	—	—	✓	—	—	—	—	—	—	✓	✓	—	✓	—	—	—	—	—	—	✓	✓	✓
IMPORTS (t+1) — BULLS — FROM 3	ROW 16	—	—	—	—	—	—	✓	—	—	—	—	—	—	✓	✓	—	✓	—	—	—	—	—	—	✓	✓	✓
TOTAL		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

2.3 Assumptions and Adjustments to Data Series Used for Constructing the Transition Tables

In constructing the transition tables all the relevent published and unpublished data series of which the author is aware have been brought together. A brief description of the nature of each data series is presented here, along with the name of the collecting agency. The assumptions which are made concerning the data series in order to make them directly useable in the construction of the transition tables are also discussed.[21]

Data relating to cattle on farm

Calves born — Statistics Canada (STATCAN) in its Calves Born Survey collects data twice annually on calves born during the preceding six months. The two data periods are December 1 to May 31, and June 1 to November 30. Since the majority of the data series used for constructing the transition tables refer to periods January 1 to June 30, and July 1 to December 31, adjustments have to be made to the calves born data series,[22] so that it is comparable with the others.

Calves on farm — The STATCAN Report on Livestock Surveys Cattle, Sheep, Horses (Livestock Survey) contain these data series. The series relate to both male and female, dairy and beef calves under 1 year old. These data series, together with the majority of the remaining data series, are all available semi-annually (January 1 to June 30 and July 1 to December 31). The one exception is the data series on natural deaths of calves and cattle.

Steers on farm — The STATCAN Livestock Surveys report both dairy and beef steers 1 year old or older kept for beef purposes under this heading.

Dairy heifers on farm — The STATCAN Livestock Surveys provide this data series. The series includes all female stock 1 to 2 years old raised primarily for milk purposes.

Beef heifers on farm — The STATCAN Livestock Surveys provide this data series. The series includes all female stock 1 to 2 years old raised mainly for beef purposes. The series does not distinguish between heifers coming from beef cattle and those from dairy herds.

Dairy cows on farm — The STATCAN Livestock Surveys provide this data series. It includes all female stock 2 years old and older kept mainly for milk and reproduction purposes.

Beef cows on farm — The STATCAN Livestock Surveys provide a series for female stock 2 years old and older kept for reproducing beef cattle.

Bulls on farm — The STATCAN Livestock Surveys provide a data series for this category which includes both beef and dairy bulls 1 year and older.

Data relating to slaughter of cattle

Information relating to slaughter of cattle is available separately for inspected slaughter and uninspected slaughter. Data for inspected slaughter are collected and published by the Livestock Division, Production and Marketing Branch, Agriculture Canada. Uninspected slaughter data are compiled by the Agricultural Division of STATCAN for its own internal use and are not formally published, but have been made available to the author. The data series for inspected slaughter are available for the following categories : male calves, female calves, heifers, steers, cows and bulls. They are also available in the usual Western Canada and Eastern Canada break-down. The uninspected slaughter series have the Western Canada and Eastern Canada break-down too, but the data series are available only for the categories of calves and cattle.

Data relating to death of cattle

The term 'death of cattle' is taken to refer to death from natural causes. The total includes cattle dying of diseases and old age. (It is, of course, very unlikely that any cattle will die of old age instead of being slaughtered.) The deaths-of-cattle series are available only for the two broad categories of cattle and calves. Like the calves-born survey, the deaths-of-cattle series are collected by STATCAN every six months. Unfortunately, the six month intervals do not coincide with the usual January 1 to June 30 and July 1 to December 31 periods so adjustments have to be made accordingly to reconcile these series with the other data series. It has been estimated by Meek that deaths of calves occur mainly in the first two quarters of the year while deaths of cattle are more or less evenly spread throughout the year.[23] It seems reasonable to assume that the heavy concentration of deaths of calves are related to the corresponding concentration of births in the same period. For this reason, we will assume that the distribution of deaths of calves during any particular year follows the birth distribution of calves. Furthermore, we will assume that deaths of cattle are evenly spread through the year.

Data relating to the trading of cattle

Trading of cattle is the last entry included in the construction of the table. Trading of cattle can be divided into 'internal trading' and 'external trading'. 'Internal trading' refers to trading of cattle within Canada (between Western Canada and Eastern Canada). 'External trading' refers to trading of cattle with the rest of the world. The term 'rest of the world' includes the U.S.A. In fact, the majority of livestock trading between Canada and the rest of the world occurs between Canada and the United States. Trading of cattle is disaggregated into three broad categories : trading of calves, trading of heifers and steers, and trading of dairy males and females. Since there is no recorded information on trading of bulls, this entity will be dropped from the transition table as presented previously. The disaggregation of cattle into the above categories applies to both 'internal trading' and 'external trading'. Assumptions made relating to any of the data series in any of the three categories will be discussed as we go along.

Calves Since we defined calves to be cattle under 1 year of age, we will use this criterion to classify and group the relevant data series. In particular, the following published series are employed in estimating the number of calves traded :

(1) Movement of calves by rail to stockyards from Western to

Eastern Canada;

(2) Movement of calves by rail for slaughter from Western to Eastern Canada;

(3) Movement of calves by rail for feeding from Western to Eastern Canada;

(4) Feeder cattle 200-700 lbs. exported from Western Canada to the United States;

(5) Feeder cattle 200-700 lbs. exported from Eastern Canada to the United States;

(6) Slaughter cattle 200-700 lbs. exported from Western Canada to the United States;

(7) Slaughter cattle 200-700 lbs. exported from Eastern Canada to the United States;

(8) Calves exported from Western Canada to the United States;

(9) Calves exported from Eastern Canada to the United States;

(10) Cattle, dairy, not elsewhere specified (NES), less than 200 lbs. exported to all countries including the United States;

(11) Cattle (calves), NES, greater than 200 lbs., exported to the United States;

(12) Cattle, NES, 200-700 lbs. exported to the United States;

(13) Imports of calves from the United States to Eastern Canada for immediate slaughter;

(14) Imports of calves from the United States to Western Canada for immediate slaughter.

Data series (1) to (9) relate to movements of calves from Western Canada to Eastern Canada, and from Western and Eastern Canada to the United States. In particular, data series (1) to (4) pertain to 'internal trading' of calves while data series (5) to (9) pertain to 'external trading'. All nine series are published by Agriculture Canada in various issues of the Livestock and Meat Trade Reports.

Data series (10) to (12) also relate to 'external trading' of calves. These series are published by STATCAN in the Trade of Canada series. Some assumptions are necessary so that we can classify the series to their appropriate regions. For data series (10), we assume that only dairy calves that are not purebred are recorded in this category. Furthermore, we assume that all exports in this category originate in Eastern Canada. Data series (11) is assumed to include mainly young dairy calves and we assume that exports in this category originate in Eastern Canada. Data series (12) includes mainly young beef cattle shipped from Western Canada to the North Central United States. For simplicity, we will assume that calves in this category originate in Western Canada.

Data series (13) and (14) are the only recorded series for imports of calves into Canada. The actual volume of such imports is very small and it does not contribute in any significant degree to the 'external trading' of calves.[26]

Heifers and steers We take all feeder cattle over 1 year of age to belong to this category. The category include all cattle over 700 lbs. by weight. The following data series are used in deriving figures relating to the trading of heifers and steers :

(15) Movement of cattle by rail to stockyard from Western to Eastern Canada;

(16) Movement of cattle by rail for slaughter from Western to Eastern Canada;

(17) Movement of feeder cattle by rail from Western to Eastern Canada;

(18) Imports of cattle from the United States to Western Canada for immediate slaughter;

(19) Imports of cattle from the United States to Eastern Canada for immediate slaughter;

(20) Feeder cattle less than 700 lbs. exported from Western Canada to the United States;

(21) Feeder cattle less than 700 lbs. exported from Eastern Canada to the United States;

(22) Slaughter cattle greater than 700 lbs. exported from Western Canada to the United States;

(23) Slaughter cattle greater than 700 lbs. exported from Eastern Canada to the United States;

(24) Cattle, purebred, NES, imported from all countries (including the United State);

(25) Cattle, NES, imported from all countries (including the United States);

(26) Cattle, purebred, exported to all countries (including the United States);

(27) Cattle, purebred, NES, exported to all countries (including the United States);

(28) Cattle, NES, greater than 700 lbs. exported to the United States.

Data series (15) to (17) and (20) to (23) are published by Agriculture Canada in various issues of the <u>Livestock and Meat Trade Report</u>. Data series (15) to (17) relate to 'internal trading' of heifers and steers, while series (20) to (23) relate to the 'external trading'. The series are self-explanatory. Data series (18) and (19) are compiled by the Agriculture Canada Information Section and are not formally published, but made available to the author. The two relate to imports of both heifers and steers into Canada.

Data series (24) to (28) are published by STATCAN in Trade of Canada. Because of the nature of the series, some further assumptions are necessary at this point. Data series (24) includes dairy and NES beef cattle, both male and female.[27] For simplicity, we will assume that the total imports in this category is split into equal shares between Eastern and Western Canada. This may not seem to be the best assumption possible, but given that the total number of such imports is relatively small, the assumption will not seriously affect our analysis. Data series (25) consists largely of cattle for immediate slaughter and may be taken to relate primarily to steers. For this reason, we will assume that cattle in this category will all be destined to Eastern Canada. Data series (26) includes both dairy and beef cattle exported from Canada. There is no information regarding the places of origin for such exports. For simplicity, we will once again assume that the total number of exports in this category is evenly split between Western and Eastern Canada. This same assumption is made also in the case of data series (27).[28] In the last export category (Cattle, NES, greater than 700 lbs. exported to the United States), we assume that all exports belonging to this category are slaughter cattle. For this reason, we will assume that they originate in Western Canada.

Male and female dairy cattle In the classification and grouping relating to the trading of calves, we include all the dairy calves in the Calves category. Hence, for this category we will assume that the data series relate to male and female dairy cattle 1 year of age or older. Trading of dairy males and females occurs largely between Canada and the United States, and there is no recorded trading of dairy cattle between Eastern and Western Canada. Series relating to this category can be briefly summarized as follows :

(29) Grade dairy females exported from Western Canada to the United States;

(30) Grade dairy females exported from Eastern Canada to the United States;

(31) Purebred dairy females exported from Western Canada to the United States;

(32) Purebred dairy females exported from Eastern Canada to the United States;

(33) Dairy females and bulls exported from Western Canada to the United States;

(34) Dairy females and bulls exported from Eastern Canada to the United States;

(35) Purebred dairy cattle imported from all countries;

(36) Purebred dairy cattle exported to all countries.

Data series (29) to (34) are collected and published by Agriculture Canada in various issues of the Livestock and Meat Trade Reports. Data series (35) and (36) are published by STATCAN in its Trade of Canada publication. Since the trade information published by STATCAN does not distinguish between Western and Eastern Canada, we will assume that all such imports and exports occur strictly between Eastern Canada and the rest of the world.[29]

FOOTNOTES TO CHAPTER 2

1. Some of the technical information regarding the biological sequences of cattle is taken from Encyclopaedia Americana, Vol. 6, 1973 edition, pp. 63-82.

2. One of the most rapidly growing practices in cattle breeding is artifical insemination. A few outstanding bulls are kept, so that several thousand calves can be sired by one bull in one year instead of the usual 20 to 30 calves produced by natural mating.

3. Agriculture Canada, Publication Number 1480 (1972).

4. Agriculture Canada, Publication Number 1439 (1971).

5. We will not make any distinction between beef and dairy calves. There are two basic reasons to justify this. First, the life cycle for both beef and dairy calves are quite similar, and secondly, the available information relating to births of calves does not allow us to distinguish between beef calves and dairy calves.

6. The concept of Markov chain process was first discussed by Markov (1907). For a simple discussion of this process, see Kemeny and Snell (1960).

7. Solow (1951), pp. 333-334.

8. Champernowne (1953), pp. 318-351.

9. Hart and Prais (1956), pp. 150-175.

10. Judge and Swanson (1961).

11. Tracz and O'Mahony (1971).

12. David and Otsuki (1968), pp. 68-77, Dawson and Denton (1974), pp.293-311, and Denton (1972), pp. 233-248.

13. Lazar (1977), pp. 112-129.

14. A more comprehensive list of reference can be found in Lee, Judge and Zellner (1970).

15. Judge and Swanson (1961) suggested the potential usefulness in analysis of time-order data in agricultural economics, but it appears that few have ever used this technique in agricultural economics.

16. Kemeny , et.al. (1959), pp. 148.

17. The age of a young bull in the category, at the end of t+1, is at most about 18 months and it is not likely to be slaughtered by this age under normal circumstances.

18. While such flows may appear intuitively unlikely, there are economic circumstances in which they would be profitable, and hence they are not ruled out in the transition table.

19. Detailed discussion concerning the data relating to slaughter and other information used in constructing the transition

table will be provided in the next section.

20. This method can be applied iteratively to adjust nonnegative matrices to given marginal totals, assuming that certain consistency requirements are satisfied. For theoretical treatment and discussion of application in the input-output context, see Bacharach (1970). For application in a different context, see Denton (1972) and Dawson and Denton (1974).

21. Different agencies collect and publish data series for the beef/dairy cattle industries. The data series may be published in one or more statistical publications and the agencies often publish each other's data. The majority of the data series that are being used in this present study are obtained from the following publications : Agriculture Canada, Livestock Market Review, Ottawa, Queen's Printer, various issues; Agriculture Canada, Livestock and Meat Trade Report, Ottawa, Queen's Printer, various issues; Statistics Canada, Dairy Review, Ottawa, Queen's Printer, various issues; Statistics Canada, Livestock and Animal Product Statistics, Ottawa, Queen's Printer, various issues; Statistics Canada, Quarterly Bulletin of Agricultural Statistics, Ottawa, Queen's Printer, various issues; Statistics Canada, Report on Livestock Survey Cattle, Sheep, Horses, Ottawa, Queen's Printer, various issues; and Statistics Canada, Trade of Canada, Ottawa, Queen's Printer, various issues.

22. The data can be adjusted to reconcile with the other series. The method of adjustment is based upon the birth distribution of claves during the different months of the year. There is a complication, however, in that beef calves and dairy calves exhibit different patterns of birth throughout the year, and there is no information as to the percentage in either Eastern Canada or Western Canada. To overcome this difficulty, we will assume, as an approximation, that calves in Western Canada are all beef calves while calves in Eastern Canada are all dairy calves. The proportionate distributions of annual births among the twelve calendar months are as follow (January is month 1, February, month 2, and so on.) :

Dairy calf birth distribution (DCB)

DCB(1) = 0.088	DCB(2) = 0.093	DCB(3) = 0.069
DCB(4) = 0.112	DCB(5) = 0.089	DCB(6) = 0.065
DCB(7) = 0.054	DCB(8) = 0.069	DCB(9) = 0.077
DCB(10)= 0.097	DCB(11)= 0.096	DCB(12)= 0.094

Beef calf birth distribution (BCB)

BCB(1) = 0.01	BCB(2) = 0.04	BCB(3) = 0.11
BCB(4) = 0.25	BCB(5) = 0.39	BCB(6) = 0.11
BCB(7) = 0.04	BCB(8) = 0.01	BCB(9) = 0.01
BCB(10)= 0.01	BCB(11)= 0.01	BCB(12)= 0.01

These distributions are based on those used by Meek (1975), pp. 201-202.

23. Meek (1975), p.227.

24. The average weight of a calf one year of age is around 400 to 500 pounds. We assume that all cattle belonging to this 200-700 lb. category arecalves.

25. We assume cattle of this weight category also belongs to the calf category.

26. Over the period 1958 -1973, imports of calves to Western Canada for immediate slaughter occurred only in the second quarter of 1967 and the number was a meer 15 ! Similarly, imports to Eastern Canada occurred only in 1967 III, 1969 III, 1970 III and 1972 II, and the number was again small. It ranged from 14 to 43.

27. A breakdown into beef and dairy was provided for the period 1969 - 1972.

28. The total number of imports during any half of a year is only in the range of 700 - 5000 heads.

29. Given the structure of the Canadian dairy industry, this assumption may seem quite reasonable for Canadian dairy purebred exports. In terms of purebred imports, one may suspect that a certain amount of the imports go to Western Canada. However, with the small number of such imports occurring every year, the assumption will not seriously affect our analysis.

CHAPTER 3 -- SPECIFICATION AND ESTIMATION OF THE TRANSITION-PROBABILITY MODEL

3.1 The Construction of the Transition Probability Matrices

In constructing the transition probability matrices, the basic flow or transition matrices are first established. Although the biological sequences of beef and dairy cattle are the same in both Western and Eastern Canada, their trading patterns differ.[1] For this reason, two different approaches are used to construct the transition matrices for the two regions.

Transition matrices for Western Canada

The first step in constructing the flow or transition matrices is to reconcile the data series, so that the sum of all row totals is equal to the sum of all column totals. Due to the fact that the data series used in the analysis are collected and published by several different agencies, discrepancies are bound to arise. As a first step to solve this problem, the sum of row totals is calculated and is compared with the sum of column totals. In most cases, the difference between the two sums averages around 5 percent. The method used to eliminate the difference is to divide it into two and prorate the resulting amounts among the row and column totals.[2]

Since there is no recorded information relating to movement of cattle from one particular category to another, assumptions have to be made in order to fill all the possible cells of the transition matrices. The rules of thumb in constructing the matrices are : (1) fill in as many cells as possible by using simple and reasonable assumptions; (2) after filling in as many cells as possible in this way, fill in as many others as possible by using the 'residual method'. Since we assume that the sum of all the cell entries in any particular row or column should be equal to its respective row or column total, we can fill in certain cell entries immediately after performing step (1). For instance, if we have two possible cell entries in row 1 based on the biological sequences, and if we have assigned a value to the first cell in row 1 by means of the assumptions that we are using , we can calculate the second cell value by taking the first row total minus the first cell value. Such a method can, of course, never assure us that the value we get will be positive. To overcome this difficulty, we rely on the following additional steps : (3) Replace all negative entries in the transition matrices by a small positive number. (In our case, all the negative entries are replaced by 10.) This creates a further problem of adding up, because now the row and column entries will not add to their respective row and column totals. (4) As a remedy for this situation, the RAS method is employed in each transition matrix. The matrices are adjusted iteratively to force the cell entries to add to their respectives row and column totals. (5) Finally, transition probabilities are calculated by dividing the elements in each of the adjusted matrices by the corresponding row totals. The probabilities are then necessarily positive and sum to unity.

The procedure for constructing the transition matrices for Western Canada starts with calculating the number of calves slaughtered, the number of calves exported to Eastern Canada and to the United States and the rest of the world, and the number of deaths to calves during period t+1. Calves for slaughter, export, and those dying can come from calves born in period t+1 or calves on farm at the end of period t which are still calves at the end of t+1 (i.e. calves that were under 1 year of age at the end of t). The number of calves remaining on farm at the end of t+1 from the two sources is calculated using the residual method, as described previously. In the next step, we calculate the number of uninspected slaughter of cattle and the number of deaths of cattle. Cattle are defined as all young steers, heifers, cows and bulls from all sources. The distributions of the uninspected slaughters and deaths of steers, heifers, cows and bulls depend on the ratios of animals in the various categories to the total number of cattle. The number of inspected slaughters of bulls is obtained by assuming that only old bulls are slaughtered in this category. It is true that all uncastrated male cattle over 1 year of age are bulls, but we can logically assume that when a cattleman decides to retain a male calf for reproduction purposes, the calf will not be slaughtered until it reaches the age when it no longer serves those purposes. In calculating the number of dairy males and females exported to the United States and the rest of the world, we assume that ten percent of all the calves and bulls on farm belong to the dairy herd. The total number of dairy males and females in Western Canada deemed suitable for export will be the ten percent of the calves and bulls population plus the total number of dairy heifers and cows on farm.[3] Exports in this category are therefore allocated among calves, dairy heifers, dairy cows and bulls according to their respective ratios to the total of the dairy cattle population in Western Canada. The number of young male calves at the end of period t which are in the bulls category at the end of t+1, and the number of bulls at the end of t remaining as bulls at the end of t+1, are calculated by the residual method after performing the steps mentioned above.

Since we assume that 10 percent of the calf population on farm in Western Canada belongs to the dairy herd, the remaining 90 percent of the calves must logically belong in the beef cattle category. In calculating the number of heifers and steers exported to the United States and Eastern Canada, we must first calculate the total number of cattle available for export in the category of heifers and steers. Heifers and steers exported to either of the two regions during t+1 can come from young heifers and steers that were calves on farm at the end of t, or older heifers and steers that were heifers and steers at the end of t but remain in their respective categories at the end of t+1. The actual amount of export from each of the three categories again depends on the ratio of each of the categories to the total number of cattle available for export under the heifers and steers category as a whole.

In deriving the number of inspected slaughters of dairy and beef cows, we assume that both dairy and beef heifers on farm at the end of t will not be slaughtered as cows during t+1. The reason is simple. If a cattleman decides to retain a heifer on farm in period t for reproduction purposes, the same heifer will logically not be slaughtered as a cow in period t+1. Only old cows whose reproductive capacity has lowered to such an extent that it is no longer profitable to retain them on farm will be slaughtered. Dairy cows on farm at the end of t+1 can come either from heifers on farm at the end of t or from cows on farm at the end of t. In either case, the actual number is derived by the residual method discussed previously. The same technique and reasoning are also used to determine the number of beef cows on farm at the end of t+1.

One other assumption was made in constructing the transition matrices, and that was that 50 percent of the imported heifers and steers to Western Canada from the United States were for immediate slaughter while the other 50 percent were retained on farm for further feeding. This assumption is undoubtedly not strictly correct, but given the adjustment procedure that we will use at the final stage it is thought to be an acceptable one.[4] Inspected slaughters of imported heifers and steers are calculated accordingly. Similarly, we calculate the number of steers, heifers and beef cows remaining on farm from imported sources. The number of calves on farm at the end of t moving into the beef heifer category during t+1 can be obtained at this stage by the residual method.

Steers on farm at the end of t which are not exported and do not die will be slaughtered or will remain on farm at the end of t+1. Here we again assume that 50 percent of the steers at the end of t will be slaughtered during t+1, while the other 50 percent will remain on farm. This allows us to calculate the numbers of steers slaughtered and retained from steers on farm at the end of t.[5] Steers on farm at the end of t+1 that were calves on farm at the end of t, and inspected slaughters of young steers during t+1 from calves on farm at the end of t, can both be obtained by the residual method.

Finally, we assume that 95 percent of the dairy heifers on farm at the end of t that are still dairy heifers at the end of t+1 will remain on farm. Only 5 percent of the dairy heifers will be slaughtered during t+1. This enables us to complete the transition matrix for Western Canada, because after filling in the numbers of heifers remaining on farm and heifers slaughtered, we can calculate the numbers of dairy heifers coming in from the calves category to be retained and to be slaughtered.

The initial set of transition matrices was constructed using the above procedures. The transition matrices were calculated using a set of 28 semi-annual observations covering the period from the first half of 1958 to the second half of 1972. It was inevitable that some negative entries would occur in the set of 28 matrices as a result of the residual calculation procedure.[6] It is assumed that all of the negative entries should be small. Accordingly, all negative entries are replaced by an arbitrary positive number. (In practice, the number specified is 10.) The RAS method is then used to adjust the entries to add to their row and column totals. In the case of Western Canada, 300 iterations were performed to ensure the desired results. (See Appendix I)

Transition matrices for Eastern Canada

The basic procedures used to construct the transition matrices for Eastern Canada are the same as those used to construct the matrices for Western Canada. To avoid repetition, we will outline only the key assumptions made in constructing the transition matrices for Eastern Canada which differ from those we made for Western Canada.

First of all, we assume that imported dairy bulls will not be slaughtered in the same period. Secondly, 80 percent of the calves on farm and 80 percent of the bulls on farm are assumed to belong to the dairy herd. Also, calves imported from Western Canada are assumed to belong entirely to the beef herd. It is assumed that imported dairy males and females will not be slaughtered for beef purposes in the same period. Furthermore, imported males and females are assumed to be mature dairy cattle. Two-thirds of the imported dairy cattle are taken to be dairy cows, the remaining one-third being dairy bulls. This set of assumptions, together with the assumptions we made in building the transition matrices for Western Canada, enable us to construct the desired matrices for Eastern Canada. An arbitrary positive number (again 10) is also used to replace negative entries. The RAS technique is employed as the final step to force the entries to add to their respective row and column totals. For each case 150 iterations were performed to ensure the desired result. (See Appendix II)

Transition probability matrices for both Western and Eastern Canada are calculated using the methods described previously. We will be making extensive use of the probabilities in our subsequent analysis and we illustrate the transition probability matrices in the following two tables to indicate the possible movements of cattle from one category to another. Cells representing possible flows are identified by numbers while cells representing impossible flows are left blank. This facilitates subsequent discussion.

TABLE 3.1 Transition Matrix for Western Canada

	On Farm (t+1): Calves	On Farm (t+1): Steers	On Farm (t+1): Dairy Heifers	On Farm (t+1): Beef Heifers	On Farm (t+1): Dairy Cows	On Farm (t+1): Beef Cows	On Farm (t+1): Bulls	Slaughter (t+1): Male Calves (Inspected)	Slaughter (t+1): Female Calves (Inspected)	Slaughter (t+1): Calves Uninspected	Slaughter (t+1): Steers (Inspected)	Slaughter (t+1): Heifers (Inspected)	Slaughter (t+1): Cows (Inspected)	Slaughter (t+1): Bulls (Inspected)	Slaughter (t+1): Cattle Uninspected	Deaths t+1: Calves	Deaths t+1: Cattle	Exports (t+1): Calves to E.C.	Exports (t+1): Calves to U.S.	Exports (t+1): Heifers Steers to E.C.	Exports (t+1): Heifers Steers to U.S.	Exports (t+1): Dairy Male Female E.C.	Exports (t+1): Dairy Male Female U.S.
Calves Born t+1	1							2	3	4						5		6	7				
On Farm (t): Calves	8	9	10	11			12	13	14	15	16	17			18	19	20	21	22	23	24		25
On Farm (t): Steers		26									27				28		29			30	31		
On Farm (t): Dairy Heifers			32		33							34			35		36						37
On Farm (t): Beef Heifers				38		39						40			41		42			43	44		
On Farm (t): Dairy Cows					45								46		47		48						49
On Farm (t): Beef Cows						50							51		52		53						
On Farm (t): Bulls							54							55	56		57						58
Imports (t+1): Calves E.C.																							
Imports (t+1): Calves U.S.																							
Imports (t+1): Heifers and Steers E.C.																							
Imports (t+1): Heifers and Steers U.S.		59		60		61					62	63			64		65			66	67		
Imports (t+1): Dairy Male Female E.C.																							
Imports (t+1): Dairy Male Female U.S.																							

TABLE 3.2 Transition Matrix for Eastern Canada

		ON FARM (t+1)							SLAUGHTER (t+1)								DEATHS t+1		EXPORTS (t+1)					
		CALVES	STEERS	DAIRY HEIFERS	BEEF HEIFERS	DAIRY COWS	BEEF COWS	BULLS	MALE CALVES (INSPECTED)	FEMALE CALVES (INSPECTED)	CALVES UNINSPECTED	STEERS (INSPECTED)	HEIFERS (INSPECTED)	COW (INSPECTED)	BULLS (INSPECTED)	CATTLE UNINSPECTED	CALVES	CATTLE	CALVES TO W.C.	CALVES TO U.S.	HEIFERS STEERS TO W.C.	HEIFERS STEERS TO U.S.	DAIRY MALE FEMALE W.C.	DAIRY MALE FEMALE U.S.
CALVES BORN t+1		1							2	3	4						5			6				
ON FARM (t)	CALVES	7	8	9	10			11	12	13	14	15	16			17	18	19		20		21		22
	STEERS		23									24				25		26				27		
	DAIRY HEIFERS			28		29							30			31		32						33
	BEEF HEIFERS				34		35						36			37		38				39		
	DAIRY COWS					40								41		42		43						44
	BEEF COWS						45							46		47		48						
	BULLS							49							50	51		52						53
IMPORTS (t+1)	CALVES W.C.								55	56	57						58			59				
	CALVES U.S.																							
	HEIFERS AND STEERS W.C.		60		61		62					63	64			65		66				67		
	HEIFERS AND STEERS U.S.		68		69		70					71	72			73		74				75		
	DAIRY MALE FEMALE W.C.																							
	DAIRY MALE FEMALE U.S.					76		77																

3.2 A Model of Beef and Dairy Cattle Demand, Supply and Inventory

The procedures outlined in the last section enable us to calculate estimates of historical transition probabilities for movements of cattle from one category to another. In order to explain such movements in economic terms, we now proceed to develop a theoretical model.

At any point in time, the total quantity of beef and dairy cattle is available for three uses:

(1) for slaughter, in order to meet the current domestic demand for beef;

(2) for export, in order to meet the foreign demand for cattle or beef; and

(3) to replenish or increase inventories of cattle in order to meet future demand for beef and dairy products; this is especially relevant in the case of young calves and heifers.

The aggregate available quantity (number of animals) in any particular category of cattle at any particular time is fixed: it cannot vary in response to current prices and feed costs, or other variables. Let Q_t^i denote such a quantity for any particular category i of cattle. With semi-annual information (i.e. if t is referred to the first half of 1958, t+1 will be the second half of 1958, and so on.), we will adopt the following definitions:

Q_t^1 = calves born during t

Q_t^2 = calves on farm at the end of t

Q_t^3 = steers on farm at the end of t

Q_t^4 = dairy heifers on farm at the end of t

Q_t^5 = beef heifers on farm at the end of t

Q_t^6 = dairy cows on farm at the end of t

Q_t^7 = beef cows on farm at the end of t

Q_t^8 = bulls on farm at the end of t

Then

Q_t^1 depends physically on the number of cows on farm at the end of t-2 and t-3

Q_t^2 depends physically on the number of calves born in t-1 and t

Q_t^3 depends physically on the number of male calves on farm t-1, and the number of steers on farm in t-1

Q_t^4 depends physically on the number of female dairy calves on farm in t-1, and the number of dairy heifers on farm in t-1

Q_t^5 depends physically on the number of female beef calves on farm in t-1, and the number of beef heifers on farm in t-1

Q_t^6 depends physically on the number of dairy heifers on farm in t-1 and the number of cows on farm in t-1

Q_t^7 depends physically on the number of beef heifers on farm in t-1 and the number cows on farm in t-1

Q_t^8 depends physically on the number of male calves on farm in t-1 and the number of bulls on farm in t-1

It is clear that the quantity of any category of cattle available during period t depends largely on the inventory of the previous periods. Inventory may be regarded as cattle retained on farm to meet future demand.

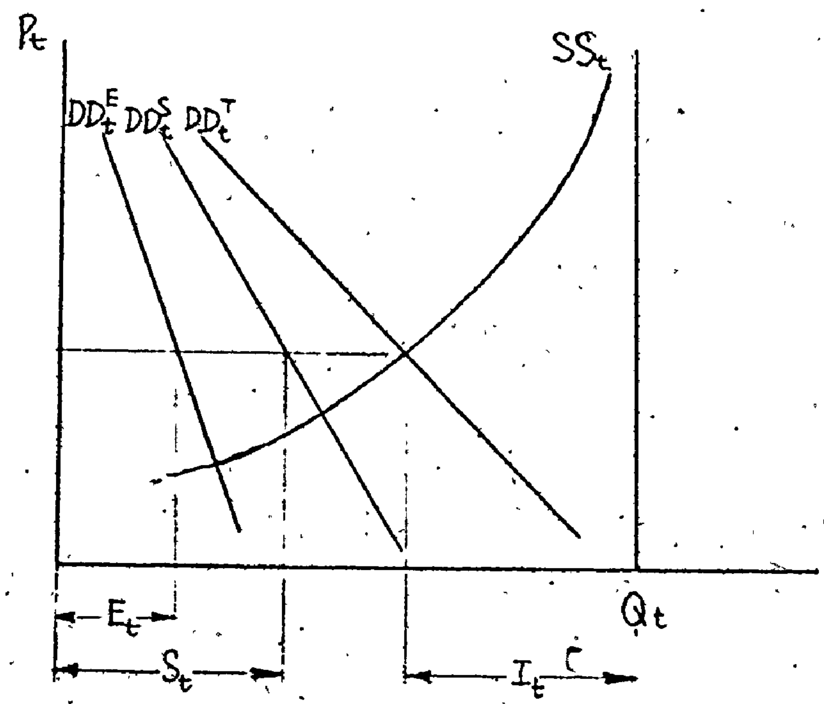
To examine the actual level of inventory in each category in any period of time, we can start with a simple supply-demand framework. Other things equal, the demand for cattle to be slaughtered for beef, is related to the income levels of the potential consumers, the prices of beef substitutes, the wage rate in the packing industry, and the price of cattle. Similarly, the lower the domestic price of any particular category of cattle, as compared with the foreign price, the higher will be the demand for export of that category of cattle.

The supply of cattle for slaughter and export is restricted by the maximum available quantity of that category of cattle at any given time, which is affected by the desired and actual level of inventory. The supply of any category of cattle at any given period of time is affected by the relative returns the producer can derive. Other things equal, economic theory would lead one to expect that the supply of heifers, for instance, would be directly related to the current price of heifers, the price of milk, the amount of milk subsidies, the price of feed, and interest costs. Let DD_t^E denote the demand for cattle exports, DD_t^S the demand for slaughter cattle, and SS_t the supply of cattle. The total demand, DD_t^T, is the horizontal summation of DD_t^E and DD_t^S, and it can be expressed as follows :

$$DD_t^T = a_o + a_1Y_t + a_2PS_t + a_3W_t + a_4P_t + a_5PF_t \quad \text{----(3.1)}$$

where Y_t is the income levels of the potential consumers, PS_t is the prices of beef substitutes, W_t is the wage rate at the packing industry, P_t is the price of cattle and PF_t is the foreign price of cattle. Other things equal, we can expect that higher the income levels of the potential consumers, the higher the price of beef substitutes and the higher the foreign cattle price, the higher will be the quantity demanded for slaughter cattle. On the other hand, the higher the wage rate in the packing industry and the higher the price of cattle, the smaller will be the quantity demanded.[7] With DD_t^T and SS_t^T, we can establish the current market price of cattle and the distribution for export, slaughter and inventory. Graphically, the analysis can be represented in the following diagram.

Diagram 3.1 The Distribution of Export, Slaughter, and Inventory for any Particular Category of Cattle



Determination of 'desired' level of inventories, however, is more complicated. Tryfos viewed the 'desired' level of inventory as determined by the expected live animal price and the expected cost of feed.[8] This relationship can be modified by assuming that the 'desired' inventory (I^*) is determined by the expected return relative to expected cost. The expected return is related not only to the expected price of live animals at the time of slaughter (P^*) but also to the expected price of milk (M^*) and milk subsidy (SD^*).[9] The expected cost includes the expected cost of feed (F^*), and the interest cost (R^*) that will be incurred in carrying the inventory. (As compared to the case of a tree growing or wine aging, the optimal period of retention of cattle on farm is less flexible; for example, a steer is not deemed suitable for slaughter until it reaches a weight of about 1,000 pounds. Nonetheless, the expected interest cost could have an impact in determining the number of animals retained as steers, and the method of feeding the cattle.)[10] We can also anticipate that the expected export price of live animals (PF^*) will affect the 'desired' inventory. The list of possible variables to be included in the analysis can be continued, but those mentioned are perhaps the most important ones and, therefore, are the ones to be included in the present analysis.[11] For simplicity, we can represent the above relationship by a linear function of the form.

$$I_t^* = b_o + b_1P_t^* + b_2M_t^* + b_3SD_t^* + b_4F_t^* + b_5R_t^* + b_6PF_t^* \quad \text{--(3.2)}$$

Other things equal, we can assume that the higher the expected price of cattle, price of milk, the milk-subsidy, gains from trade, and income price of substitutes, the greater the number of cattle that will be held as inventory. On the other hand, the higher the expected cost of feed and the rate of interest, the smaller the number that will be kept as inventory. Thus we can expect b_1, b_2, b_3 and b_6 to be positive and b_4 and b_5 to be negative.

The relationship between desired inventory (I^*) and actual inventory (I) can be represented by :

$$I_t - I_{t-1} = c(I_t^* - I_{t-1}) \qquad (3.3)$$

where $0 < c < 1$ indicates a 'partial adjustment' process relating actual inventory to desired inventory. This relationship allows us to express the actual inventory as :

$$I_t = cI_t^* + (1 - c)\, I_{t-1} \qquad (3.4)$$

given the expression I_t^* in (1), we can rewrite (3) as :

$$I_t = c(b_o + b_1 P_t^* + \dots + b_6 PF^*) + (1 - c)\, I_{t-1} \qquad (3.5)$$

The supply of slaughter and export cattle can be written as the difference between the quantity of livestock available during the period (Q_t) and the change in inventory.

$$SS_t = Q_t - d(I_t - I_{t-1}) \qquad (3.6)$$

where $d > 0$. We have now specified the variables to be included in the inventory equation, and the relationship between inventory and supply. The distribution of the aggregate available quantity of any particular category of cattle between slaughter, export, and inventory is undoubtedly a simultaneous decision, and basically it is determined by equations (3.1), (3.5), and (3.6).

The formulation of the inventory equation is based on microeconomic theory that treats cattle as capital goods and producers as portfolio managers. The producers will hold cattle as long as their capital value in production exceeds their slaughter value.[12] As Jarvis points out, cattle, especially calves, are 'growing machines', so that the criterion for slaughter decision becomes a maximization of the present discounted 'profit' of the cattle's fattening process.[13] In the decision relating to the slaughter of cows, the analysis is somewhat complicated. Cows are considered as 'renewable' resources. Cows may be fattened and slaughtered, but they can also bear calves which may themselves be fattened and slaughtered. Hence, an additional term, the present value of the calves stream, will have to be added to the present discounted profit. Heifers used for slaughter purposes will, of course, be affected by the income stream associated with calf production.

3.3 Model of Demand and Supply of Beef and Dairy Cattle for Empirical Estimation

In the last section we considered the supply side of the beef and dairy industry. Before proceeding with empirical estimation, however, we have to consider also the demand side.

The demand for cattle in any category is actually demand derived from final consumers. In the case of export demand, the demand may well be the demand of the foreign producers. However, for our purpose we can consider all the foreign producers as if they were consumers. To simplify matters even more, we will consider only differences in price between the exporting and importing regions. The domestic demand for cattle is based upon the consumers' utility maximization behavior. Given a budget constraint, a consumer will choose the amounts of beef and other commodities so as to maximize his utility. For simplicity, we will assume that only pork and mutton will enter as competing commodities in the consumer's utility function. We will also assume that trend and seasonal elements will affect both the demand for and supply of cattle. Wages in the packing industry will affect the demand for cattle, because we assume that any increase in wages will be passed along at least in part to the consumers. Without specifying the functional form of either the demand or supply equations we can indicate the nature of these equations for both Western and Eastern Canada in the following manner.

For Western Canada

The equation numbers used here correspond to the numbers of the cells in Table 3.1 and 3.2. The variables included in the analysis are listed and defined at the end of this section.

(I) Equations 1-7 : Calves born during t+1

The cell entries in this row, and any other rows, are actually the equilibrium quantities of inventory, domestic demand, and foreign demand determined by the simultaneous system discussed in the last section. There are also certain cell entries in each row depicting the number of deaths in each category of cattle. These numbers are considered as withdrawals from the system which are not affected by economic variables.

As discussed previously, the level of inventory is determined by the expected return of keeping the cattle on farm and the level of inventory of that particular category of cattle in the previous period. The supply of cattle for slaughter and export is defined as the difference between the total quantity of cattle available during the period and the change in inventory. For simplicity, we will substitute the inventory equation as presented in equation (3.5) into the supply equation (3.6) and consider this as the 'reduced' supply equation SS. This 'reduced' supply equation of slaughter and export of cattle can be represented as follow:

$$SS = f(\dot{P}_W ; F_W, \dot{F}_W ; C_W, \dot{C}_W ; R, \dot{R} ; T; S; Q^{1W})$$ [14]

[14] Time subscripts for all the variables are omitted from the presentation for simplicity.

The demand equation presented here represents the summation of domestic and foreign demand. As was pointed out previously, the total demand is affected by the income levels of potential consumers, own price levels, prices of beef substitutes, foreign cattle price, seasonal variations, and habit. The demand equation can be represented as :

$$DD = g(P_W;\ C_W;\ W_W;\ L_W;\ H_W;\ Y;\ C_U;\ T;\ S;\ C_E)^{15}$$

The equilibrium level of inventory, demand and supply is represented by the following equation :

$$EQ = F(P_W,\ \dot{P}_W;\ F_W,\ \dot{F}_W;\ C_W,\ \dot{C}_W;\ R,\ \dot{R};\ T;\ S;\ Q^{1W};\ W_W;\ L_W;\ H_W;\ Y;\ C_U;\ C_E)$$

In order to reduce the number of explanatory variables, certain variables are employed in ratio form. Hereafter, we will use Q' to denote the equilibrium equation when certain variables are expressed in ratio form :

$$EQ' = F(P_W/F_W;\ C_W/F_W;\ R;\ T;\ S;\ Q^{1W};\ W_W;\ L_W/P_W;\ H_W/P_W;\ Y;\ C_W/P_W;\ C_E/P_W;\ \dot{P}_W/F_W;\ \dot{C}_W/F_W;\ \dot{R})$$

Since we are working with transition probabilities, we will divide the above equation by the total number of calves born during t+1, to have the required probabilities as our dependent variables :

$$EQ'' = F\left(\frac{P_W/F_W}{Q^{1W}};\ \frac{C_W/F_W}{Q^{1W}};\ \frac{R}{Q^{1W}};\ \frac{T}{Q^{1W}};\ \frac{S}{Q^{1W}};\ 1;\ \frac{W_W}{Q^{1W}};\ \frac{L_W/P_W}{Q^{1W}};\ \frac{H_W/P_W}{Q^{1W}};\ \frac{Y}{Q^{1W}};\ \frac{C_U/P_W}{Q^{1W}};\ \frac{\dot{C}_E/P_W}{Q^{1W}};\ \frac{\dot{P}_W/F_W}{Q^{1W}};\ \frac{\dot{R}}{Q^{1W}}\right)$$

(II) Equations 8-25 : Calves on farm at the end of t

The formulation of the 'reduced' supply, demand and equilibrium equations, for this set of equations and all the following sets of equations, follows the same reasoning as discussed in the previous case.

$$SS = f(\dot{P}_W;\ F_W,\ \dot{F}_W;\ C_W;\ R;\ \dot{R};\ T;\ S;\ Q^{2W})$$

$$DD = g(P_W;\ C_W;\ W_W;\ L_W;\ H_W;\ Y;\ P_U;\ C_U;\ C_E;\ T;\ S)$$

$$EQ = F(P_W,\ \dot{P}_W;\ F_W,\ \dot{F}_W;\ C_W;\ R,\ \dot{R};\ T;\ S;\ Q^{2W};\ W_W;\ Y;\ L_W;\ H_W;\ P_U;\ P_E;\ C_U;\ C_E)$$

$$EQ' = F(P_W/F_W;\ C_W/F_W;\ R;\ T;\ S;\ Q^{2W};\ W_W;\ L_W/P_W;\ H_W/P_W;\ Y;\ P_U/P_W;\ P_E/P_W;\ C_U/P_W;\ \dot{P}_W/F_W;\ C_W/F_W;\ \dot{R})$$

$$EQ'' = F\left(\frac{P_W/F_W}{Q^{2W}};\ \ldots;\ \frac{\dot{R}}{Q^{2W}}\right)$$

(III) Equations 26-31 : Steers on farm at the end of t

$$SS = f(P_W,\ P_W;\ F_W,\ F_W;\ R,\ R;\ T;\ S;\ Q^{3W})$$

$$DD = g(P_W;\ W_W;\ L_W;\ H_W;\ Y;\ T;\ S;\ P_E;\ P_U)$$

$$EQ = F(P_W,\ \dot{P}_W;\ F_W,\ \dot{F}_W;\ R,\ \dot{R};\ T;\ S;\ Q^{3W};\ W_W;\ L_W;\ H_W;\ Y;\ P_E;\ P_U)$$

$$EQ' = F(P_W/F_W;\ R;\ T;\ S;\ Q^{3W};\ W_W;\ L_W/P_W;\ H_W/P_W;\ Y;\ P_E/P_W;\ P_U/P_W;\ \dot{P}_W/F_W;\ \dot{R})$$

$$EQ'' = F\left(\frac{P_W/F_W}{Q^{3W}} ; \ldots ; \frac{\dot{R}}{Q^{3W}}\right)$$

(IV) <u>Equations 32-37 : Dairy heifers on farm at the end of t</u>

$$SS = f(HE_W,\ \dot{HE}_W;\ F_W,\ \dot{F}_W;\ \dot{C}_W;\ R,\ \dot{R};\ T;\ S;\ Q^{4W})$$

$$DD = g(HE_W;\ P_W;\ W_W;\ L_W;\ H_W;\ Y;\ T;\ S)$$

$$EQ = F(HE_W,\ \dot{HE}_W;\ F_W,\ \dot{F}_W;\ \dot{C}_W;\ R,\ \dot{R};\ T;\ S;\ Q^{4W};\ W;\ L_W;\ H_W;\ Y)$$

$$EQ' = F(HE_W/F_W;\ R;\ T;\ S;\ Q^{4W};\ W_W;\ L_W/P_W;\ H_W/P_W;\ Y;\ \dot{HE}_W/F_W;\ \dot{C}\ ;\ \dot{R})$$

$$EQ'' = F\left(\frac{HE_W/F_W}{Q^{4W}} ; \ldots ; \frac{\dot{R}}{Q^{4W}}\right)$$

(V) <u>Equations 38-44 : Beef heifers on farm at the end of t</u>

$$SS = f(HE_W,\ \dot{HE}_W;\ F_W,\ \dot{F}_W;\ \dot{C};\ R,\ R;\ T;\ S;\ Q^{5W})$$

$$DD = g(HE_W;\ P_W;\ W_W;\ L_W;\ H_W;\ Y;\ T;\ S;\ P\ ;\ P\ )$$

$$EQ = F(HE_W,\ \dot{HE}_W;\ F_W,\ \dot{F}_W;\ C;\ R,\ \dot{R};\ T;\ S;\ Q^{5W};\ W_W;\ L_W;\ H_W;\ Y;\ P_E;\ P_U)$$

$$EQ' = F(HE_W/F_W;\ R;\ T;\ S;\ Q^{5W}:\ W_W;\ L_W/P_W;\ H_W/P_W;\ Y;\ P_E/HE_W;\ P_U/HE_W;\ \dot{HE}_W/F_W;\ \dot{C};\ \dot{R})$$

$$EQ'' = F\left(\frac{HE_W/F_W}{Q^{5W}} ; \ldots ; \frac{\dot{R}}{Q^{5W}}\right)$$

(IV) <u>Equations 45-49 : Dairy cows on farm at the end of t</u>

$$SS = f(SC_W, \dot{SC}_W; F_W, \dot{F}_W; C, \dot{C}; R, R; T; S; Q^{6W})$$

$$DD = g(SC_W; P_W; W_W; L_W; H_W; Y; T; S)$$

$$EQ = F(SC_W, \dot{SC}_W; F_W, \dot{F}_W; C_W, \dot{C}_W; R, \dot{R}; T; S; Q^{6W}; P_W; W_W; L_W; H_W; Y)$$

$$EQ' = F(SC_W/F_W; C_W/F_W; R; T; S; Q^{6W}; W_W; L_W/P_W; H_W/P_W; Y; \dot{SC}_W/F_W; \dot{M}_W/F_W; \dot{C}_W/F_W; \dot{R})$$

$$EQ'' = F(\frac{SC_W/F_W}{Q^{6W}}; \ldots; \frac{R}{Q^{6W}})$$

(VII) <u>Equations 50-53 : Beef cows on farm at the end of t</u>

$$SS = f(SC_W, \dot{SC}_W; F_W, \dot{F}_W; C_W, \dot{C}_W; R, \dot{R}; T; S; Q^{7W})$$

$$DD = g(SC_W; P_W; W_W; L_W; H_W; Y; T; S)$$

$$EQ = F(SC_W, \dot{SC}_W; F_W, \dot{F}_W; C_W, \dot{C}_W; R, \dot{R}; T; S; Q^{7W}; P_W; W_W; L_W; H_W; Y)$$

$$EQ' = F(SC_W/F_W; C_W/F_W; R; T; S; Q^{7W}; W_W; L_W/P_W; H_W/P_W; Y; \dot{SC}_W/F_W; \dot{C}_W/F_W; \dot{R})$$

$$EQ'' = F(\frac{SC_W/F_W}{Q^{7W}}; \ldots; \frac{\dot{R}}{Q^{7W}})$$

(VIII) Equations 54-58 : Bulls on farm at the end of t

$$SS = f(SC_W, \dot{SC}_W; F_W, \dot{F}_W; R, R; T; S; Q^{8W})$$

$$DD = g(SC_W; P_W; W_W; L_W; H_W; Y; T; S)$$

$$EQ = F(SC_W, \dot{SC}_W; F_W, \dot{F}_W; R, \dot{R}; T; S; Q^{8W}; P_W; W_W; L_W; H_W; Y)$$

$$EQ' = F(SC_W/F_W; R; T; S; Q^{8W}; W_W; L_W/P_W; H_W/P_W; Y; \dot{SC}_W/F_W; R)$$

$$EQ'' = F(\frac{SC_W/F_W}{Q^{8W}}; \ldots; \frac{\dot{R}}{Q^{8W}}$$

(IX) Equations 59-66 : Heifers and steers imported from the United States during t+1

$$SS = f(P_W, \dot{P}_W; F_W, \dot{F}_W; R, R; T; S; Q^{12W})$$

$$DD = g(P_W; P_E; P_U; W_W; L_W; H_W; Y; T; S)$$

$$EQ = F(P_W, \dot{P}_W; F_W, \dot{F}_W; R, \dot{R}; T; S; Q^{12W}; P_E; P_U; W_W; L_W; H_W; Y)$$

$$EQ' = F(P_W/F_W; R; T; S; Q^{12W}; P_E/P_W; P_U/P_W; W_W; L_W/P_W; Y; \dot{P}_W/F_W; \dot{R})$$

$$EQ'' = F(\frac{P_W/F_W}{Q^{12W}}; \ldots; \frac{\dot{R}}{Q^{12W}})$$

For Eastern Canada

(I) Equations 1-6 : Calves born during t+1

$$SS = f(\dot{P}_E;\ F_E,\ \dot{F}_E;\ C_E,\ \dot{C}_E;\ R,\ \dot{R};\ T;\ S;\ Q^{1E})$$

$$DD = g(P_E;\ P_W;\ C_E;\ W_E;\ L_E;\ H_E;\ Y;\ T;\ S;\ C_U)$$

$$EQ = F(P_E,\ \dot{P}_E;\ F_E,\ \dot{F}_E;\ C_E,\ \dot{C}_E;\ R,\ \dot{R};\ T;\ S;\ Q^{1E};\ W_E;\ L_E;\ H_E;\ Y;\ C_U;\ P_W)$$

$$EQ' = F(P_E/F_E;\ C_E/F_E;\ R;\ T;\ S;\ Q^{1E};\ W_E;\ L_E/P_E;\ H_E/P_E;\ Y;\ C_U/P_W;\ \dot{P}_E/F_E)^{16}$$

$$EQ'' = F\left(\frac{P_E/F_E}{Q^{1E}};\ \ldots;\frac{\dot{R}}{Q^{1E}}\right)$$

(II) Equations 7-22 : Calves on farm at the end of t

$$SS = f(\dot{P}_E;\ F_E,\ \dot{F}_E;\ C_E;\ R,\ \dot{R};\ T;\ S;\ Q^{2E})$$

$$DD = g(P_E;\ P_W;\ C_E;\ W_E;\ L_E;\ H_E;\ Y;\ T;\ S;\ C\ ;\ P\ )$$

$$EQ = F(P_E,\ \dot{P}_E;\ F_E,\ \dot{F}_E;\ C_E;\ R,\ \dot{R};\ T;\ S;\ Q^{2E};\ W_E;\ L_E;\ H_E;\ Y;\ C_U;\ P_U;\ P_W)$$

$$EQ' = F(P_E/F_E;\ C_E/F_E;\ R;\ T;\ S;\ Q^{2E};\ W_E;\ L_E/P_W;\ H_E/P_W;\ Y;\ C_U/P_W;\ P_U/P_W;\ P_E/F_E;\ \dot{R})$$

$$EQ'' = F\left(\frac{P_E/F_E}{Q^{2E}};\ \ldots;\frac{\dot{R}}{Q^{2E}}\right)$$

(III) Equations 23-27 : Steers on farm at the end of t

$$SS = f(P_E, \dot{P}_E; F_E, \dot{F}_E; R, \dot{R}; T; S; Q^{3E})$$

$$DD = g(P_E; P_W; W_E; L_E; H_E; Y; T; S; P_U)$$

$$EQ = F(P_E, \dot{P}_E; F_E, \dot{F}_E; R, \dot{R}; T; S; Q^{3E}; W_E; L_E; H_E; Y; P_U; P_W)$$

$$EQ' = F(P_E/F_E; R; T; S; Q^{3E}; W_E; L_E/P_W; H_E/P_W; Y; P_U/P_W; \dot{P}_E/F_E; \dot{R})$$

$$EQ'' = F(\frac{P_E/F_E}{Q^{3E}}; \ldots; \frac{\dot{R}}{Q^{3E}})$$

(IV) Equations 28-33 : Dairy heifers on farm at the end of t

$$SS = f(HE_E, \dot{HE}_E; F_E, \dot{F}_E; C_E; R, \dot{R}; T; S; Q^{4E})$$

$$DD = g(HE_E; P_W; W_E; L_E; H_E; Y; T; S)$$

$$EQ = F(HE_E, \dot{HE}_E; F_E, \dot{F}_E; C_E; R, \dot{R}; T; S; Q^{4E}; W_E; L_E; H_E; Y; P_W)$$

$$EQ' = F(HE_E/F_E; R; T; S; Q^{4E}; W_E; L_E/P_W; H_E/P_W; Y; \dot{HE}_E/F_E; \dot{C}_E; \dot{R})$$

$$EQ'' = F(\frac{HE_E/F_E}{Q^{4E}}; \ldots; \frac{\dot{R}}{Q^{4E}})$$

(V) Equations 34-39 : Beef heifers on farm at the end of t

$$SS = f(HE_E, \dot{HE}_E; F_E, \dot{F}_E; \dot{C}_E; R, \dot{R}; T; S; Q^{5E})$$

$$DD = g(HE_E; P_W; W_E; L_E; H_E; Y; T; S; P_U)$$

$$EQ = F(HE_E, \dot{HE}_E; F_E, \dot{F}_E; C_E; R, \dot{R}; T; S; Q^{5E}; W_E; L_E; H_E; Y; P_U; P_W)$$

$$EQ' = F(HE_E/F_E; R; T; S; Q^{5E}; W_E; L_E/P_E; H_E/P_W; Y; P_U/P_W; \dot{HE}_E/F_E; \dot{R})$$

$$EQ'' = F(\frac{HE_E/F_E}{Q^{5E}}; \ldots; \frac{\dot{R}}{Q^{5E}})$$

(VI) Equations 40-44 : Dairy cows on farm at the end of t

$$SS = f(SC_E, \dot{SC}_E; F_E, \dot{F}_E; C_E, \dot{C}_E; R, \dot{R}; T; S; Q^{6E})$$

$$DD = g(SC_E; P_W; P_E; W_E; L_E; H_E; Y; T; S)$$

$$EQ = F(SC_E, \dot{SC}_E; P_E; F_E, \dot{F}_E; C_E, \dot{C}_E; R, \dot{R}; T; S; Q^{6E}; W_E; L_E; H_E; Y; P_W)$$

$$EQ' = F(SC_E/F_E; C_E/F_E; R; T; S; Q^{6E}; W_E; L_E/P_W; Y; H_E/P_W; P_E/P_W; \dot{SC}_E/F_E; \dot{C}_E/F_E; \dot{R})$$

$$EQ'' = F(\frac{SC_E/F_E}{Q^{6E}}; \ldots; \frac{\dot{R}}{Q^{6E}})$$

(VII) Equations 45-48 : Beef cows on farm at the end of t

$$SS = f(SC_E, \dot{SC}_E; F_E, \dot{F}_E; C_E, \dot{C}_E; R, \dot{R}; T; S; Q^{7E})$$

$$DD = g(SC_E; P_W; P_E; W_E; L_E; H_E; Y; T; S)$$

$$EQ = F(SC_E, \dot{SC}_E; F_E, \dot{F}_E; C_E, \dot{C}_E; R, \dot{R}; T; S; Q^{7E}; W_E; P_E; L_E; H_E; Y; P_W)$$

$$EQ' = F(SC_E/F_E; C_E/F_E; R; T; S; Q^{7E}; W_E; P_E/P_W; L_E/P_W; H_E/P_W; Y; \dot{SC}_E/F_E; \dot{C}_E/F_E; \dot{R})$$

$$EQ'' = F\left(\frac{SC_E/F_E}{Q^{7E}}; \ldots; \frac{\dot{R}}{Q^{7E}}\right)$$

(VIII) Equations 49-53 : Bulls on farm at the end of t

$$SS = f(SC_E, \dot{SC}_E; F_E, \dot{F}_E; R, \dot{R}; T; S; Q^{7E})$$

$$DD = g(SC_E; P_W; P_E; W_E; L_E; H_E; Y; T; S)$$

$$EQ = F(SC_E, \dot{SC}_E; F_E, \dot{F}_E; R, \dot{R}; T; S; Q^{8E}; W_E; P_E; L_E; H_E; Y; P_W)$$

$$EQ' = F(SC_E/F_E; R; T; S; Q^{8E}; W_E; P_E/P_W; L_E/P_W; H_E/P_W; Y; \dot{SC}_E/F_E; \dot{R})$$

$$EQ'' = F\left(\frac{SC_E/F_E}{Q^{8E}}; \ldots; \frac{\dot{R}}{Q^{8E}}\right)$$

(IX) Equations 54-59 : Calves imported from Western Canada during t+1

$$SS = f(\dot{P}_E;\ F_E,\ \dot{F}_E;\ C\ ;\ R,\ \dot{R};\ T;\ S;\ Q^{9E})$$

$$DD = g(P_E;\ P_W;\ C_E;\ W_E;\ L_E;\ H_E;\ Y;\ T;\ S;\ C_U)$$

$$EQ = F(P_E,\ \dot{P}_E;\ F_E,\ \dot{F}_E;\ C_E;\ R,\ \dot{R};\ T;\ S;\ Q^{9E};\ W_E;\ L_E;\ H_E;\ Y;\ C_U;\ P_W)$$

$$EQ' = F(P_E/F_E;\ C_E/F_E;\ R;\ T;\ S;\ Q^{9E};\ W_E;\ L_E/P_W;\ H_E/P_W;\ Y;\ C_U/P_W;\ \dot{P}_E/F_E;\ \dot{R})$$

$$EQ'' = F\left(\frac{P_E/F_E}{Q^{9E}}\ ;\ \ldots;\ \frac{\dot{R}}{Q^{9E}}\right)$$

(X) Equations 60-67 : Heifers and steers imported from Western Canada during t+1

$$SS = f(P_E,\ \dot{P}_E;\ F_E,\ \dot{F}_E;\ R,\ \dot{R};\ T;\ S;\ Q^{11E})$$

$$DD = g(P_E;\ W_E;\ L_E;\ H_E;\ Y;\ T;\ S;\ P_W;\ P_U)$$

$$EQ = F(P_E,\ \dot{P}_E;\ F_E,\ \dot{F}_E;\ R,\ \dot{R};\ T;\ S;\ Q^{11E};\ W_E;\ L_E;\ H_E;\ Y;\ P_W;\ P_U)$$

$$EQ' = F(P_E/F_E;\ R;\ T;\ S;\ Q^{11E};\ W_E;\ L_E/P_W;\ H_E/P_W;\ Y;\ P_U/P_W;\ P_E/P_W;\ \dot{P}_E/F_E;\ \dot{R})$$

$$EQ'' = F\left(\frac{P_E/P_E}{Q^{11E}}\ ;\ \ldots;\ \frac{\dot{R}}{Q^{11E}}\right)$$

(XI) Equations 68-75 : Heifers and steers imported from the United States during t+1

$$SS = f(P_E, \dot{P}_E; F_E, \dot{F}_E; R, \dot{R}; T; S; Q^{12E})$$

$$DD = g(P_E; W_E; L_E; H_E; Y; T; S; P_W; P_U)$$

$$EQ = F(P_E, \dot{P}_E; F_E, \dot{F}_E; R, \dot{R}; T; S; Q^{12E}; W_E; L_E; H_E; Y; P_W; P_U)$$

$$EQ' = F(P_E/F_E; R; T; S; Q^{12E}; W_E; L_E/P_W; H_E/P_W; Y; P_E/P_W; P_U/P_W; \dot{P}_E/F_E; \dot{R})$$

$$EQ'' = F(\frac{P_E/F_E}{Q^{12E}}; \ldots; \frac{\dot{R}}{Q^{12E}})$$

(XII) Equations 76-80 : Dairy males and females imported from the United States during t+1

$$SS = f(SC_E; \dot{SC}_E; F_E, \dot{F}_E; C_E, \dot{C}_E; R, \dot{R}; T; S; Q^{14E})$$

$$DD = g(SC_E; P_E; P_W; L_E; H_E; Y; T; S)$$

$$EQ = F(SC_E, \dot{SC}_E; F_E, \dot{F}_E; C_E, \dot{C}_E; R, \dot{R}; T; S; Q^{14E}; P_E; P_W; W_E; L_E; H_E; Y)$$

$$EQ' = F(SC_E/F_E; C_E/F_E; R; T; S; Q^{14E}; P_E/P_W; W_E; L_E/P_W; H_E/P_W; Y; \dot{SC}_E/F_E; \dot{C}_E/F_E; \dot{R})$$

$$EQ'' = F(\frac{SC_E/F_E}{Q^{14E}}; \ldots; \frac{\dot{R}}{Q^{14E}})$$

Symbols and Descriptions of Variables Used

Symbol	Variable Name and Description	Source of Data
C_E	Price of stock calves-Toronto ($/100 lbs.)	CDA Livestock and Meat Trade Report
C_U	Feeder calf prices - Kansas City	USDA, Livestock and Meat Statistics
C_W	Price of stock calves - Calgary ($/100 lbs.)	CDA Livestock and Meat Trade Report (weekly)
F_E	Grain feed price index - Eastern Canada (1961=100)	STATCAN, Farm input price index
F_W	Grain feed price index - Western Canada (1961=100)	STATCAN, Farm input Price index
H_E	Price index for hogs, Toronto ($/100 lbs.)	CDA Livestock Market Review (Annual)
H_W	Price index for hogs, Calgary ($/100 lbs.)	CDA Livestock Market Review (Annual)
HE_E	Price of choice slaughter heifers, Toronto ($/100 lbs.)	CDA Livestock and Meat Trade Report (weekly)
HE_W	Price of choice slaughter heifers, Calgary ($/100 lbs.)	CDA Livestock and Meat Trade Report (weekly)
L_E	Price of good lambs, Toronto (weighted average $/100 lbs.)	CDA Livestock and Meat Trade Report (weekly)
L_W	Price of good lambs, Winnipeg (weighted average $/100 lbs.)	CDA Livestock and Meat Trade Report (weekly)
P_E	Price of choice slaughter steers-Toronto ($/100 lbs.)	CDA Livestock and Meat Trade Report (weekly)
P_U	Price of choice slaughter steers Omaha ($/100 lbs.)	USDA, Livestock and Meat Statistics
P_W	Price of choice slaughter steers-Calgary ($/100 lbs.)	CDA Livestock and Meat Trade Report (weekly)
Q^{1E}	Calves born in Eastern Canada	

Symbol	Variable Name and Description	Source of Data
Q^{iE} i=2,...,8	As described in Section 1, Chapter 3, with E indicating Eastern Canada	
Q^{9E}	Calves imported from Western Canada to Eastern Canada	
Q^{11E}	Heifers and steers imported from Western Canada to Eastern Canada	
Q^{12E}	Heifers and steers imported from the United States and the rest of the world to Eastern Canada	
Q^{14E}	Dairy males and females imported from the United States and the rest of the world to Eastern Canada	
Q^{1W}	Calves born in Western Canada	
Q^{iW} i=2,...,8	As described in Section1, Chapter 3, with W indicating Western Canada	
Q^{12W}	Heifers and steers imported from the United States and the rest of the world to Western Canada	
R	Interest rate paid by farmers	Bank of Canada Annual Statistical Review
S	Season (semi-annual period)	1959I=1, 1959II=0, 1960I=1, 1960II=0, etc.
SC_E	Price of good slaughter cows, Toronto ($/100 lbs.)	CDA Livestock and Meat Trade Report (weekly)
SC_W	Price of good slaughter cows, Calgary (4/100 lbs.)	CDA Livestock and Meat Trade Report (weekly)
T	Trend	1959I=1, 1959II=2, ..., 1972II=28

Symbol	Variable Name and Description	Source of Data
W_E	Packing House Wage Rates Eastern Canada (Ontario), deflated by C.P.I.	STATCAN, Review of Man-Hours and Hourly Earnings.
W_W	Packing House Wage Rates, Western Canada (Prairies) deflated by C.P.I.	STATCAN, Review of Man-Hours and Hourly Earnings.
Y	Real per capita personal disposable income minus personal far, income	STATCAN, National Income and Expenditure Accounts

3.4 Empirical Results I (Linear Regression Analysis)

Equilibrium equations for demand and supply in each cell of the transition matrices for the two regions, Western Canada and Eastern Canada, were estimated. In both regions, the equations were estimated using a set of 28 semi-annual observations covering the period from the first half of 1958 to the second half of 1972. In the cases of the 'calves born' row and the 'import' rows, only 27 observations were used. (In these cases the initial period was the second half of 1958.) The least-squares method was employed in estimating the equilibrium equations for the two regions.

Owing to the fact that we have, on the average, twelve independent variables associated with each estimated equation, attempts were made to reduce the number of such variables. The procedures used in determining which variables to retain were as follow. First, all the independent variables included in the equilibruim equations as presented in the last section were included initially in the analysis. Based on the relative explanatory power of the independent variables in the different equations of a given row, different independent variables were retained or discarded. The number of independent variables to be included in each equation was set at six. This included an income variable, which is defined as real per capita disposal income minus farm income. (This variable is used to capture the consumers' purchasing power in the market for beef.) Since some cells are essentially biological in nature (for example, natural death), when selecting the explanatory variables to be retained, no consideration was given to the performance of the different explanatory variables in the equations for those cells. Similarly, little consideration was given to the performance of the different explanatory variables in the uninspected slaughter equations.

The results of the regression analysis for both the Western and Eastern Canada are as set forth in Tables 3.3 to 3.3.23.

In general, the regression results for both Western and Eastern Canada appear quite satisfactory. Of the 144 equations estimated for the two regions, 35 have $\bar{R}^2$ values above 0.8 and 64 have $\bar{R}^2$ values above 0.65. Equations for Western Canada display somewhat higher values of $\bar{R}^2$ than those for Eastern Canada. In both regions, equations associated with the import rows show lower $\bar{R}^2$ values than those associated with 'domestic' cattle on farm. However, this comes as no surprise. Usually equations for cattle imports are more difficult to estimate.

The signs associated with each of the particular coefficients of the estimated equations have no specific interpretation, inasmuch as the equations estimated are reduced forms of the more basic supply and demand equations. The dependent variables of the equations are probabilities and, as such, should sum to unity.[17] This restriction is satisfied by the regression estimates of the probabilities obtained by the least squares method. Thus, the constant terms in the equations for the probabilities in each row of a matrix sum to 1 and the coefficients for any given independent variable sum to 0. Furthermore, it is of interest to point out that despite the method used to select independent variables for inclusion in the final equations, there are, in all cases, at least three independent variables which are the 'same' for any particular row in the two regions. For instance, in the case of row 1, which corresponds to the number of calves born during period t+1, five out of six independent variable are the 'same' for the Eastern and Western Canada equations. They are the 'same' in the sense that in both regions they represent similar influences on the dependent variables. For example C_E/F_E is considered the 'same' as C_W/F_W. C_E/F_E is the ratio of the Eastern Canada stocker calf price to the Eastern Canada feed cost ratio, while C_W/F_W is the ratio of the Western Canada stocker calf price to the Western Canada feed cost ratio.[18]

3.5 Empirical Results II (Multinomial Logit Regression Analysis)

As pointed out in the previous section, the linear least-squares method employed in estimating the probabilities satisfies the adding up constraint but fails to constrain the probabilities to lie within the 0 to 1 interval in predictions. To overcome this difficulty, an alternative method of estimation was employed. To ensure that the dependent variables lie between 0 and 1 the equations were respecified so that the dependent variables of each row at time t were of the form $\ln(p_{ijt}/p_{iht})$. This is referred to as the multinomial logit form.[19] The multinomial logit equations satisfy both the adding-up constraint and the 0-1 constraint. The multinomial logit equations are the same in form as the linear equations presented in the previous section except that the dependent variables are now transformed.

When constructing and adjusting the original transition matrices, some cells which are theoretically non-zero turned out to have zero estimated values. Hence in estimating the multinomial equations certain procedures had to be changed accordingly. In particular, we have for the Western Canada region, cell $a_{8,23}$ of the Western Canada matrix which relates to bulls exported to the United States and the rest of the world from the stock of bulls on farm; it displayed zero entries in many instances. Also, cells $a_{12,15}$, $a_{12,17}$, $a_{12,20}$ and $a_{12,21}$ displayed zero entries from time to time.

Theoretically we can expect cell $a_{12,15}$, uninspected slaughter of imported heifers and steers, to be non-zero. However, in reality we can expect that most of the imported heifers and steers are either retained on farm or slaughtered under federal inspection. Similarly, we can expect that the number of imported heifers and steers dying of natural causes ($a_{12,17}$) and the number of imported heifers and steers to be exported in the same period ($a_{12,20}$ and $a_{12,21}$) to be quite negligible. This is especially true when the total number of imports of heifers and steers from the United States to Western Canada is very small. For Eastern Canada, cells $a_{12,12}$, $a_{12,15}$, $a_{12,17}$ and $a_{12,21}$ display zero entries occasionally. Cell $a_{12,12}$ represents federally inspected slaughters of heifers imported from the United States.[20] Cell $a_{12,15}$ represents uninspected slaughters of imported United States heifers and steers and $a_{12,17}$ represents deaths of imported United States heifers and steers by natural causes. $a_{12,21}$ represents imported heifers and steers from the United States to be 're-exported' to the United States in the same period. Naturally, when the total number of United States imports of heifers and steers is small, zero entries may occur in the above cells.

In the multinomial logit equation estimation, we transform the dependent variables by taking the natural logarithms of the ratios of the original variables, and so zero values in the denominations of these ratios are obviously inadmissible. On account of this problem, cells with possible zero entries for the two regions were omitted from the multinomial logit equation analysis.

The estimated multinomial logit equations are presented in Tables 3.24 to 3.44.

The multinomial equations involve ratios of pairs of probabilities and direct comparison with the least squares results, which relate to individual probabilities, are difficult. However, the general impression is that the two different estimation results tell roughly the same story about the behaviour of the Canadian beef and dairy cattle industry. A more rigorous comparison of the two sets of results can be obtained from simulation tests. In fact, simulation testing is perhaps the only method available to verify our models since the estimated coefficients from either model are difficult to interpret.

Table 3.3 Linear Regression Equations of the Transition Probability Matrix

Western Canada Row 1 (Calves born during t+1)

Dependent Variables \ Independent Variables	Constant	H_W/P_W	C_W/F_W	Y	L_W/P_W	C_E/P_W	T	$\bar{R}^2$	DW
1	0.938 (134.635)	-17.587 (-1.687)	147.397 (2.289)	-13.591 (-3.371)	23.975 (0.854)	33.087 (0.891)	0.186 (0.400)	0.853	1.789
2	0.006 (7.870)	0.521 (0.465)	-8.449 (-1.222)	1.184 (2.733)	2.555 (0.848)	-2.837 (-0.711)	-0.300 (-6.012)	0.889	2.152
3	0.006 (7.112)	0.660 (0.538)	-20.489 (-2.706)	1.529 (3.225)	6.428 (1.947)	-5.746 (1.315)	-0.174 (-3.189)	0.912	1.887
4	0.003 (6.444)	0.152 (0.262)	-2.537 (-0.708)	0.237 (1.056)	1.679 (1.075)	-0.875 (-0.423)	-0.053 (-2.037)	0.706	1.419
5	0.043 (73.478)	-1.226 (-1.403)	8.944 (1.657)	-1.522 (-4.504)	2.823 (1.200)	-2.069 (-0.664)	0.139 (3.578)	0.985	1.999
6	0.000 (0.240)	-7.010 (-2.889)	-70.167 (-4.698)	-0.316 (-0.338)	7.599 (1.167)	25.937 (3.010)	1.118 (10.361)	0.982	1.472
7	0.005 (0.828)	24.490 (2.953)	-54.701 (-1.068)	12.480 (3.890)	-45.060 (-2.018)	-47.497 (-1.607)	-0.916 (-2.475)	0.734	2.008

Note : Definitions for all the dependent variables are as indicated in Table 3.1 and Table 3.2 in Chapter 3.
Numbers in brackets are t-ratios.
$\bar{R}^2$ is coefficient of determination corrected for degrees of freedom.
DW is Durbin-Watson ratios.
All independent variables are divided by the row totals of their respective rows.

This set of note applies to Table 3.3 to Table 3.23.

Table 3.4 Linear Regression Equations of the Transition Probability Matrix

Western Canada Row 2 (Calves on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	S	P_U/P_W	C_E/P_W	Y	P_W/F_W	L_W/P_W	$\bar{R}^2$	DW
8	0.373 (2.482)	1593.392 (24.453)	-503.651 (-2.639)	-913.351 (-2.936)	22.706 (1.126)	1623.835 (1.897)	395.005 (1.510)	0.980	2.354
9	0.139 (2.374)	-671.574 (-26.421)	206.547 (2.778)	311.930 (2.574)	-1.803 (-0.257)	-579.869 (-1.737)	-45.406 (-0.445)	0.983	2.835
10	-0.033 (-1.365)	-92.786 (-8.887)	146.589 (4.796)	-68.452 (-1.375)	-0.293 (-0.102)	327.700 (2.390)	5.352 (0.126)	0.890	2.734
11	0.247 (3,329)	-698.949 (-21.748)	56.687 (0.602)	562.146 (3.669)	-3.376 (-0.380)	-615.658 (-1.459)	-360.656 (-2.796)	0.977	2.953
12	0.011 (2.809)	-38.633 (-23.692)	9.844 (2.062)	27.270 (3.508)	-0.062 (-0.118)	-17.210 (-0.804)	-22.671 (-3.463)	0.981	2.639
13	-0.004 (0.490)	18.511 (5.530)	49.638 (5.065)	15.856 (0.993)	-1.101 (-1.191)	-158.162 (-3.598)	-18.378 (-1.368)	0.829	1.465
14	0.023 (2.258)	19.597 (4.495)	30.895 (2.420)	12.430 (0.598)	-1.075 (-0.893)	-266.569 (-4.656)	-1.221 (-0.067)	0.812	1.816
15	-0.001 (-0.246)	6.026 (4.394)	9.179 (2.286)	3.302 (0.505)	-0.180 (-0.477)	-37.208 (-2.066)	6.301 (1.145)	0.723	1.800
16	-0.004 (-0.201)	-25.693 (-3.258)	-14.800 (-0.641)	61.888 (1.646)	-0.339 (-0.156)	-3.788 (-0.037)	-17.087 (-0.540)	0.520	2.067
17	0.017 (0.471)	-127.084 (-8.125)	-64.142 (-1.401)	142.605 (1.912)	-0.309 (-0.072)	-126.586 (-0.616)	31.900 (0.508)	0.835	2.468
18	-0.000 (0.022)	-11.054 (-13.160)	5.167 (2.101)	8.268 (2.065)	0.108 (0.467)	-10.188 (-0.901)	-0.993 (-0.295)	0.940	2.419
19	-0.030 (6.234)	-58.573 (-28.197)	1.351 (0.222)	45.104 (4.554)	-0.442 (-0.771)	-38.427 (-1.409)	-24.285 (-2.912)	0.986	2.631

Row 2 continue

Dependent Variables	Constant	S	P_U/P_W	C_E/P_W	Y	P_W/F_W	L_W/P_W	$\bar{R}^2$	DW
20	0.004 (1.624)	-15.295 (-12.972)	3.934 (1.140)	15.185 (2.701)	0.003 (0.012)	-14.618 (-0.944)	-11.459 (-2.421)	0.942	2.738
21	0.072 (1.847)	94.807 (5.604)	-193.054 (-3.898)	-148.729 (-1.844)	2.318 (0.496)	226.125 (1.018)	210.172 (3.095)	0.838	2.400
22	0.148 (2.879)	71.023 (3.174)	127.034 (1.939)	-52.745 (-0.494)	-13.544 (-2.192)	-400.199 (-1.363)	-185.756 (-2.068)	0.648	2.298
23	-0.022 (-1.155)	-40.310 (-4.972)	53.961 (2.274)	28.841 (0.746)	-0.394 (-0.176)	-52.153 (-0.489)	29.155 (0.896)	0.703	1.324
24	-0.009 (-0.566)	-23.283 (-3.423)	76.585 (3.845)	-53.912 (-1.662)	-2.232 (-1.188)	144.064 (1.613)	11.890 (0.435)	0.577	1.890
25	0.001 (1.816)	-0.654 (-3.115)	-1.755 (-2.855)	2.358 (2.356)	0.007 (0.119)	-1.389 (-0.504)	-1.844 (-2.188)	0.653	2.252

Table 3.5 Linear Regression Equations of the Transition Probability Matrix

Western Canada Row 3 (Steers on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	S	P_U/P_W	W_W	P_W/F_W	Y	T	$\bar{R}^2$	DW
26	0.507 (11.259)	85.976 (4.997)	-39.984 (-1.455)	112.277 (1.095)	-166.654 (-1.929)	-4.924 (-0.400)	0.141 (0.162)	0.866	2.209
27	0.282 (8.748)	-90.246 (-7.329)	15.390 (3.833)	-84.921 (-1.157)	-52.031 (-0.842)	11.571 (1.313)	0.907 (1.458)	0.972	2.504
28	0.023 (2.332)	-2.542 (-0.671)	-16.195 (-2.675)	29.280 (1.296)	27.738 (1.457)	-3.027 (-1.116)	-0.568 (-0.297)	0.249	2.390
29	0.024 (2.308)	-4.070 (-1.029)	-17.639 (-2.793)	51.870 (2.201)	39.541 (1.991)	-5.800 (-2.050)	0.043 (0.216)	0.294	2.635
30	0.104 (3.899)	11.901 (1.164)	-37.551 (-2.299)	-76.102 (1.184)	65.556 (1.277)	8.660 (1.184)	-1.234 (-2.389)	0.735	1.787
31	0.059 (1.685)	-1.020 (-0.076)	35.978 (1.674)	-32.402 (-0.404)	85.851 (1.271)	-6.480 (-0.673)	0.200 (0.294)	0.581	2.245

Table 3.6 Linear Regression Equations of the Transition Probability Matrix

Western Canada Row 4 (Dairy heifers on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	S	HE_W/F_W	$\dot{R}$	Y	W_W	T	$\bar{R}^2$	DW
32	0.621 (8.483)	62.687 (17.343)	-100.379 (-1.686)	3.539 (1.567)	-4.062 (-0.576)	27.126 (0.452)	0.268 (0.347)	0.943	2.897
33	0.263 (3.526)	-65.108 (-17.686)	138:730 (2.288)	-3.210 (-1.395)	7.532 (1.048)	-46.701 (-0.765)	-0.968 (-1.231)	0.948	2.925
34	0.077 (4.016)	1.994 (2.111)	-27.804 (-1.787)	-0.118 (-0.200)	-3.959 (-2.148)	26.394 (1.685)	0.549 (2.719)	0.466	2.378
35	0.018 (6.291)	0.359 (2.491)	-6.627 (-2.794)	-0.139 (1.542)	0.452 (1.609)	-4.858 (-2.035)	0.056 (1.813)	0.519	2.638
36	0.021 (6.341)	0.010 (0.060)	-4.655 (-1.743)	-0.171 (-1.692)	0.205 (0.650)	-3.258 (-1.212)	0.062 (1.802)	0.321	2.254
37	-0.000 (-0.128)	0.058 (0.771)	0.735 (0.588)	0.099 (2.090)	-0.169 (-1.142)	1.299 (1.032)	0.033 (2.030)	0.798	1.701

Table 3.7 Linear Regression Equations of the Transition Probability Matrix

Western Canada Row 5 (Beef heifers on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	Y	H_W/P_W	$\dot{R}$	R	L_W/P_W	$\dot{C}_W$	$\bar{R}^2$	DW
38	1.309 (7.139)	-42.068 (-3.825)	-234.807 (-2.625)	74.506 (2.293)	-40.621 (-1.920)	351.204 (1.688)	114.889 (0.854)	0.782	1.640
39	-0.754 (-3.167)	56.875 (3.985)	293.959 (2.533)	-101.059 (-2.397)	64.099 (2.335)	-589.504 (-2.183)	-135.784 (-0.778)	0.791	1.524
40	0.332 (5.463)	-7.829 (-2.150)	-74.734 (-2.523)	16.976 (1.578)	-14.312 (-2.043)	138.156 (2.005)	38.374 (0.861)	0.660	2.385
41	0.001 (0.601)	0.204 (1.406)	-0.143 (-0.122)	0.372 (0.867)	-0.675 (-2.419)	6.634 (2.418)	1.679 (0.946)	0.208	2.515
42	0.001 (0.396)	0.320 (2.374)	1.301 (1.187)	-0.292 (-0.734)	-0.340 (-1.313)	2.291 (0.899)	1.276 (0.774)	0.314	2.454
43	0.044 (1.555)	-2.090 (-1.229)	-2.332 (-0.169)	6.717 (1.337)	-7.696 (-2.353)	83.653 (2.600)	-5.956 (-0.286)	0.333	2.097
44	0.067 (2.068)	-5.411 (-2.803)	16.756 (1.067)	2.781 (0.488)	-0.455 (-0.123)	7.566 (0.207)	-14.477 (-0.613)	0.236	2.214

Table 3.8 Linear Regression Equations of the Transition Probability Matrix

Western Canada Row 6 (Dairy cows on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	S	$\dot{R}$	SC_W/F_W	T	L_W/P_W	Y	$\bar{R}^2$	DW
45	0.881 (45.174)	-18.997 (-4.571)	0.921 (0.462)	220.068 (3.827)	-1.808 (-2.657)	29.365 (1.697)	-1.057 (-0.693)	0.548	2.627
46	0.089 (5.344)	14.720 (4.168)	-1.644 (-0.969)	-184.280 (-3.771)	1.214 (2.099)	-16.020 (-1.090)	0.933 (0.721)	0.538	2.345
47	0.013 (5.510)	2.244 (4.409)	0.317 (1.193)	-27.818 (-3.628)	0.233 (2.565)	-4.426 (-1.919)	0.076 (0.375)	0.449	2.912
48	0.017 (5.946)	0.969 (1.626)	0.021 (0.072)	-18.447 (-2.237)	0.238 (2.438)	-6.077 (-2.449)	-0.033 (-0.152)	0.184	2.329
49	-0.000 (-0.086)	1.064 (2.049)	0.385 (1.545)	10.470 (1.458)	0.123 (1.447)	-2.843 (-1.316)	0.080 (0.423)	0.824	2.110

Table 3.9 Linear Regression Equations of the Transition Probability Matrix

Western Canada — Row 7 (Beef cows on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	C_W/F_W	$\dot{R}$	R	$\dot{SC}_W/F_W$	W_W	Y_W	$\bar{R}^2$	DW
50	0.880 (53.957)	414.278 (5.237)	-0.386 (-0.043)	-1.563 (-0.271)	34.463 (2.775)	427.804 (3.421)	-47.122 (-3.305)	0.587	2.225
51	0.099 (6.753)	-341.058 (-4.789)	-0.139 (-0.017)	0.770 (0.148)	-30.738 (-2.754)	-363.579 (-3.236)	40.201 (3.318)	0.543	1.835
52	0.013 (5.926)	-45.458 (-4.368)	1.447 (1.225)	-0.067 (0.088)	-2.281 (-1.396)	-35.689 (-2.169)	3.757 (2.003)	0.541	2.[illegible]76
53	0.009 (2.802)	-2.777 (-1.814)	-0.921 (-0.530)	0.726 (0.650)	-1.446 (-0.602)	-28.537 (-1.180)	3.163 (1.147)	-0.088	2.348

Table 3.10 Linear Regression Equations of the Transition Probability Matrix

Western Canada — Row 8 (Bulls on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	S	SC_W/F_W	Y	T	$\ddot{P}_W/F_W$	$\dot{R}$	$\bar{R}^2$	DW
54	0.839 (33.044)	-6.402 (-5.947)	23.578 (1.574)	0.438 (1.317)	-0.111 (-1.131)	1.657 (0.966)	-0.001 (-0.200)	0.766	2.815
55	0.150 (8.919)	-0.019 (-0.026)	-7.090 (-0.716)	-0.427 (-1.942)	-0.120 (-1.851)	-0.359 (-0.316)	-0.006 (-2.380)	0.621	2.174
56	0.006 (0.478)	3.366 (5.910)	-12.978 (-1.638)	0.042 (0.241)	0.125 (2.402)	-0.738 (-0.812)	0.005 (2.059)	0.678	3.110
57	0.008 (0.869)	2.760 (7.042)	-3.945 (-0.724)	-0.063 (-0.520)	0.088 (2.464)	-0.510 (-0.817)	0.002 (1.401)	0.758	3.295
58	-0.003 (-1.349)	0.295 (2.817)	0.434 (0.298)	0.010 (0.299)	0.018 (1.932)	-0.051 (-0.306)	-0.001 (1.800)	0.364	2.932

Table 3.11 Linear Regression Equations of the Transition Probability Matrix

Western Canada   Row 12 (Heifers and steers imported from the U.S. during t+1)

Dependent Variables \ Independent Variables	Constant	P_U/P_W	S	H_W/P_W	$\dot{P}_W/F_W$	Y_W	P_E/P_W	$\bar{R}^2$	DW
59	0.100 (5.874)	0.050 (3.309)	-0.395 (-2.449)	0.097 (1.766)	-0.009 (-2.813)	0.010 (2.112)	-0.130 (-1.708)	0.581	2.816
60	0.283 (6.933)	-0.060 (-1.644)	-0.139 (-3.595)	-0.165 (-1.241)	-0.000 (-0.061)	-0.006 (-0.506)	0.291 (1.598)	0.265	2.919
61	0.202 (10.113)	-0.016 (-0.917)	-0.008 (-0.403)	-0.118 (-1.823)	-0.003 (-0.766)	-0.001 (-0.095)	0.109 (1.225)	0.130	2.340
62	0.186 (5.082)	0.031 (0.933)	0.129 (3.731)	0.335 (2.818)	0.004 (0.639)	0.005 (0.201)	-0.380 (-2.326)	0.434	2.859
63	0.178 (7.479)	-0.040 (-1.866)	0.066 (2.906)	-0.144 (-1.859)	0.009 (2.019)	-0.008 (-1.215)	0.171 (1.610)	0.451	2.023
64	0.006 (4.184)	-0.000 (-0.438)	0.000 (0.014)	0.000 (-0.057)	-0.000 (-0.002)	-0.000 (-0.496)	-0.002 (-0.307)	0.252	1.715
65	0.005 (4.728)	-0.062 (-2.047)	-0.000 (-0.352)	-0.001 (-0.358)	-0.000 (-0.047)	-0.000 (-1.213)	0.002 (0.463)	0.292	1.535
66	0.031 (1.817)	0.024 (1.584)	-0.010 (-0.599)	-0.009 (-0.164)	-0.001 (-0.205)	0.001 (0.265)	-0.300 (-0.387)	0.088	1.791
67	0.010 (1.643)	0.013 (2.512)	0.001 (0.209)	0.004 (0.219)	-0.000 (-0.407)	0.002 (0.931)	-0.032 (-1.232)	0.241	1.139

Table 3.12 Linear Regression Equations of the Transition Probability Matrix

Eastern Canada   Row 1 (Calves born during t+1)

Dependent Variables \ Independent Variables	Constant	C_E/F_E	Y	L_E/P_W	H_E/P_W	T	C_U/P_W	$\bar{R}^2$	DW
1	0.633 (11.818)	580.153 (1.937)	-24.371 (-1.341)	270.351 (2.455)	-114.090 (-2.127)	-1.034 (-0.391)	39.406 (0.353)	0.411	2.573
2	0.105 (12.205)	8.154 (0.170)	0.254 (0.087)	21.493 (1.217)	15.762 (1.833)	-0.828 (-1.952)	-59.258 (-3.310)	0.830	2.821
3	0.044 (11.616)	12.199 (0.578)	0.253 (0.198)	13.558 (1.746)	12.390 (3.276)	-0.345 (-1.850)	-37.327 (4.741)	0.847	2.649
4	0.040 (6.617)	-49.909 (-1.489)	-0.781 (-0.384)	0.407 (0.033)	2.016 (0.336)	-0.043 (-0.144)	9.729 (0.779)	0.590	2.386
5	0.058 (10.698)	31.801 (1.046)	-1.265 (-0.686)	-24.917 (-2.230)	-2.924 (-0.537)	0.493 (1.836)	2.340 (0.207)	0.676	1.604
6	0.120 (2.191)	-582.397 (-1.902)	25.910 (1.395)	-280.895 (-2.495)	86.848 (1.584)	1.757 (0.649)	45.103 (0.395)	0.253	2.750

Table 3.13 Linear Regression Equations of the Transition Probability Matrix

Eastern Canada — Row 2 (Calves on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	S	T	R	P_U/P_W	C_U/P_W	Y	$\bar{R}^2$	DW
7	0.471 (4.618)	350.868 (20.003)	-8.311 (-2.151)	-12.963 (-1.261)	-213.604 (-1.408)	-62.523 (-0.633)	6.679 (0.287)	0.966	1.795
8	0.132 (1.176)	-195.024 (-10.109)	6.856 (1.613)	6.102 (0.540)	140.566 (0.842)	27.618 (0.254)	-16.394 (-0.641)	0.879	2.737
9	-0.270 (-2.641)	-40.811 (-2.317)	-8.326 (-2.146)	15.362 (1.489)	131.054 (0.860)	60.748 (0.613)	31.122 (1.333)	0.397	1.565
10	0.142 (3.023)	-64.692 (-7.984)	4.783 (2.679)	5.811 (1.224)	-109.984 (-1.569)	91.765 (2.012)	-5.042 (-0.469)	0.913	1.703
11	0.002 (0.212)	-32.382 (-17.820)	-1.430 (-3.572)	2.201 (2.068)	-11.286 (-0.718)	-13.016 (-1.273)	7.550 (3.134)	0.957	2.612
12	0.089 (4.408)	-13.306 (-3.850)	-1.714 (-2.251)	3.063 (1.513)	56.986 (1.907)	-84.658 (-4.303)	2.308 (0.504)	0.862	1.795
13	0.044 (3.773)	-5.052 (-2.528)	-0.174 (-0.394)	0.922 (0.788)	37.370 (2.162)	-39.472 (-3.509)	-1.776 (-0.670)	0.769	1.488
14	0.046 (4.259)	-1.282 (-0.697)	-1.105 (-2.726)	0.619 (0.574)	12.169 (0.765)	-32.789 (-3.167)	2.275 (0.933)	0.822	1.938
15	0.015 (0.279)	-12.237 (-1.342)	1.898 (0.945)	-7.275 (-1.363)	-140.325 (-1.779)	104.116 (2.028)	6.948 (0.575)	0.681	1.526
16	0.031 (1.623)	-6.816 (-2.061)	1.514 (2.078)	3.644 (1.881)	46.183 (1.615)	-24.070 (-1.293)	-6.583 (-1.502)	0.600	1.478
17	0.002 (0.050)	-0.814 (-1.709)	-0.033 (-0.314)	0.306 (1.098)	1.789 (0.434)	4.027 (1.502)	-0.688 (-1.089)	0.491	2.174
18	0.048 (5.120)	-5.995 (-3.729)	-0.112 (-0.36)	-1.744 (-1.851)	-30.469 (-2.191)	5.333 (0.589)	3.397 (1.594)	0.713	1.965

Row 2 Continue

Dependent Variables	Constant	S	T	R	P_U/P_W	C_U/P_W	Y	$\bar{R}^2$	DW
19	0.001 (0.912)	-0.486 (-3.125)	-0.017 (-0.492)	0.104 (1.146)	0.545 (0.405)	1.801 (2.059)	-0.357 (-1.731)	0.492	2.078
20	0.252 (1.929)	30.065 (1.338)	0.067 (1.226)	-17.228 (-1.309)	79.832 (0.411)	-43.996 (-0.348)	-28.866 (-0.969)	0.056	2.065
21	0.002 (2.991)	0.061 (0.530)	-0.016 (-0.628)	0.024 (0.354)	-0.708 (-0.710)	-1.473 (-2.272)	0.047 (0.306)	0.375	2.111
22	-0.005 (-2.228)	-2.096 (-5.296)	0.086 (0.986)	1.061 (4.575)	-0.352 (-0.102)	6.588 (2.957)	-0.621 (-1.183)	0.799	1.897

Table 3.14 Linear Regression Equations of the Transition Probability Matrix

Eastern Canada   Row 3 (Steers on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	T	S	R	Y	W_E	P_U/P_W	$\bar{R}^2$	DW
23	0.609 (7.569)	-3.213 (-1.841)	32.591 (3.0[illegible]3)	-5.005 (-0.899)	10.954 (0.740)	-58.387 (-0.577)	-1.506 (-0.020)	0.656	2.651
24	0.379 (4.428)	3.356 (1.805)	-34.517 (-3.025)	5.432 (0.906)	-10.117 (-0.641)	57.516 (0.534)	-7.108 (-0.090)	0.070	2.660
25	-0.002 (-0.443)	-0.098 (-0.874)	2.660 (3.884)	-0.099 (-0.274)	0.632 (0.668)	-6.538 (-1.011)	6.490 (1.371)	0.660	2.279
26	-0.001 (-0.388)	-0.028 (-0.773)	0.691 (3.117)	-0.010 (-0.089)	0.202 (0.661)	-2.059 (-0.984)	1.917 (1.252)	0.570	2.182
27	0.015 (3.199)	-0.017 (-0.169)	-1.425 (-2.281)	-0.319 (-0.971)	-1.672 (-1.936)	9.467 (1.640)	0.208 (0.048)	0.347	1.737

Table 3.15 Linear Regression Equations of the Transition Probability Matrix

Eastern Canada Row 4 (Dairy heifers on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	S	$\dot{H}_E/F_E$	$\dot{R}$	L_E/P_W	Y_E	R	$\bar{R}^2$	DW
28	0.934 (9.856)	-19.551 (-1.435)	45.864 (2.397)	1.756 (0.205)	-88.028 (-1.218)	9.130 (1.422)	-8.326 (-1.034)	0.354	2.346
29	0.039 (0.380)	19.286 (1.314)	-49.029 (-2.378)	-0.643 (-0.070)	83.646 (1.074)	-8.115 (-1.173)	6.836 (0.788)	0.306	2.336
30	0.026 (2.912)	-0.427 (-0.338)	3.542 (1.996)	-0.346 (-0.436)	4.897 (0.731)	-0.334 (-0.561)	-0.603 (-0.808)	0.027	2.330
31	0.012 (8.158)	0.248 (1.135)	0.159 (0.516)	0.019 (0.138)	0.102 (0.088)	-0.322 (-3.125)	0.084 (0.651)	0.635	2.618
32	0.004 (6.156)	-0.078 (-0.942)	0.086 (0.736)	-0.005 (-0.096)	-0.154 (-0.350)	-0.105 (-2.701)	0.102 (2.084)	0.347	2.634
33	-0.014 (-5.055)	0.522 (1.300)	-0.621 (-1.101)	-0.782 (-3.101)	-0.466 (-0.219)	-0.253 (-1.338)	1.908 (8.026)	0.872	1.506

Table 3.16 Linear Regression Equations of the Transition Probability Matrix

Eastern Canada   Row 5 (Beef heifers on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	R	S	$\dot{H}_E/F_E$	H_E/P_W	Y	$\dot{C}_E$	$\bar{R}^2$	DW
34	0.504 (3.830)	-6.401 (-2.256)	-13.241 (-1.862)	-5.959 (-0.965)	9.806 (0.945)	-4.554 (-0.855)	9.506 (0.637)	0.148	1.996
35	0.279 (0.157)	9.426 (2.460)	23.052 (2.400)	12.411 (1.488)	-34.117 (-2.434)	14.286 (1.986)	0.556 (0.028)	0.229	2.158
36	0.274 (4.074)	-2.664 (-1.840)	-5.449 (-1.501)	-3.471 (-1.101)	14.750 (2.785)	-4.836 (-1.779)	-0.847 (-0.111)	0.134	1.645
37	0.086 (5.524)	0.350 (1.049)	-0.156 (-0.187)	-1.295 (-1.784)	0.330 (0.270)	-1.753 (-2.799)	0.292 (0.166)	0.457	1.768
38	0.027 (5.202)	0.114 (1.023)	-0.548 (-1.961)	-0.175 (-0.720)	-0.406 (-0.995)	-0.425 (-2.030)	1.118 (1.907)	0.240	1.533
39	0.082 (1.876)	-0.825 (-0.880)	-3.658 (-1.556)	-1.511 (-0.740)	9.637 (2.809)	-2.718 (-1.544)	-10.624 (-2.154)	0.227	1.770

Table 3.17 Linear Regression Equations of the Transition Probability Matrix

Eastern Canada — Row 6 (Dairy cows on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	L_E/P_W	H_E/P_W	$\dot{R}$	W_E	P_E/P_W	Y	$\bar{R}^2$	DW
40	0.914 (13.616)	-88.363 (-3.581)	-58.714 (-2.165)	6.761 (1.563)	-150.439 (-1.621)	327.695 (2.052)	-3.999 (-0.292)	0.497	2.471
41	0.105 (2.408)	79.125 (4.946)	14.517 (0.826)	-4.062 (-1.448)	39.135 (0.651)	-283.567 (-2.740)	3.394 (0.382)	0.631	2.911
42	0.041 (3.014)	6.116 (1.228)	7.599 (1.388)	-0.229 (-0.262)	39.581 (2.113)	-84.901 (-2.634)	-1.397 (-0.505)	0.414	2.944
43	0.005 (0.870)	-3.157 (-1.557)	5.275 (2.368)	-0.036 (-0.101)	9.655 (1.267)	-6.328 (-0.482)	-0.515 (-0.457)	0.132	2.537
44	-0.065 (-1.647)	6.280 (0.434)	31.321 (1.969)	-2.434 (-0.959)	62.073 (1.140)	47.100 (0.503)	2.515 (0.313)	0.770	0.877

Table 3.18 Linear Regression Equations of the Transition Probability Matrix

Eastern Canada Row 7 (Beef cows on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	L_E/P_W	P_E/P_W	T	C_E/F_E	$\dot{SC}_E/F_E$	Y	$\overline{R}^2$	DW
45	0.596 (11.679)	-65.972 (-5.431)	117.560 (2.527)	1.668 (1.553)	114.498 (2.460)	11.095 (1.818)	-8.451 (-1.148)	0.580	2.004
46	0.230 (4.894)	80.928 (7.251)	-53.065 (-1.241)	-0.093 (-0.095)	-81.588 (-1.908)	-13.345 (-2.380)	-2.974 (-0.440)	0.736	1.510
47	0.141 (6.594)	-4.537 (-0.890)	-61.754 (-3.163)	-1.480 (-3.284)	-31.706 (-1.623)	1.547 (0.604)	9.513 (3.081)	0.297	2.408
48	0.033 (3.923)	-10.395 (-5.175)	-2.890 (-0.376)	-0.098 (-0.554)	1.152 (0.150)	0.725 (0.719)	1.914 (1.574)	0.635	1.848

Table 3.19 Linear Regression Equations of the Transition Probability Matrix

Eastern Canada Row 8 (Bulls on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	S	$\dot{R}$	$\dot{SC}_E/F_E$	P_E/P_W	T	Y_E	$\bar{R}^2$	DW
49	0.221 (1.917)	7.323 (2.660)	0.134 (0.307)	-0.085 (-0.055)	67.478 (4.649)	-0.762 (-2.796)	-0.648 (-0.457)	0.825	2.058
50	0.314 (3.756)	-1.821 (-0.914)	0.350 (1.110)	-3.265 (-2.934)	-6.143 (-0.585)	0.696 (3.532)	-2.120 (-2.067)	0.599	2.377
51	0.270 (5.921)	-3.990 (-3.662)	-0.101 (-0.584)	1.457 (2.395)	-31.100 (-5.415)	0.136 (1.259)	0.851 (1.518)	0.800	2.286
52	0.080 (5.575)	-1.155 (-3.367)	-0.049 (-0.906)	0.550 (2.869)	-9.572 (-5.295)	0.027 (0.809)	0.321 (1.821)	0.793	2.366
53	0.114 (2.387)	-0.357 (-0.313)	-0.334 (-1.848)	1.344 (2.106)	-20.662 (-3.431)	-0.098 (-0.865)	1.596 (2.713)	0.728	2.671

Table 3.20 Linear Regression Equations of the Transition Probability Matrix

Dependent Variables \ Independent Variables	Constant	T	P_E/F_E	SC_E/F_E	$\dot{R}$	$\dot{P}_E/F_E$	Y	$\bar{R}^2$	DW
	Eastern Canada			Row 9 (Calves imported from Western Canada during t+1)					
54	0.716 (30.696)	-2.136 (-7.629)	181.259 (2.766)	-173.953 (-1.969)	-3.505 (-2.624)	1.574 (1.433)	0.919 (0.595)	0.867	1.636
55	0.074 (7.520)	0.644 (5.464)	-75.117 (-2.717)	59.098 (1.589)	0.911 (1.621)	-0.317 (-0.687)	0.262 (0.403)	0.786	2.586
56	0.030 (7.067)	0.299 (5.844)	-33.694 (-2.812)	28.150 (1.746)	0.506 (2.079)	-0.169 (-0.842)	0.052 (0.185)	0.801	2.362
57	0.040 (10.240)	0.248 (5.337)	-43.675 (-4.002)	38.572 (2.626)	0.437 (1.969)	0.286 (1.566)	0.094 (0.368)	0.772	2.653
58	0.045 (9.768)	0.280 (5.080)	8.624 (0.666)	0.744 (0.043)	-0.047 (-0.179)	-0.499 (-2.305)	-0.423 (-1.389)	0.866	1.799
59	0.095 (5.121)	0.665 (2.974)	-37.398 (-0.713)	47.390 (0.672)	1.697 (1.591)	-0.874 (-0.997)	-0.905 (-0.734)	0.398	1.939

Table 3.21 Linear Regression Equations of the Transition Probability Matrix

Eastern Canada   Row 11 (Heifers and steers imported from Western Canada during t+1)

Dependent Variables \ Independent Variables	Constant	T	Y	P_U/P_W	L_E/P_W	S	R	$\bar{R}^2$	DW
60	0.266 (33.909)	-0.245 (-2.248)	1.074 (1.892)	-4.563 (-1.148)	-1.672 (-0.675)	0.389 (0.551)	0.016 (0.060)	0.351	2.518
61	0.216 (7.079)	-0.704 (-1.662)	2.618 (1.186)	-6.657 (-0.430)	-13.935 (-1.447)	-1.275 (-0.504)	1.188 (1.162)	0.457	2.494
62	0.013 (4.185)	-0.145 (-3.399)	0.598 (2.694)	-4.033 (-2.586)	-0.112 (-0.115)	-0.080 (-0.314)	0.181 (1.763)	0.433	2.545
63	0.397 (7.405)	1.353 (1.818)	-4.494 (-1.160)	12.351 (0.454)	19.697 (1.166)	2.539 (0.571)	-1.711 (-0.953)	0.532	2.437
64	0.094 (4.733)	-0.165 (-0.600)	-0.046 (-0.032)	4.159 (0.414)	-4.527 (-0.725)	-1.273 (-0.776)	0.294 (0.444)	0.438	2.222
65	0.010 (4.898)	-0.110 (-3.771)	0.432 (2.856)	-2.865 (-2.698)	-0.094 (-0.142)	-0.075 (-0.430)	0.138 (1.969)	0.547	2.424
66	0.003 (4.854)	-0.030 (-3.548)	0.116 (2.594)	-0.780 (-2.492)	-0.039 (-0.200)	0.003 (0.053)	0.045 (2.177)	0.482	2.370
67	0.001 (0.467)	0.046 (1.907)	-0.299 (-2.358)	2.387 (2.681)	0.680 (1.229)	-0.198 (-1.360)	-0.151 (-2.573)	0.434	1.292

Table 3.22 Linear Regression Equations of the Transition Probability Matrix

Eastern Canada — Row 12 (Heifers and steers imported from the U.S. during t+1)

Dependent Variables \ Independent Variables	Constant	S	T	P_E/F_E	H_E/P_W	P_U/P_W	Y	$\bar{R}^2$	DW
68	0.294 (10.843)	0.242 (2.441)	-0.016 (-0.350)	0.267 (0.086)	-0.619 (-1.633)	1.289 (0.681)	-0.062 (-0.197)	0.538	2.375
69	0.214 (9.098)	-0.193 (-0.224)	0.010 (0.252)	3.395 (1.169)	-0.757 (-2.303)	2.070 (1.261)	-0.273 (-0.995)	0.502	2.314
70	0.013 (5.463)	-0.013 (-1.415)	0.002 (0.380)	-0.159 (-0.528)	-0.011 (-0.324)	0.107 (0.627)	-0.012 (-0.411)	0.200	1.286
71	0.422 (11.459)	0.010 (0.074)	-0.043 (-0.706)	0.419 (0.092)	0.974 (1.893)	-4.788 (-1.862)	0.519 (1.208)	0.493	2.010
72	0.042 (2.080)	-0.194 (-2.621)	0.039 (1.158)	-3.399 (-1.361)	0.477 (1.690)	0.823 (0.583)	-0.116 (-0.493)	0.674	2.044
73	0.010 (5.190)	-0.014 (-1.911)	0.003 (0.944)	-0.328 (-1.355)	-0.032 (-1.182)	0.215 (1.570)	-0.020 (-0.854)	0.257	1.380
74	0.002 (4.123)	-0.001 (-0.630)	-0.000 (-0.212)	0.012 (0.223)	0.005 (0.835)	-0.013 (-0.441)	0.001 (0.114)	0.118	1.780
75	0.002 (1.596)	-0.012 (-2.167)	0.006 (2.468)	-0.206 (-1.139)	-0.038 (-1.852)	0.298 (2.916)	-0.037 (-2.145)	0.144	2.331

Table 3.23 Linear Regression Equations of the Transition Probability Matrix

Eastern Canada — Row 14 (Dairy males and females imported from the U.S. during t+1)

Dependent Variables \ Independent Variables	Constant	S	C_E/F_E	L_E/P_W	Y	$\bar{R}^2$	DW
76	0.319 (1.930)	-0.062 (-1.074)	0.162 (0.320)	-0.193 (-0.737)	0.028 (0.698)	0.378	2.235
77	0.681 (1.930)	0.062 (1.074)	-0.162 (-0.320)	0.193 (0.737)	-0.028 (-0.698)	0.378	2.234

Table 3.24 Multinomial Logit Regression Equations of the Transition Probability Matrix

Western Canada, Row 1 (Calves born during t+1)

Dependent Variables \ Independent Variables	Constant	H_W/P_W	T	L_W/P_W	C_W/F_W	Y	C_E/P_W	$\bar{R}^2$	DW
1	0.517 (33.854)	-141.472 (-0.619)	19.592 (1.920)	-257.651 (-0.419)	1884.068 (1.334)	-64.376 (-0.728)	-188.765 (-0.232)	0.679	2.304
2	-0.090 (-1.941)	13.700 (0.198)	-8.696 (-2.818)	-192.295 (-1.033)	408.913 (0.957)	-3.976 (-0.149)	116.664 (0.473)	0.412	2.171
3	0.852 (7.644)	28.888 (0.173)	-0.711 (-0.096)	-128.489 (-0.286)	-1696.316 (-1.646)	58.155 (0.901)	132.312 (0.222)	0.273	1.920
4	-2.928 (-23.224)	144.551 (0.766)	-15.457 (-1.836)	489.901 (0.965)	-928.482 (-0.797)	61.941 (0.849)	77.211 (0.115)	0.877	1.603
5	1.905 (14.074)	-44.815 (-0.221)	-9.851 (-1.090)	106.875 (0.196)	1829.606 (1.463)	-130.905 (-1.671)	-383.736 (-0.532)	0.944	2.152
6	1.426 (2.584)	-683.270 (-0.827)	44.198 (1.199)	2599.256 (1.169)	5926.034 (1.162)	-426.124 (-1.334)	-273.594 (-0.093)	0.271	2.232
7	-6.339 (-12.669)	682.418 (0.911)	-29.076 (-0.870)	-2617.597 (-1.299)	-7423.818 (-1.605)	505.285 (1.745)	519.906 (0.195)	0.522	2.153

Note : Definitions for all the dependent variables are indicated in Table 3.1 and Table 3.2 in Chapter 3.
Numbers in brackets are t-ratios.
$\bar{R}^2$ is coefficient of determination corrected for degrees of freedom.
DW is Durbin-Watson ratios.
All independent variables are divided by the row totals of their respective rows.

This set of note applies to Table 3.24 to Table 3.44.

Table 3.25 Multinomial Logit Regression Equations of the Transition Probability Matrix

Western Canada Row 2 (Calves on farm at the end of t)

Dependent Variables \ Independent Vaiables	Constant	S	P_U/P_W	C_E/P_W	P_W/F_W	L_W/P_W	Y	$\bar{R}^2$	DW
8	3.445	14399.721	-9644.475	-18988.426	50924.841	10533.090	-77.576	0.890	2.493
	(0.903)	(8.964)	(-2.051)	(-2.479)	(2.414)	(1.633)	(-0.175)		
9	7.380	1976.891	-1929.020	7716.984	-62702.771	-3244.922	105.701	0.539	2.497
	(3.099)	(1.915)	(-0.638)	(1.568)	(-4.626)	(-0.783)	(0.371)		
10	-7.759	-3637.801	6577.906	708.269	11450.868	-430.942	150.282	0.847	2.214
	(-5.789)	(-6.253)	(3.862)	(0.255)	(1.499)	(-0.185)	(0.935)		
11	5.581	3479.418	-3911.926	-8082.824	24208.487	3584.303	-144.766	0.838	2.411
	(4.256)	(6.113)	(-2.348)	(-2.979)	(3.319)	(1.569)	(-0.921)		
12	-3.315	-11642.200	2607.284	14201.047	-1003.904	-12658.156	114.849	0.929	2.719
	(-1.321)	(-10.689)	(0.818)	(2.735)	(-0.070)	(-2.895)	(0.382)		
13	-1.058	85.597	2028.505	-88.601	4351.257	-1414.390	-13.541	0.619	1.219
	(-3.513)	(0.655)	(5.301)	(-0.142)	(2.535)	(-2.696)	(-0.375)		
14	2.605	172.794	1759.837	-901.415	-15287.131	-919.987	-5.679	0.482	1.471
	(3.334)	(0.509)	(1.772)	(-0.557)	(-3.208)	(-0.676)	(-0.061)		
15	1.120	8966.588	-3480.321	-16214.433	24359.881	13353.695	-8.885	0.823	2.315
	(0.331)	(6.110)	(-0.810)	(-2.317)	1.264	2.267	-0.022		
16	-0.601	3794.151	684.426	7417.689	-31750.021	-4190.467	27.893	0.487	2.530
	(-0.257)	(3.741)	(0.231)	(1.534)	(-2.384)	(-1.029)	(0.100)		
17	1.378	-7047.714	56.618	950.531	10684.070	-728.845	-187.260	0.943	2.566
	(1.255)	(-14.780)	(0.041)	(0.418)	(1.706)	(-0.381)	(-1.422)		
18	-5.628	-1861.147	5433.553	6278.369	-12354.292	-3874.816	129.792	0.548	2.012
	(-2.939)	(-2.239)	(2.233)	(1.584)	(-1.132)	(-1.161)	(0.565)		
19	4.943	2372.528	-5510.093	-7219.564	11242.853	5883.165	-66.739	0.644	2.258
	(2.625)	(2.903)	(-2.303)	(-1.853)	(1.048)	(1.793)	(-0.296)		

Row 2 Continue

Dependent Variables	Constant	S	P_U/P_W	C_E/P_W	P_W/F_W	L_W/P_W	Y	$\bar{R}^2$	DW
20	-6.813 (-3.045)	-8395.313 (-8.645)	12004.359 (4.222)	10123.943 (2.187)	-7437.686 (-0.583)	-10685.702 (-2.741)	10.344 (0.039)	0.910	2.137
21	-0.848 (-0.212)	-1136.841 (-0.655)	-20034.586 (-3.945)	13250.399 (1.602)	17102.690 (0.751)	6722.173 (0.965)	127.897 (0.267)	0.430	1.390
22	5.583 (1.450)	8127.413 (4.862)	6704.347 (1.370)	-22762.318 (-2.856)	4710.188 (0.215)	1298.476 (0.194)	11.184 (0.024)	0.733	2.197
23	-1.251 (-0.646)	130.280 (0.155)	-6336.487 (-2.574)	6425.862 (1.603)	-4732.623 (-0.429)	3142.124 (0.931)	271.372 (1.169)	0.199	2.182
24	4.572 (1.379)	1977.740 (1.481)	17282.891 (4.420)	-2827.524 (-0.444)	-29442.321 (-1.679)	-3768.345 (-0.703)	-760.988 (-2.063)	0.666	2.748
25	-9.325 (-3.178)	-11762.101 (-9.234)	-4292.314 (-1.151)	10012.013 (1.649)	4675.622 (0.280)	-2600.471 (-0.509)	316.118 (0.899)	0.889	2.555

Table 3.26 Multinomial Logit Regression Equations of the Transition Probability Matrix

Western Canada Row 3 (Steers on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	S	P_U/P_W	T	W_W	Y	P_W/F_W	$\bar{R}^2$	DW
26	0.579 (3.705)	404.634 (6.776)	-266.137 (-2.790)	-1.433 (-0.475)	489.191 (1.375)	-49.589 (-1.161)	-150.024 (-0.500)	0.955	2.612
27	2.776 (2.828)	-154.562 (-0.412)	1461.310 (2.400)	11.157 (0.589)	-1302.637 (-0.583)	104.323 (0.389)	-2139.566 (-1.136)	0.406	2.422
28	0.145 (0.565)	141.341 (1.439)	-93.847 (-0.598)	-11.502 (-2.318)	-1878.189 (-3.208)	243.763 (3.468)	-1036.496 (-2.101)	0.670	1.441
29	-2.414 (-3.133)	-430.942 (-1.465)	-398.945 (-0.849)	35.281 (2.374)	5184.461 (2.957)	-582.064 (-2.765)	2273.601 (1.539)	0.714	2.375
30	1.633 (1.041)	-145.571 (-0.243)	-1379.808 (-1.442)	-19.769 (-0.653)	-2055.173 (-0.576)	383.778 (0.895)	-4.470 (-0.001)	0.032	1.897
31	-2.720 (-1.899)	185.101 (0.338)	677.428 (0.775)	-13.734 (-0.497)	-437.647 (-0.134)	-100.192 (-0.256)	1056.955 (0.385)	0.302	1.859

Table 3.27 Multinomial Logit Regression Equations of the Transition Probability Matrix

Western Canada Row 4 (Dairy heifers on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	S	HE_W/F_W	$\dot{R}$	Y	T	W_W	$\bar{R}^2$	DW
32	1.108 (2.552)	384.345 (17.945)	-574.379 (-1.628)	19.330 (1.444)	-37.844 (-0.905)	3.847 (0.840)	222.151 (0.625)	0.947	3.201
33	0.782 (1.204)	-335.866 (-10.476)	1075.626 (2.036)	-16.218 (-0.809)	117.717 (1.881)	-16.582 (-2.420)	-721.323 (-1.357)	0.882	2.647
34	1.204 (2.172)	36.472 (1.333)	96.843 (0.215)	34.175 (1.999)	-161.046 (-3.016)	6.082 (1.040)	1307.910 (2.882)	0.308	2.891
35	-0.109 (-0.923)	44.899 (7.671)	-367.802 (-3.814)	6.711 (1.835)	20.288 (1.776)	1.431 (1.144)	-141.928 (-1.462)	0.778	0.969
36	2.833 (6.502)	-28.456 (-1.323)	387.182 (1.093)	-50.179 (-3.734)	107.647 (2.562)	-13.923 (-3.030)	-1046.418 (-2.934)	0.869	2.347
37	-5.817 (-11.153)	101.395 (-3.939)	-617.472 (-1.456)	6.182 (0.384)	-46.761 (-0.931)	19.145 (3.480)	379.608 (0.889)	0.853	1.897

Table 3.28 Multinomial Logit Regression Equations of the Transition Probability Matrix

Western Canada   Row 5 (Beef heifers on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	Y	H_W/P_W	L_W/P_W	R	$\dot{R}$	$\dot{C}_W$	$\bar{R}^2$	DW
38	9.149 (4.119)	-492.584 (-3.697)	-2218.850 (-1.955)	6243.186 (2.476)	-642.180 (-2.506)	612.993 (1.557)	1230.987 (0.755)	0.750	1.677
39	-6.533 (-0.720)	398.526 (3.260)	1764.059 (1.774)	-5726.680 (-2.476)	569.934 (2.424)	-460.176 (-1.274)	-1077.131 (-0.720)	0.704	1.867
40	6.271 (6.736)	-108.982 (-1.951)	-283.216 (-0.624)	554.586 (0.525)	-185.174 (-1.724)	6.078 (0.037)	-412.074 (-0.603)	0.612	2.688
41	0.034 (0.186)	-8.863 (-0.814)	-138.943 (-1.569)	637.687 (3.096)	-66.779 (-3.189)	116.445 (3.620)	48.449 (0.364)	0.584	1.746
42	-2.516 (-4.425)	95.316 (2.795)	-58.226 (-0.210)	-1708.548 (-2.648)	181.201 (2.763)	-260.749 (-2.588)	434.674 (1.042)	0.606	2.214
43	0.524 (0.566)	91.075 (1.468)	-515.922 (-1.022)	540.146 (0.460)	-75.762 (-0.635)	19.561 (0.107)	453.990 (0.598)	-0.081	1.702
44	-6.929 (-4.219)	25.511 (0.259)	1351.098 (1.686)	-540.377 (-0.290)	218.761 (1.155)	-34.153 (-0.117)	-678.893 (-0.563)	0.437	2.534

Table 3.29 Multinomial Logit Regression Equations of the Transition Probability Matrix

Western Canada Row 6 (Dairy cows on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	S	$\dot{R}$	SC_W/F_W	T	L_W/P_W	Y	$\bar{R}^2$	DW
45	2.304 (8.421)	-234.790 (-4.032)	27.291 (0.976)	2949.869 (3.661)	-19.489 (-2.044)	233.433 (0.963)	-13.431 (-0.629)	0.527	2.367
46	1.740 (5.487)	-67.620 (-1.002)	-64.832 (-2.001)	922.713 (0.988)	-12.645 (-1.144)	343.309 (1.222)	4.048 (0.164)	0.008	1.734
47	-0.384 (-2.420)	194.508 (5.766)	45.155 (2.788)	-1437.398 (-3.080)	1.431 (0.259)	178.686 (1.272)	13.924 (1.126)	0.811	0.879
48	2.535 (3.611)	-151.989 (-1.017)	-124.872 (-1.741)	1451.443 (0.702)	-44.525 (-1.820)	-21.865 (-0.035)	-38.811 (-0.708)	0.807	2.349
49	-6.195 (-9.761)	259.882 (1.924)	117.258 (1.808)	-3886.682 (-2.079)	75.227 (3.401)	-733.565 (-1.304)	34.269 (0.692)	0.830	1.588

Table 3.30 Multinomial Logit Regression Equations of the Transition Probability Matrix

Western Canada — Row 7 (Beef cows on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	C_W/F_W	$\dot{R}$	R	$S\dot{C}_W/F_W$	W_W	Y	$\bar{R}^2$	DW
50	2.070 (7.664)	6585.401 (5.025)	33.675 (0.226)	-37.460 (-0.392)	599.805 (2.915)	6970.524 (3.364)	-770.218 (-3.260)	0.554	1.981
51	1.937 (5.262)	2099.743 (1.175)	-224.677 (-1.108)	-19.459 (-0.149)	-129.171 (-0.460)	207.533 (0.073)	-5.371 (-0.017)	0.0216	1.615
52	0.657 (1.748)	-2928.056 (-1.604)	396.764 (1.916)	-110.213 (-0.827)	-149.699 (-0.522)	-1113.133 (-0.386)	90.184 (0.274)	0.213	2.485
53	-4.665 (-8.895)	-5757.079 (-2.262)	-205.763 (-0.712)	167.132 (0.900)	-320.935 (-0.803)	-6064.929 (-1.508)	685.405 (1.494)	-0.011	2.402

Table 3.31 Multinomial Logit Regression Equations of the Transition Probability Matrix

Western Canada   Row 8 (Bulls on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	Y	T	$\dot{R}$	SC_W/F_W	S	$\dot{P}_W/F_W$	$\bar{R}^2$	DW
54	1.678 (9.069)	4.069 (1.712)	1.072 (1.523)	0.074 (2.471)	127.956 (1.194)	-7.689 (-0.998)	6.968 (0.567)	0.659	2.054
55	3.249 (6.238)	-4.926 (-0.723)	-6.650 (-3.298)	-0.246 (-2.862)	461.316 (1.503)	-217.535 (-9.855)	24.852 (0.706)	0.850	2.857
56	-0.257 (-1.344)	4.525 (1.808)	1.438 (1.941)	0.116 (3.673)	-417.283 (-3.698)	53.567 (6.605)	-4.690 (-0.363)	0.760	1.059
57	-4.639 (-12.307)	-3.669 (-0.744)	4.140 (2.836)	0.056 (0.899)	-171.989 (-0.774)	171.657 (10.742)	-27.129 (-1.065)	0.881	3.337

Table 3.32 Multinomial Logit Regression Equations of the Transition Probability Matrix

Western Canada   Row 12 (Heifers and steers imported from the U.S. during t+1)

Dependent Variables \ Independent Variables	Constant	P_U/P_W	S	H_W/P_W	$\dot{P}_W/F_W$	Y	P_E/P_W	$\bar{R}^2$	DW
59	0.100 (5.874)	0.050 (3.309)	-0.039 (-2.449)	0.098 (1.766)	-0.009 (-2.813)	0.010 (2.112)	-0.130 (-1.708)	0.581	2.816
60	0.283 (6.933)	-0.060 (-1.644)	-0.139 (-3.595)	-0.165 (-1.241)	-0.000 (-0.061)	-0.006 (-0.506)	0.291 (1.598)	0.265	2.919
61	0.202 (10.113)	-0.016 (-0.917)	-0.008 (-0.403)	-0.118 (-1.823)	-0.003 (-0.766)	-0.001 (-0.095)	0.109 (1.225)	0.130	2.340
62	0.186 (5.082)	0.031 (0.933)	0.129 (3.731)	0.335 (2.818)	0.004 (0.639)	0.002 (0.201)	-0.380 (-2.326)	0.434	2.859
63	0.178 (7.479)	-0.040 (-1.866)	0.066 (2.906)	-0.014 (-1.859)	0.009 (2.019)	-0.008 (-1.215)	0.171 (1.610)	0.451	2.023

Table 3.33 Multinomial Logit Regression Equations of the Transition Probability Matrix

Eastern Canada Row 1 (Calves born during t+1)

Dependent Variables \ Independent Variables	Constant	C_E/F_E	H_E/P_W	C_U/P_W	T	Y	L_E/P_W	$\bar{R}^2$	DW
1	1.735 (12.680)	727.326 (0.951)	-355.507 (-2.596)	975.894 (3.423)	13.436 (1.988)	-48.479 (-1.045)	-23.577 (-0.084)	0.858	2.295
2	0.875 (11.336)	-227.772 (-0.528)	-178.243 (-2.307)	389.243 (2.420)	0.027 (0.007)	-4.240 (-0.162)	-161.817 (-1.020)	0.373	2.552
3	0.237 (1.024)	1895.794 (1.465)	299.113 (1.291)	-1585.859 (-3.287)	-12.871 (-1.126)	43.704 (0.557)	422.554 (0.888)	0.385	2.561
4	-0.510 (-2.197)	-2301.666 (-1.774)	179.676 (0.773)	200.465 (0.414)	-14.948 (-1.303)	11.693 (0.148)	676.364 (1.418)	0.744	2.507
5	-0.817 (-1.096)	8453.847 (2.03)	-841.403 (-1.128)	-142.637 (-0.092)	2.543 (0.069)	-482.159 (-1.908)	3079.322 (2.011)	0.253	2.658
6	-1.520 (-1.881)	-8547.531 (-1.893)	896.364 (1.108)	162.894 (0.097)	11.812 (0.296)	479.481 (1.750)	-3992.849 (-2.405)	0.178	2.840

Table 3.34 Multinomial Logit Regression Equations of the Transition Probability Matrix

Eastern Canada Row 2 (Calves on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	S	T	R	C_U/P_W	Y	P_U/P_W	$\bar{R}^2$	DW
7	1.015 (0.871)	2908.329 (14.505)	-125.471 (-2.841)	-91.249 (-0.777)	-1790.352 (-1.578)	349.567 (1.315)	-967.556 (-0.558)	0.940	2.129
8	4.469 (3.553)	-441.385 (-2.040)	101.227 (2.124)	-89.931 (-0.709)	-950.971 (-0.781)	-278.558 (-0.971)	-1527.282 (-0.816)	0.646	1.893
9	-4.951 (-3.805)	-254.942 (-1.139)	-108.070 (-2.191)	122.858 (0.937)	781.546 (0.620)	315.972 (1.064)	2335.940 (1.206)	0.493	1.634
10	8.328 (3.769)	4824.686 (12.691)	20.812 (0.248)	-388.136 (-1.743)	-845.020 (-0.395)	150.849 (0.299)	-5650.395 (-1.718)	0.899	2.406
11	-8.233 (-3.533)	-5018.362 (-12.516)	24.380 (0.276)	365.693 (1.557)	2550.138 (1.130)	-125.148 (-0.235)	4151.167 (1.197)	0.895	2.342
12	0.665 (3.535)	-13.586 (-0.413)	-17.637 (-2.475)	5.981 (0.516)	153.503 (0.843)	96.022 (2.239)	-494.918 (-1.769)	0.275	1.718
13	0.124 (0.212)	-171.104 (-1.705)	30.670 (1.388)	34.557 (0.588)	-289.049 (-0.512)	-165.708 (-1.246)	797.424 (0.919)	0.194	1.756
14	2.943 (0.820)	655.111 (1.061)	-167.736 (-1.234)	-2.537 (-0.007)	-4875.822 (-1.404)	-101.999 (-0.125)	6673.163 (1.250)	0.679	2.122
15	-2.485 (-0.694)	-488.174 (-0.793)	93.563 (0.690)	-59.216 (-0.164)	4404.186 (1.270)	302.586 (0.371)	-7225.903 (-1.357)	0.545	2.021
16	2.557 (5.153)	104.942 (1.229)	35.270 (1.876)	-29.293 (-0.586)	-1946.271 (-4.051)	147.013 (1.299)	505.292 (0.684)	0.883	2.565
17	-3.066 (-3.599)	-126.466 (-0.865)	6.998 (0.217)	165.493 (1.933)	1101.984 (1.340)	-391.282 (-2.020)	1544.901 (1.222)	0.604	1.759
18	4.132 (4.883)	331.389 (2.276)	-28.906 (-0.901)	-154.588 (-1.812)	-1674.878 (-2.044)	491.926 (2.549)	-1554.863 (-1.235)	0.564	1.441

Row 2 continue

Dependent Variables	Constant	S	T	R	C_U/P_W	Y	P_U/P_W	$\bar{R}^2$	DW
19	-7.002 (-3.086)	-784.734 (-2.010)	-60.521 (-0.704)	400.879 (1.753)	1970.961 (0.897)	-29.457 (-0.057)	124.003 (0.037)	0.185	1.967
20	0.724 (0.207)	269.709 (0.448)	104.087 (0.786)	-491.603 (-1.395)	4554.973 (1.346)	-173.373 (-0.217)	3881.394 (0.746)	0.205	2.109
21	8.676 (3.497)	803.206 (1.882)	-21.199 (-0.225)	-56.341 (-0.225)	-6741.526 (-2.806)	-174.659 (-0.309)	-4093.830 (-1.109)	0.657	1.897
22	-7.903 (-6.169)	-2598.846 (-11.790)	112.533 (2.317)	267.443 (2.071)	3596.604 (2.899)	-413.749 (-1.416)	1501.465 (0.788)	0.905	2.318

Table 3.35 Multinomial Logit Regression Equations of the Transition Probability Matrix

Eastern Canada Row 3 (Steers on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	T	S	R	Y	W_E	P_U/P_W	$\bar{R}^2$	DW
23	0.448 (1.248)	-13.725 (-1.761)	145.879 (3.051)	-22.817 (-0.908)	43.993 (0.666)	-230.602 (-0.551)	23.717 (0.072)	0.655	2.614
24	4.228 (4.519)	27.960 (1.376)	-304.757 (-2.445)	-18.330 (-0.280)	-73.277 (-0.425)	1465.179 (1.244)	-710.487 (-0.825)	0.681	2.652
25	1.369 (8.226)	-4.688 (-1.298)	60.551 (2.732)	-3.430 (-0.294)	-7.534 (-0.246)	30.262 (0.145)	-80.087 (-0.523)	0.634	1.838
26	-5.138 (-3.098)	3.265 (0.091)	889.752 (4.028)	157.062 (1.353)	792.237 (2.595)	-5677.472 (-2.721)	436.591 (0.286)	0.437	1.257
27	-0.907 (-0.532)	-12.813 (-0.346)	-791.424 (-3.484)	-112.485 (-0.942)	-755.420 (-2.406)	4412.634 (2.056)	330.265 (0.210)	0.516	1.470

Table 3.36 Multinomial Logit Regression Equations of the Transition Probability Matrix

Eastern Canada Row 4 (Dairy heifers on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	S	$\dot{H}_E/F_E$	L_E/P_W	Y_E	R	$\dot{Z}$	$\bar{R}^2$	DW
28	2.464 (3.832)	-106.761 (-1.154)	287.452 (2.213)	-583.170 (-1.189)	61.853 (1.420)	-53.281 (-0.975)	18.444 (0.318)	0.289	2.216
29	1.151 (1.294)	105.405 (0.824)	-416.437 (-2.319)	269.576 (0.397)	-36.328 (-0.603)	68.797 (0.910)	-3.058 (-0.038)	0.105	2.311
30	0.669 (1.460)	-47.492 (-0.725)	172.634 (1.865)	162.456 (0.465)	29.699 (0.956)	-40.520 (-1.040)	-15.669 (-0.379)	0.209	2.447
31	1.283 (11.216)	55.684 (3.384)	-11.257 (-0.487)	69.028 (0.791)	-2.745 (-0.354)	-22.651 (-2.329)	3.056 (0.296)	0.675	2.299
32	1.501 (3.943)	-58.089 (- .061)	116.878 (1.521)	-140.700 (-0.485)	-31.882 (-1.236)	-114.838 (-3.549)	58.408 (1.701)	0.806	1.888
33	-7.068 (-21.504)	51.553 (1.091)	-149.240 (-2.248)	222.810 (0.889)	-20.596 (-0.925)	162.493 (5.816)	-61.181 (-2.063)	0.815	2.063

Table 3.37 Multinomial Logit Regression Equations of the Transition Probability Matrix

Eastern Canada Row 5 (Beef heifers on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	R	S	H_E/P_W	Y_E	$\dot{H}_E/F_E$	$\dot{C}_E$	$\bar{R}^2$	DW
34	1.265 (1.479)	-43.614 (-2.367)	-101.999 (-2.209)	109.074 (1.618)	-47.561 (-1.375)	-47.254 (-1.178)	48.077 (0.496)	0.177	2.055
35	-0.786 (-0.9 7)	39.080 (2.140)	90.229 (1.971)	-189.193 (-2.832)	69.895 (2.039)	52.367 (1.318)	8.816 (0.092)	0.192	1.912
36	1.497 (2.322)	-29.481 (-2.122)	-47.566 (-1.366)	122.544 (2.411)	-7.341 (-0.281)	0.705 (0.023)	-9.370 (-0.128)	0.141	2.120
37	1.248 (5.179)	-1.264 (-0.243)	31.959 (2.457)	39.416 (2.076)	-11.620 (-1.192)	-17.858 (-1.581)	-71.058 (-2.603)	0.633	2.341
38	-3.854 (-1.426)	52.578 (0.903)	271.919 (1.863)	-641.937 (-3.014)	168.995 (1.546)	-40.584 (-0.320)	944.464 (3.085)	0.390	1.579
39	0.629 (0.243)	-17.300 (-0.310)	-244.543 (-1.750)	560.096 (2.747)	-172.367 (-1.647)	52.624 (0.434)	-920.929 (-3.142)	0.384	1.451

Table 3.38 Multinomial Logit Regression Equations of the Transition Probability Matrix

Eastern Canada — Row 6 (Dairy cows on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	P_E/P_W	L_E/P_W	$\dot{R}$	Y	H_E/P_W	W_E	$\bar{R}^2$	DW
40	1.733 (1.275)	7696.288 (2.381)	-2671.456 (-5.348)	143.775 (1.642)	-65.785 (-0.237)	-697.992 (-1.272)	-1075.046 (-0.572)	0.667	2.927
41	0.872 (1.125)	-2177.872 (-1.182)	2198.492 (7.719)	-114.937 (-2.402)	164.285 (1.039)	71.552 (0.229)	-1666.817 (-1.556)	0.757	2.424
42	2.661 (4.355)	-3914.074 (-2.695)	997.855 (4.445)	-7.720 (-0.196)	-0.807 (-0.006)	-505.490 (-2.049)	677.031 (0.802)	0.593	2.003
43	2.264 (0.891)	-2184.662 (-0.362)	-962.471 (-1.031)	102.089 (0.623)	-475.413 (-0.917)	-348.550 (-0.340)	710.520 (0.202)	0.682	1.389
44	-7.529 (-3.540)	580.301 (0.115)	437.580 (0.560)	-118.208 (-0.862)	377.720 (0.870)	1480.483 (1.724)	1354.312 (0.461)	0.764	0.924

Table 3.39 Multinomial Logit Regression Equations of the Transition Probability Matrix

Eastern Canada Row 7 (Beef cows on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	L_E/P_W	Y	P_E/P_W	SC_E/F_E	C_E/F_E	T	$\bar{R}^2$	DW
45	1.000 (3.081)	-520.741 (-6.742)	6.115 (0.131)	418.366 (1.414)	83.947 (2.164)	562.974 (1.902)	2.592 (0.380)	0.703	1.636
46	0.392 (1.190)	468.211 (5.979)	-112.669 (-2.375)	364.579 (1.215)	-83.392 (-2.120)	-82.063 (-0.273)	14.467 (2.090)	0.708	1.577
47	1.535 (6.328)	272.800 (4.726)	42.290 (1.210)	-567.089 (-2.565)	-3.178 (-0.110)	-284.519 (-1.286)	-12.716 (-2.492)	0.543	2.423
48	-2.927 (-10.745)	-220.190 (-3.397)	64.273 (1.637)	-215.991 (-0.870)	2.581 (0.079)	-196.361 (-0.791)	-4.344 (-0.758)	0.456	1.978

Table 3.40 Multinomial Logit Regression Equations of the Transition Probability Matrix

Eastern Canada   Row 8 (Bulls on farm at the end of t)

Dependent Variables \ Independent Variables	Constant	S	T	P_E/P_W	$\dot{SC}_E/F_E$	Y	$\dot{R}$	$\bar{R}^2$	DW
49	-0.061 (-0.103)	20.186 (1.418)	-5.143 (-3.649)	126.698 (1.688)	19.805 (2.492)	11.576 (1.580)	-1.972 (-0.875)	0.689	2.244
50	-8.636 (-4.208)	118.526 (2.421)	-0.710 (-0.146)	1513.905 (5.867)	-89.774 (-3.285)	-58.817 (-2.334)	9.866 (1.273)	0.906	2.493
51	2.301 (2.164)	-18.170 (-0.716)	4.592 (1.828)	-26.141 (-0.195)	-46.604 (-3.290)	-17.835 (-1.366)	10.923 (2.719)	0.381	2.129
52	2.569 (1.375)	-85.416 (-1.917)	-3.068 (-0.965)	-360.846 (-1.537)	74.634 (3.000)	10.950 (0.477)	-7.145 (-1.013)	0.726	1.365
53	3.827 (1.525)	-35.126 (-0.587)	4.329 (0.730)	-1253.615 (-3.972)	41.938 (1.254)	54.126 (1.756)	-11.672 (-1.231)	0.847	1.608

Table 3.41 Multinomial Logit Regression Equations of the Transition Probability Matrix

Eastern Canada Row 9 (Calves imported from Western Canada during t+1)

Dependent Variables \ Independent Variables	Constant	T	P_E/F_E	SC_E/F_E	$\dot{R}$	$\dot{P}_E/F_E$	Y_E	$\bar{R}^2$	DW
54	2.254 (20.475)	-9.934 (-7.518)	901.421 (2.908)	-912.994 (-2.189)	-16.523 (-2.622)	5.988 (1.156)	5.373 (0.737)	0.864	2.367
55	0.878 (50.132)	-0.330 (-1.570)	39.030 (0.792)	-42.242 (-0.637)	-1.551 (-1.547)	0.364 (0.441)	0.334 (0.288)	-0.003	1.996
56	-0.223 (-4.679)	1.120 (1.963)	10.700 (0.080)	-30.210 (-0.168)	1.443 (0.530)	-4.769 (-2.131)	-0.171 (-0.054)	0.339	1.617
57	-0.147 (-2.643)	0.513 (0.768)	-647.110 (-4.136)	569.431 (2.704)	5.204 (1.636)	8.583 (3.281)	2.609 (0.709)	0.629	1.241
58	-0.614 (-3.315)	-1.516 (-0.683)	378.390 (0.726)	-325.944 (-0.465)	-9.899 (-0.934)	1.042 (0.120)	1.097 (0.090)	-0.079	2.334
59	-2.149 (-11.696)	10.148 (4.602)	-682.431 (-1.319)	741.958 (1.066)	21.327 (2.027)	-11.207 (-1.296)	-9.242 (-0.760)	0.662	1.734

Table 3.42 Multinomial Logit Regression Equations of the Transition Probability Matrix

Eastern Canada Row 11 (Heifers and steers imported from Western Canada during t+1)

Dependent Variables \ Independent Variables	Constant	T	S	Y	L_E/P_W	R	P_U/P_W	$\bar{R}^2$	DW
60	0.210 (1.354)	2.254 (1.094)	5.764 (0.468)	-6.961 (-0.649)	56.288 (1.202)	-5.268 (-1.060)	11.111 (0.147)	0.344	2.532
61	2.936 (14.743)	6.506 (2.354)	-2.420 (-0.147)	-19.899 (-1.382)	-54.999 (-0.876)	-12.398 (-1.860)	212.853 (2.106)	0.333	2.267
62	-3.537 (-8.622)	-13.484 (-2.368)	-9.213 (-0.271)	44.837 (1.512)	-62.675 (-0.484)	22.860 (1.664)	-284.332 (-1.365)	0.441	2.465
63	1.423 (3.787)	4.862 (0.932)	20.618 (0.662)	-2.940 (-0.108)	95.783 (0.809)	-10.037 (-0.798)	-43.955 (-0.231)	0.522	2.244
64	2.325 (16.516)	8.020 (4.105)	-8.461 (-0.725)	-37.869 (-3.721)	-33.576 (-0.756)	-11.375 (-2.414)	291.531 (4.081)	0.431	2.054
65	1.182 (26.944)	-0.642 (-1.055)	-13.354 (-3.673)	2.396 (0.756)	7.653 (0.553)	-2.061 (-1.404)	-5.095 (-0.229)	0.787	1.562
66	1.101 (2.290)	-16.761 (-2.512)	53.004 (1.330)	99.262 (2.855)	-211.511 (-1.396)	51.197 (3.180)	-759.945 (-3.262)	0.495	1.386
67	-5.630 (-10.143)	9.246 (1.200)	-45.939 (-0.998)	-78.827 (-1.964)	203.036 (1.169)	-32.918 (-1.771)	613.831 (2.179)	0.496	1.718

Table 3.43 Multinomial Logit Regression Equations of the Transition Probability Matrix

Eastern Canada — Row 12 (Heifers and steers imported from the U.S. during t+1)

Dependent Variables \ Independent Variables	Constant	P_E/F_E	S	T	Y	P_U/P_W	H_E/P_W	$\bar{R}^2$	DW
68	0.362 (6.609)	-5.666 (-0.838)	0.675 (3.570)	-0.073 (-0.803)	0.717 (1.122)	-4.021 (-1.055)	0.420 (0.549)	0.324	1.218
69	3.017 (31.105)	6.392 (0.534)	0.026 (0.074)	0.014 (0.086)	-0.001 (-0.001)	-2.228 (-0.329)	0.517 (0.382)	-0.196	1.329
70	-3.594 (-11.819)	12.096 (0.322)	-0.394 (-0.354)	0.270 (0.535)	-4.021 (-1.133)	33.748 (1.590)	-7.828 (-1.843)	0.419	2.076
71	0.215 (0.873)	-12.822 (-0.423)	-0.307 (-0.342)	-0.210 (-0.516)	3.305 (1.152)	-27.499 (-1.604)	6.891 (2.008)	0.484	2.499

Table 3.44 Multinomial Logit Regression Equations of the Transition Probability Matrix

Eastern Canada — Row 14 (Dairy males and females imported from the U.S. during t+1)

Dependent Variables \ Independent Variables	Constant	S	C_E/F_E	L_E/P_W	Y	$\bar{R}^2$	DW
76	-0.747 (-1.064)	-0.245 (-1.045)	0.694 (0.324)	-0.824 (-0.741)	0.119 (0.693)	0.369	2.200
77	0.747 (1.064)	0.245 (1.045)	-0.694 (-0.324)	0.824 (0.741)	-0.119 (-0.693)	0.369	2.200

FOOTNOTES TO CHAPTER 3

1. Western Canada exports calves, heifers, and steers to both Eastern Canada and the United States, while Eastern Canada does not export them to Western Canada. Also, Western Canada imports heifers and steers only from the United States, while Eastern Canada imports heifers and steers from Western Canada and the United States. Eastern Canada also imports dairy males and females from the United States.

2. For instance, there are 3 values in the row totals A, B and C, and there are 2 values in the column totals D and E. Now suppose that the sum of row totals A + B + C is less than the sum of column totals D + E, and the difference is X. The method used to distribute this difference involves subtracting (D/(D + E)) (X/2) from D, and (E/(D + E)) (X/2) from E, and adding (A/(A + B + C)) (X/3) to A, (B/(A + B + C)) (X/3) to B, and (C/(A + B + C)) (X/3) to C.

3. We assume that young dairy calves born in period t+1 are not exported in the same period as dairy males and females.

4. As an extension of the present study, it would be useful, perhaps, to perform some sort of sensitivity test of the initial assumptions to determine the extent to which they affect the final results.

5. Again, the 50-50 allocation between slaughter and retention is arbitrary, and is just an initial step to separate the

data. We rely on the RAS method to obtain the final distribution of slaughter and retention.

6. The number of negative entries in a single matrix varies from zero to four in the initial set of matrices.

7. It is believed that the cost of slaughter is largely passed on to the consumers. Hence, the higher the cost of slaughter, the higher will be the price of beef.

8. Tryfos(1974),pp.107-113.

9. Due to the difficulty of selecting the appropriate milk price and to marginal variations in the milk subsidy, both variables are ignored in the subsequent empirical analysis.

10. The length of time required for a steer to attain the desirable slaughter weight depends on the dairy feed inputs.

11. The expected returns and expected costs listed here are not applicable to each and every case in the subsequent empirical analysis. An outline of exactly what variables are to be included in each case will be presented later.

12. The treatment of cattle as capital good is best illustrated by Jarvis (1974,pp.489-520) and Carvalho (1975).

13. Jarvis (1974), p.492.

14. It is difficult to know with precision how expectation are

formed. Here we use the percentage change in value as a proxy for the expected value. Percentage change is indicated by a dot over a variable. For instance, $\dot{P}$ is defined as $(P_t - P_{t-2})/P_{t-2}$. P_{t-2} instead of P_{t-1} is used as the base period in calculating the expected value. In doing so, it is hoped, changes caused by seasonal variations can be minimized.

15. As previously discussed, income of the consumers is one of the key determinants of the derived demand for cattle. Income, which is regarded as the purchasing power of the consumers, is defined as personal disposable income minus personal farm income deflated by the consumer price index. The reason that we take away the personal farm income from our definition of income is that the personal farm income variable includes the inventory of farm produce. Such inventory moves erratically and is general regarded as a poor indicator of consumer purchasing power.

16. Certain prices (for example, the prices of calves, lambs, and hogs) are expressed relative to the price of Western Canada steers.

17. A discussion of the adding up property can be found in a recent manuscript by Denton(1977).

18. Both of these variables are divided by their respective stock totals in the equations actually fitted.

19. See Theil (1969), pp.251-259.

20. The zero entries in this cell reflect the fact that the majority of imports of heifers and steers from the United States are steers.

CHAPTER 4 -- SIMULATION WITH THE TRANSITION MATRICES

4.1 Estimation of Births of Calves and Imports of Cattle

The semi-annual historical transition matrices constructed from available data, as described in Chapter 2, are interesting in themselves. They indicate the movements of the different categories of cattle through time, and the probabilities associated with them. These probabilities are then further explained by sets of explanatory variables as described in the last chapter, based on two different sets of regression equations. In the present chapter we will see how the estimated equations can be used for simulation purposes.

Let x_t be a row vector, the elements of which represent the distribution of the total stock of cattle at the end of period t among the different categories specified. Let P_t to be the transition probability matrix which governs movements between the end of period t and the end of period t+1. The transition probability matrix is, in turn, determined by the estimated equations and the exogenous variables included in them, as specified in the previous chapter. The conditional expectation of x_{t+1} is then given by

$$E(x_{t+1} \mid x_t) = x_t P_t \qquad \text{------------------------(4.1)}$$

The conditional expectation of x_{t+2} is $x_t P_t P_{t+1}$, and so on. In general, the expected value at t+k, conditional on x_t, is given by

$$E(x_{t+k} \mid x_t) = x_t P_t P_{t+1} \cdots P_{t+k-1} \qquad \text{------------(4.2)}$$

Thus, if the initial vector is given, and the equations and exogenous variables governing the probabilities are specified, we can compute the changing matrices of probabilities for both regions. Based on these matrices, we can then calculate the flows of cattle into the different categories from period to period. By specifying different assumptions about the exogenous variables, we can further examine how such assumptions affect the probabilities, the flows, and the resultant stocks in the various categories.

Before we can proceed with simulation, we have to overcome one major difficulty. The difficulty is caused by the fact that the time period associated with births of calves and imports into the two regions is always one period (6 months) ahead of the period for the other rows. The reason for this is that the total number of calves born and the total number of imports are flows coming into the system, while the other rows indicate only the distribution of existing stocks. Hence, in order to make the system self-contained, we have to have separate estimates for the numbers of calves born and imports of the different types of cattle into the two regions.

Estimation of calves born

The number of calves born in either region is governed by the fertility rate of cows. It is reasonable to assume that this rate is not influenced by economic variables. This is because a heifer is kept on farm only for reproduction purposes and it will fulfil this purpose by giving birth to one calf every year. The decision to keep the heifer on farm for reproduction purpose is, by and large, influenced by the economic situation confronting the cattle producers, but the fertility rate itself is probably not.

The gestation period for a cow is roughly 270 days. Since we are working with semi-annual information, a calf born in period t should be conceived between the end of period t-2 and the begining of t-1. If we let f_t be the fertility rate at time t, we have the following relationship between the fertility rate, the total number of births, and the total number of cows capable of giving birth :

$$f_t = B_t/NC_t \qquad \text{------------------------------(4.3)}$$

where f_t is the fertility rate of cows in period t,

B_t is the total number of calves born in period t, and

NC_t is the average number of cows that were capable of conceiving and giving birth to calves in period t.

NC_t is further defined as a weighted average of the total number of cows on farm at the end of t-1 and t-2. Since for a calf to be born in period t, it should be conceived roughly at the end of period t-2 or the beginning of t-1, we apply equal weights to the number of cows at the end of t-1 and at the end of t-2 to derive the total number of cows capable of conceiving and giving birth to calves in period t. NC_t is therefore defined as

$$W_1C_{t-1} + W_2C_{t-2} \qquad \text{------------------------(4.4)}$$

where $W_1 = W_2 = 0.5$.

However, before we can proceed to calculate the fertility rate, we have to refine definition of cows on farm. Since in the Calves Born Survey there is no separate information relating to the number of births of beef calves and dairy calves, we have to group the total number of beef cows on farm and the number of dairy cows to come to the total number of cows on farm. Tables 4.1 and 4.2 present the fertility rates of cows in Western and Eastern Canada in this manner.

It is interesting to observe from Table 4.1 and 4.2 that the fertility rates for cows have been roughly constant over the years, aside from seasonal variation. The average rate in Western Canada is 0.84264 for the first half of the year and 0.10356 for the second half. The standard deviations assciated with the two average rates are 0.03210 for the first half of the year and 0.00798 for the second half of the year. For Eastern Canada, the fertility rates are 0.53723 and 0.36256 for the first and second halves of the year, respectively. The standard deviations assciated with the two average rates are 0.01312 for the first half of the year and 0.01804 for the second half of the year. It should be pointed out that once a heifer is kept on farm for reproduction purposes, the objective is to have her produce one calf per year. However, when the fertility rates in the two periods of the year are added together they do not add to 1. For Western Canada, the calculated average rates for cows sum to 0.94620; for Eastern Canada, they sum to 0.89978. The reason for such discreprancies, at least in part, is that cows are exported during any particular period of time and they may also die of natural causes during any particular period.

Table 4.1 Calculating the Fertility Rate of Cows in Western Canada

Period	No. of dairy cows on farm (end of t)*	No. of beef cows on farm (end of t)	Total No. of cows (end of t)	No. of cows capable of giving birth (NC_t)	Births (B_t)	Fertility rate (f_t)
1958I	822.0	1633.0	2455.0			
1958II	804.0	1595.8	2399.8			
1959I	800.2	1720.0	2520.2	2427.40	2001.8	0.8247
1959II	795.5	1675.0	2470.5	2460.00	286.6	0.1165
1960I	805.3	1776.3	2581.6	2495.35	2063.2	0.8268
1960II	798.9	1764.0	2562.9	2526.05	305.8	0.1207
1961I	816.8	1921.4	2738.2	2572.25	2214.9	0.8611
1961II	802.0	1862.0	2664.0	2650.55	301.9	0.1139
1962I	788.0	1989.0	2777.0	2701.10	2216.3	0.8205
1962II	754.0	1964.0	2718.0	2720.50	294.4	0.1082
1963I	753.0	2105.0	2858.0	2747.50	2266.8	0.8250
1963II	732.0	2135.0	2867.0	2788.00	296.3	0.1063
1964I	727.0	2333.0	3060.0	2862.00	2286.4	0.7989
1964II	699.0	2345.0	3044.0	2963.50	304.2	0.1026
1965I	688.0	2528.0	3216.0	3052.00	2522.6	0.8265
1965II	652.0	2445.0	3097.0	3130.00	309.6	0.0989
1966I	628.0	2517.4	3145.4	3156.50	2624.2	0.8314
1966II	597.0	2432.0	3029.0	3121.20	313.1	0.1003
1967I	574.0	2514.0	3088.0	3087.20	2544.7	0.8243
1967II	552.0	2389.0	2941.0	3058.50	295.7	0.0967
1968I	537.0	2444.0	2981.0	3014.50	2474.3	0.8208
1968II	520.0	2326.0	2846.0	2961.00	279.3	0.0943
1969I	509.0	2428.0	2937.0	2913.50	2433.4	0.8352
1969II	509.0	2423.0	2932.0	2891.50	271.4	0.0939
1970I	506.0	2593.0	3099.0	2934.50	2610.8	0.8897
1970II	486.0	2599.0	3085.0	3015.50	301.9	0.1001
1971I	487.6	2866.4	3354.0	3092.00	2849.7	0.9210
1971II	444.0	2807.0	3251.0	3219.50	318.4	0.0989
1971I	463.8	2999.0	3462.8	3302.50	2873.5	0.8701
1972II	427.0	3005.0	3432.0	3356.90	330.7	0.0985
1973I	441.0	3232.0	3673.0	3552.50	3067.8	0.8636

*All numbers, except the fertility rates, are in thousands.

Table 4.2 Calculating the Fertility Rate of Cows in Eastern Canada

Period	No. of dairy cows of farm (end of t)*	No. of beef cows of farm (end of t)	Total No. of cows (end of t)	No. of cows capable of giving birth (NC_t)	Births (B_t)	Fertility rate (f_t)
1958I	2206.0	378.5	2584.5			
1958II	2148.7	388.4	2537.2			
1959I	2154.5	381.6	2536.1	2560.85	1301.3	0.5082
1959II	2112.7	405.4	2518.1	2536.65	860.9	0.3394
1960I	2159.5	382.5	2542.0	2527.10	1306.4	0.5170
1960II	2122.1	417.4	2539.5	2530.05	883.5	0.3492
1961I	2170.0	419.6	2589.6	2540.75	1346.5	0.5300
1961II	2133.8	442.0	2575.8	2564.55	876.2	0.3417
1962I	2150.0	448.0	2598.5	2582.70	1347.7	0.5203
1962II	2099.0	466.8	2565.8	2587.15	894.7	0.3458
1963I	2120.0	474.3	2594.3	2582.15	1364.4	0.5284
1963II	2062.0	484.0	2546.0	2580.05	905.6	0.3510
1964I	2118.0	497.1	2615.1	2570.15	1406.6	0.5473
1964II	2062.0	495.7	2557.7	2580.55	921.6	0.3571
1965I	2107.0	507.0	2614.0	2585.40	1442.5	0.5577
1965II	2044.0	481.5	2525.5	2585.85	892.7	0.3452
1966I	2045.9	469.5	2515.4	2569.75	1380.5	0.5372
1966II	2001.0	470.8	2471.8	2520.45	918.6	0.3465
1967I	1995.0	481.6	2476.6	2493.60	1344.9	0.5393
1967II	1956.0	503.9	2459.9	2474.20	938.5	0.3793
1968I	1952.0	523.0	2479.0	2468.25	1368.7	0.5545
1968II	1925.0	512.2	2437.2	2469.45	942.0	0.3815
1969I	1933.0	555.0	2488.0	2458.10	1355.1	0.5513
1969II	1892.0	553.5	2445.5	2462.60	954.8	0.3877
1970I	1883.0	583.6	2466.6	2466.75	1352.3	0.5482
1970II	1809.0	608.7	2417.7	2456.05	953.7	0.3883
1971I	1767.5	647.9	2415.4	2442.15	1327.6	0.5436
1971II	1713.5	629.5	2343.0	2416.55	894.1	0.3700
1972I	1747.0	680.4	2427.4	2379.20	1273.6	0.5353
1972II	1720.0	660.7	2380.7	2385.20	894.6	0.3751
1973I	1711.0	708.6	2419.6	2404.05	1298.7	0.5402

*All numbers, except the fertility rates, are in thousands.

There are two additional facts worth mentioning in connection with the fertility rate. First, the annual rate for cows in Eastern Canada is 0.89978 while it is 0.94620 for Western Canada. This reflects, to a certain extent, the fact that exports of cows (which are largely dairy cows) from Eastern Canada tends to be greater than the exports from Western Canada. Secondly, the semi-annual fertility rates indicate that births of calves are more heavily concentrated in the first half of the year in Western Canada than in the second half. As for Eastern Canada, births of calves are more evenly distributed throughout the year.

Estimation of Imports

There are five different categories of cattle entering the system through imports. For Western Canada, there are imports of heifers and steers from the United States and the rest of the world. For Eastern Canada, there are imports of heifers and steers from Western Canada, imports of heifers and steers from the United States and the rest of the world, and imports of dairy males and females from the United States and the rest of the world. The Eastern Canada imports of calves and of heifers and steers from Western Canada are, of course, the exports of calves and of heifers and steers of Western Canada to Eastern Canada. For this reason, we do not need to estimate these import equations separately.

The estimation of the import equations is based on a number of conditions. Total imports is assumed to be determined by the ratio of prices in the exporting and importing regions for the particular type of cattle being traded, by the domestic cattle price and feed cost ratio in the exporting region (as an indication of the cattleman's rate of return), by real per capita disposable income minus the farm income (as an indication of consumer's demand), by a trend variable and by a seasonal variable. The estimated import equations are as follows:

(I) Imports of heifers and steers from the United States to Western Canada

$$\text{Total imports} = \underset{(0.672)}{20.00} - \underset{(-2.248)}{36.62}\ USS/WCS + \underset{(0.532)}{17.37}\ WCS/WCF + \underset{(0.628)}{2.51}\ Y$$

$$\underset{(-0.466)}{-0.22}\ T + \underset{(0.032)}{0.46}\ S$$

$\bar{R}^2 = 0.4617$ DW = 2.2224

(II) Imports of heifers and steers from the United States to Eastern Canada

$$\text{Total imports} = \underset{(1.263)}{238.64} - \underset{(-3.608)}{374.42}\ USS/ECS + \underset{(0.814)}{22.35}\ Y + \underset{(1.034)}{8.77}\ S$$

$$\underset{(-0.717)}{-2.36}\ T - \underset{(-0.063)}{15.27}\ ECS/ECF$$

$\bar{R}^2 = 0.4483$ DW = 1.6667

(III) Imports of dairy males and females from the United States to Eastern Canada

$$\text{Total imports} = \underset{(-0.160)}{-0.17} + \underset{(4.649)}{0.26}\ Y - \underset{(-2.277)}{1.92}\ USC/ECC + \underset{(2.018)}{0.16}\ S$$

$\bar{R}^2 = 0.7353$ DW = 2.8142

Note : Numbers in brackets are t-ratios.
$\bar{R}^2$ is the coefficient of determination corrected for degrees of freedom.
DW is the Durbin-Watson ratio.
The numbers of observations for imports of heifers and steers from the United States to Western Canada and Eastern Canada are 28 covering the period between 1959 to 1972.

The numbers of observations for imports of dairy males and females from the United States to Eastern Canada are 12 covering the period between 1966 to 1972.
Total imports are in thousands.

USS/WCS -- Ratio of the United States (Omaha) choice steer price ($/100 lbs.) adjusted by the exchange rate to the price of choice steer in Western Canada (Calgary).

WCS/WCF -- Ratio of the price of choice steer (Calgary) to the Western Canada feed grain price index.

Y -------- Real per capita personal disposable income minus personal farm income.

T -------- Trend: 1959I = 1, 1959II = 2,..., and so on.

S -------- Season: 1959I = 1, 1959II = 0,
1960I = 1, 1960II = 0, etc.

USS/ECS -- Ratio of the United States (Omaha) choice steer price ($/100 lbs.) adjusted by the exchange rate to the price of choice steer in Eastern Canada (Toronto).

ECS/ECF -- Ratio of the price of choice steer (Toronto) to the Eastern Canada feed grain price index.

USC/ECC -- Ratio of the United States (Kansas City) feeder calf price ($/100 lbs.) adjusted by the exchange rate to the price of stocker calf in Eastern Canada (Toronto).

The estimated import equations all have the expected signs on the ratios of prices in the importing and exporting regions. The estimated coefficients of the income variables are all positive as expected. The coefficients of the seasonal dummies are also positive while the trend coefficients are negative. These results all seem reasonable. As the purchasing power of consumers increases, the demand for imports of cattle increases. The negative trend coefficients indicate declining trends of cattle imports, while the positive coefficients associated with the seasonal dummy variable indicate that imports tend to be greater in the first half of the year than in the second. The coefficient of the domestic price-feed ratio in the equation for imports of heifers and steers into Western Canada from the United States indicates a positive relationship between imports and the profitability of raising cattle by the cattle producers. However, the price-feed ratio for the Eastern Canada import function of heifers and steers has a negative signs which is not easy to explain. However, judging by the t-ratio associated with this coefficient, the coefficient, is not significant.

As a result of introducing the fertility rate of cows and the import equations for the two regions, the system is now complete. This allows us to proceed with the simulation experiments referred to earlier.

4.2 Historical Simulation

As pointed out in the last chapter, one way of verifying our estimated probability equations is by simulation. In this section we discuss the simulation results for the two regions and compare these results with the published data. The simulation procedures used here are based on the conditional expected value equations developed in the previous section.

The conditional expected value of the row vector x_t at time t+1 is

$$E(x_{t+1} \mid x_t) = x_t P_t \qquad \text{-----------------------(4.3)}$$

where P_t is the transition probability matrix. In our present simulation, t refers to the first half of 1966 for cattle on farm and the second half of 1966 for the total number of calves born and cattle imported. We choose 1966 as our starting period for simulation because information regarding imports of dairy males and females from the United States to Eastern Canada is available only from that year onwards. The simulation covers seven half-year periods with the last period being the first half of 1969 for cattle on farm and the second half of 1969 for the total number calves born and cattle imported. The transition probability matrix P_t is generated by using the estimated coefficients outlined in the last chapter and the actual values of the exogenous variables for each period. Both the linear regression model and the multinomial logit model are used in the simulation. For comparative purposes, we will discuss only the simulated row totals for cattle on farm of each region. This is so because the row and column totals are the only variables for which there are published data. The simulated column totals are not discussed because the column totals of any particular period correspond to the row totals of the following period. For illustrative purposes, we present the simulated results of the two regions using the linear regression model and the multinomial logit model and compare these results with the adjusted row totals as presented in Appendix I and II.

Diagrams 4.1 to 4.8 provide a visual comparison of the actual and simulated results for Western Canada. Diagrams 4.9 to 4.16 display similar comparisons for Eastern Canada. A brief explanation is required. For Diagram 4.1, calves born during t+1 in Western Canada, we can see that both the linear and the multinomial logit models predict very well for the second half of every year but overestimate the first half of 1967 and 1968. From the second half of 1968 onward both models predict the historical figures very well. In fact, the numbers generated by the two models are so close that we can only use one set of lines (dotted lines as in this case) to indicate the predicted results. Diagram 4.2, calves on farm at the end of t in Western Canada, displays an overestimation of the historical figures in the second half of every year. The overestimation does appear to be levelling off at the end of the

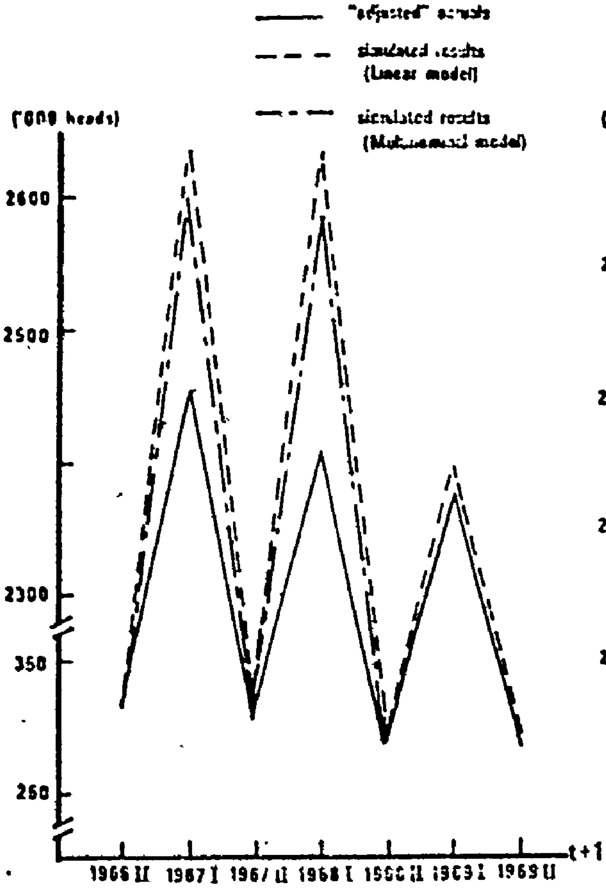


Diagram 4.1 Calves Born during t+1 in Western Canada

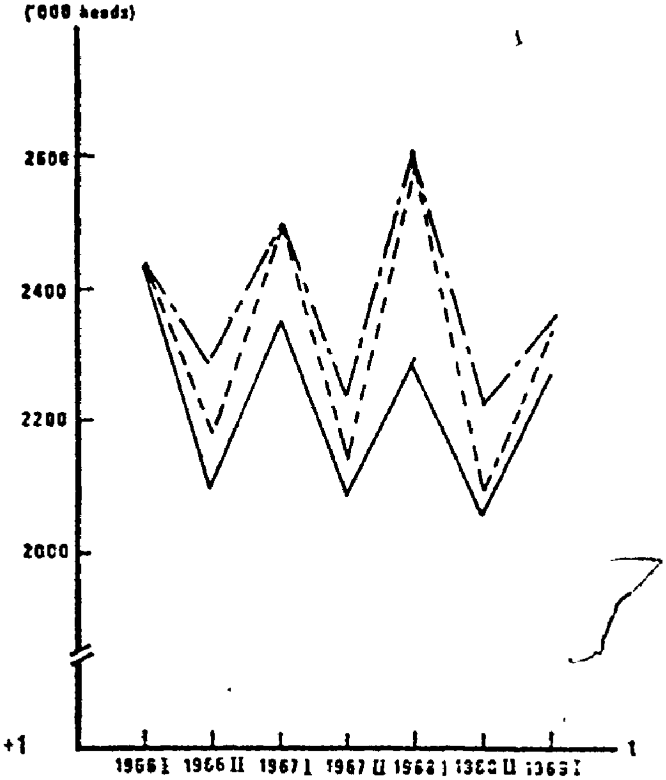


Diagram 4.2 Calves on Farm at the End of t in Western Canada

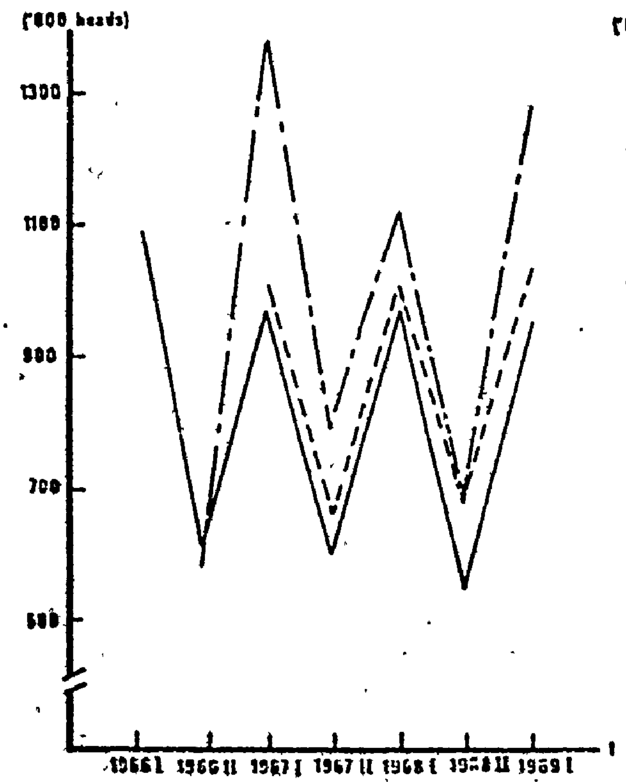


Diagram 4.3 Steers on Farm at the End of t in Western Canada

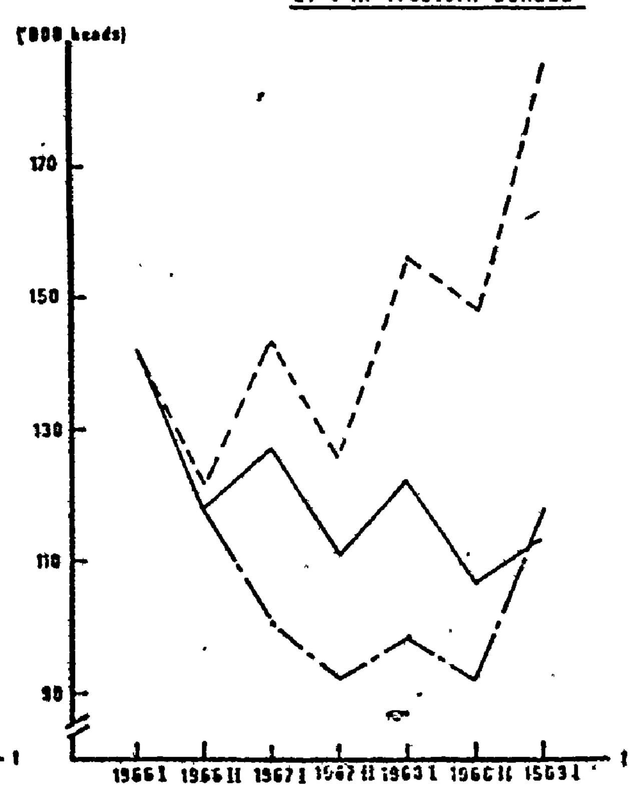


Diagram 4.4 Dairy Heifers on Farm at the End of t in Western Canada

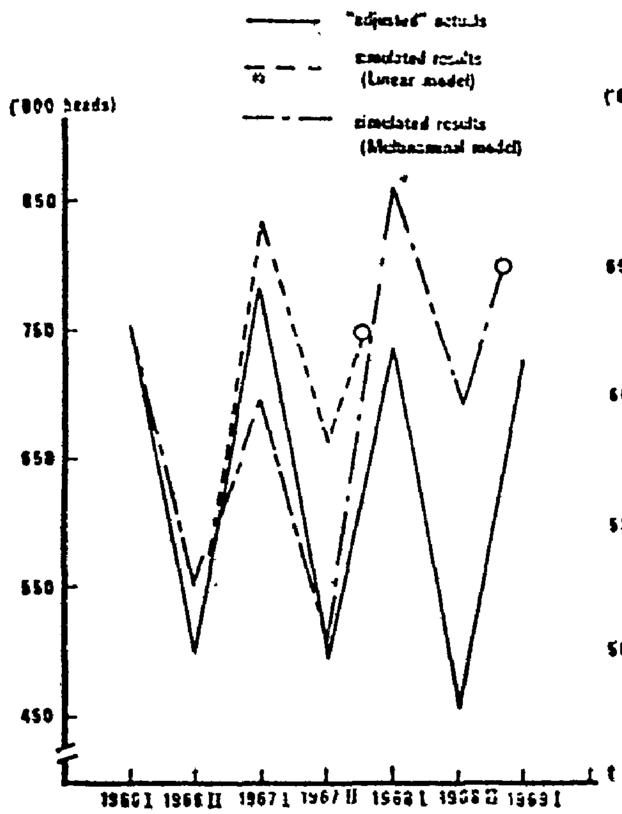


Diagram 4.5 Beef Heifers on Farm at the End of t in Western Canada

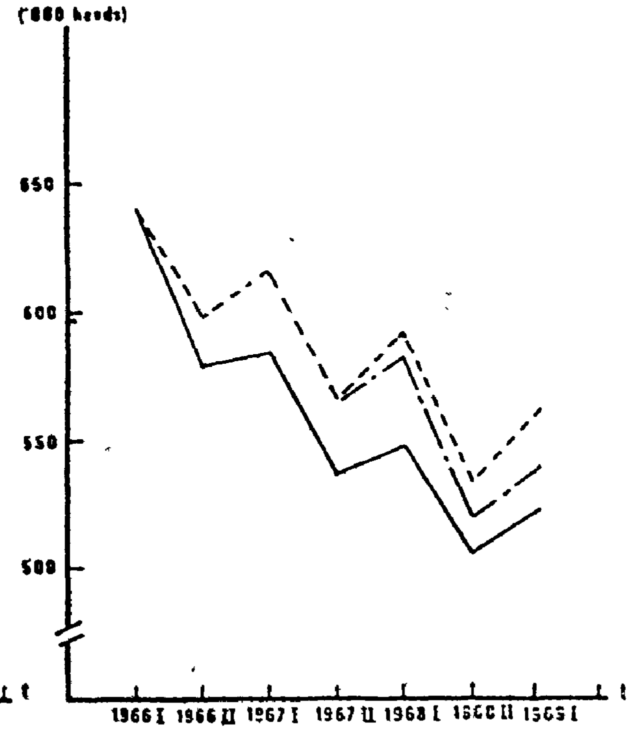


Diagram 4.6 Dairy Cows on Farm at the End of t in Western Canada

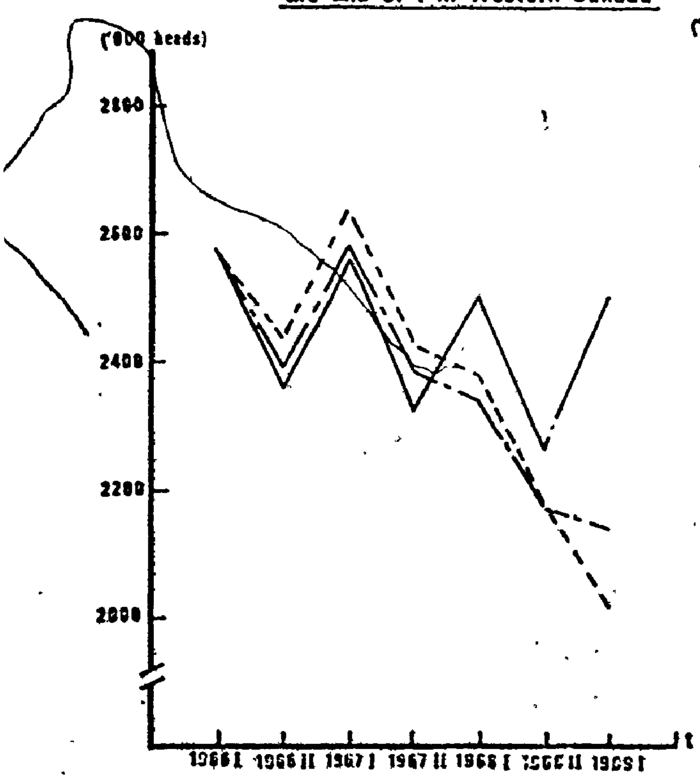


Diagram 4.7 Beef Cows on Farm at the End of t in Western Canada

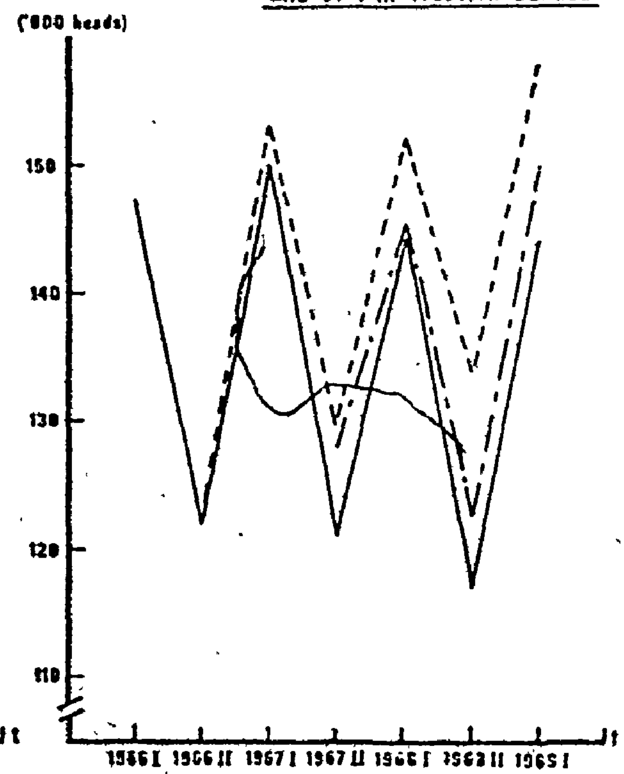


Diagram 4.8 Bulls on Farm at the End of t in Western Canada

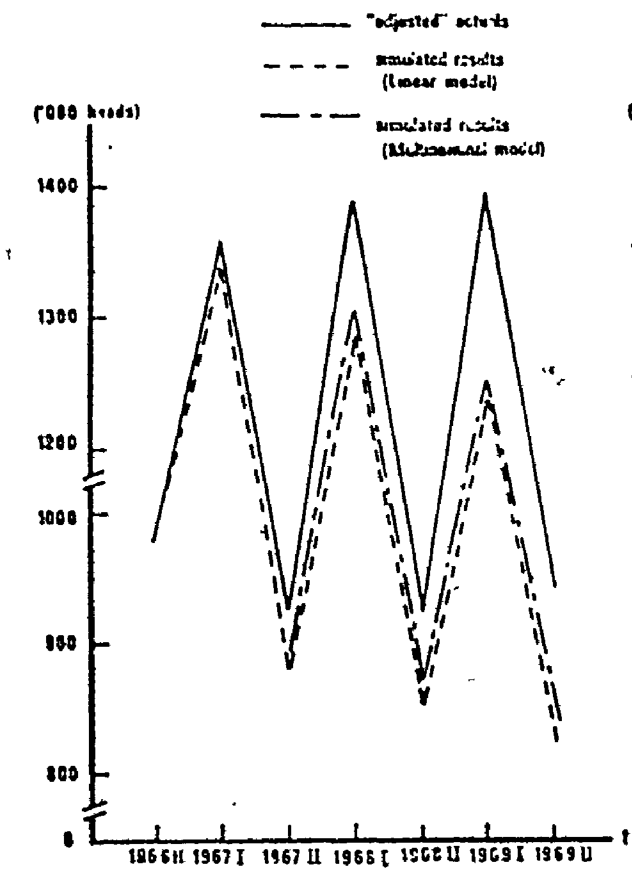


Diagram 4.9 Calves Born during t+1 in Eastern Canada

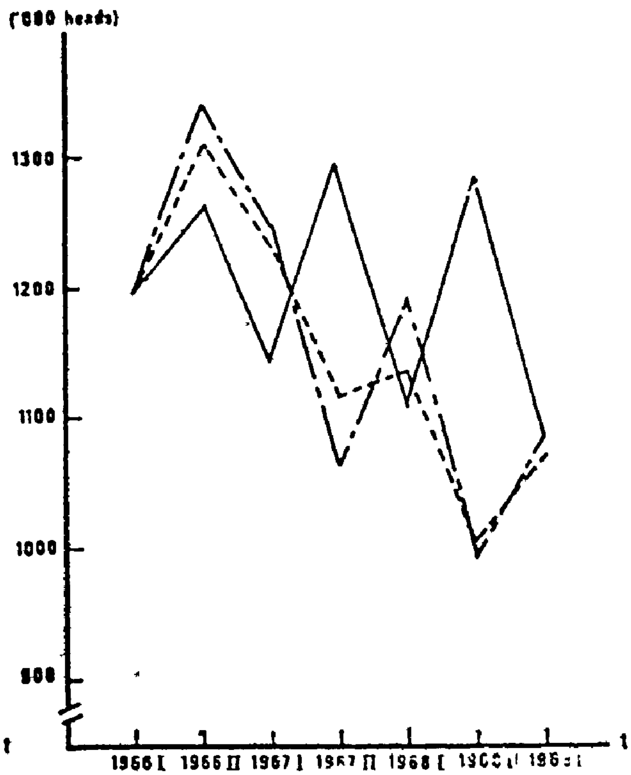


Diagram 4.10 Calves on Farm at the End of t in Eastern Canada

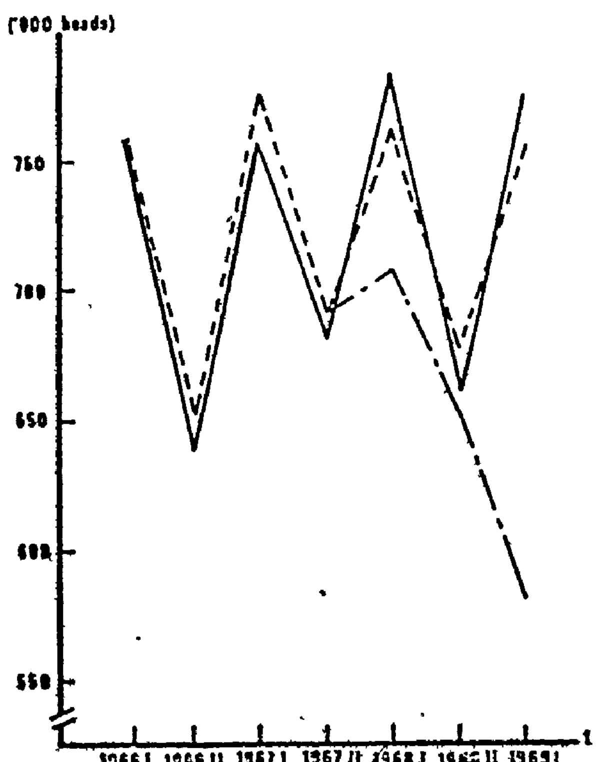


Diagram 4.11 Steers on Farm at the End of t in Eastern Canada

Diagram 4.12 Dairy Heifers on Farm at the End of t in Eastern Canada

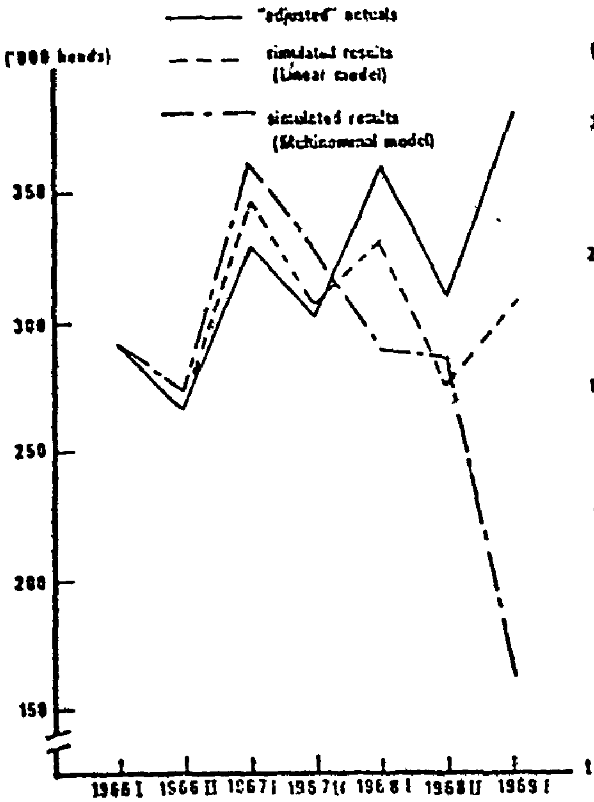


Diagram 4.13 Beef Heifers on Farm at the End of t in Eastern Canada

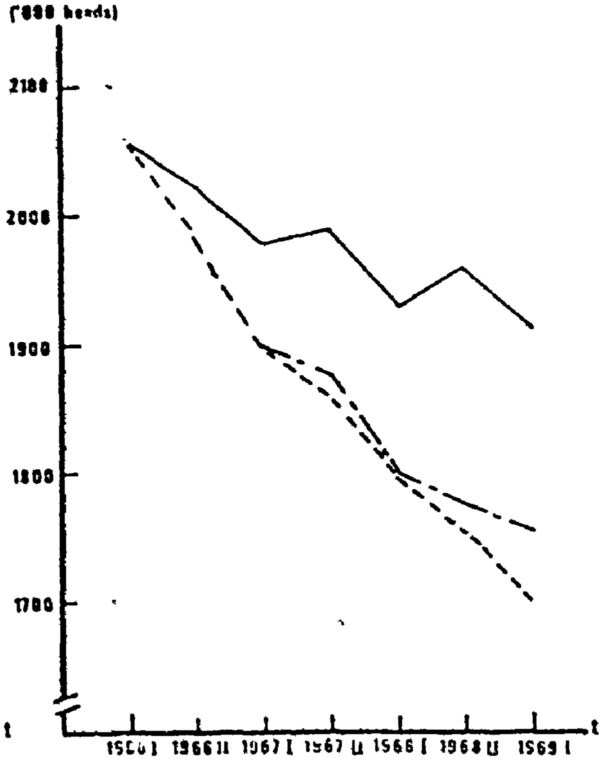


Diagram 4.14 Dairy Cows on Farm at the End ot in Eastern Canada

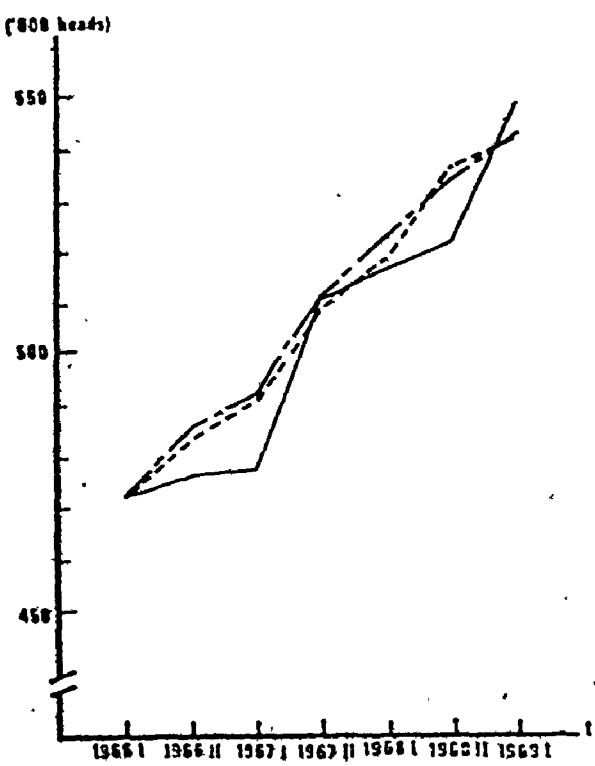


Diagram 4.15 Beef Cows on Farm at the End of t in Eastern Canada

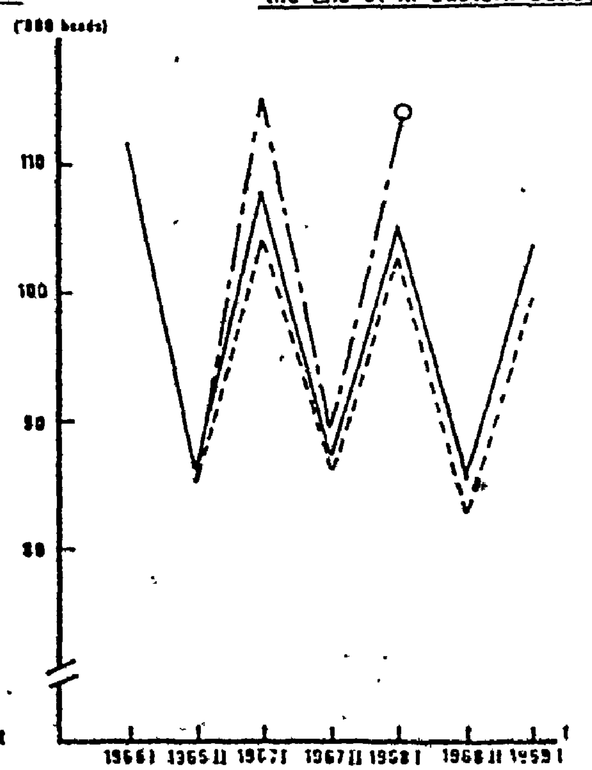


Diagram 4.16 Bulls on Farm at the End of t in Eastern Canada

first half of 1969, which is the last period of our simulation analysis. On the whole, the linear model appears to perform better in this case. Diagram 4.3, steers on farm at the end of t in Western Canada, shows that the linear model performs better for historical simulation. In fact, the simulated results as generated by the linear model for the first three periods are so close to the actual numbers that drawing of the dotted line on the diagram is impossible. Diagram 4.4 and 4.5 depict the number of dairy heifers and beef heifers respectively on farm at the end of t in Western Canada. The simulated results as generated by both the linear and multinomial models do not appear very impressive. For dairy heifers, the linear model grossly overestimates the historical figures while the multinomial model underestimates the historical figures. There is a sign, however, that the multinomial model starts to adjust and provide better predicted results at the end of our simulation period. For beef heifers, the linear model provides us with simulated results very close to the adjusted actual figures for the first three periods. However, starting from the first half of 1968, the linear model starts to generate numbers which are very large in value. The same situation occurs in the multinomial model results at the end of the first half of 1969. For this reason, results beyond the second half of 1967, as generated by the linear model, and results beyond the second half of 1968, as generated by the multinomial model, are not included in the diagram. In Diagram 4.6, dairy cows on farm at the end of t in Western Canada, both the linear and the multinomial models overestimate the historical figures. For the beginning four periods, the two models have generated numbers that are very close to one another. For this reason, only one set of lines indicating the simulated results (the dotted lines) is used. Diagram 4.7, beef cows on farm at the end of t in Western Canada, is quite self-explanatory. In Diagram 4.8, bulls on farm at the end of t in Western Canada, both the linear model and the multinomial model have generated numbers for the second half of 1966 so close to the historical actual that the drawing of the predicted results is impossible. Between the second half of 1966 and the second half of 1967, the two models have again generated numbers that are very close to each other. Again, only the simulated results generated by the linear model are shown.

Diagram 4.9 depicts the number of calves born in Eastern Canada during t+1. Both the linear and multinomial models have generated numbers that are very close to each other. Due to the closeness of the simulated results generated by the two models, only the results generated by the linear model for the initial three periods are shown in this diagram. When comparing this diagram with Diagram 4.1, calves born during the same periods in Western Canada, we see that the simulated results for the second half of each year are always better in both of the two regions. Diagram 4.10, calves on farm at the end of t in Eastern Canada, is self-explanatory. Neither of the two models reports very satisfactory results. In Diagram 4.11, steers on farm at the end of t in Eastern Canada, the simulated results generated by the linear model are very satisfactory. The multinomial results are quite satisfactory for the initial four periods, but starting from the fifth observation, the multinomial model performs rather poorly. Diagram 4.12 reports the number of dairy heifers on farm at the end of t in Eastern Canada. Both the linear and the multinomial models show very close results. Again, for the first three observations, because of the closeness of the results, only the results generated by the linear model are shown. After four periods of simulation, both models report unduly large simulated results as compared to the adjusted actuals. In Diagram 4.13, beef heifers on farm at the end of t in Eastern Canada, the results generated by the linear model appear to be superior than the results generated by the multinomial model. In fact, the linear model is so close to the adjusted actual that only the adjusted actual is shown on the diagram. In Diagram 4.14, dairy cows on farm at the end of t in Eastern Canada, it is quite obvious from the diagram that neither of the two models is capable of generating good predictive values in this case. This is also true for Diagram 4.15, beef cows on farm at the end of t in Eastern Canada. Finally, in Diagram 4.16, bulls on farm at the end of t in Eastern Canada, it is obvious that the linear model has generated a set of results which is better than the multinomial model. The results generated by the multinomial model have become so unduly large after the fourth period that we have excluded those results in the diagram. For the second observation, bulls on farm at the end of 1966 in Eastern

Canada, both models have generated results very close to the adjusted actual, and for this reason only the adjusted actual is shown on the diagram.

The sixteen diagrams presented above give us a visual display of the actual and simulated results. However, in order to study the predictive efficiency of the two models, the simulated results are tested using Theil's U-coefficient procedure.[1] If the U-coefficient is equal to 0, the simulated results are perfect. If U = 1, there is a complete lack of relationship between the predicted and the actual values.

As it was observed in several of the sixteen cases of comparison between actual and simulated results, there were signs that the simulated results exhibited tendency of adjusting themselves to the historical actuals. For this reason, we will extend our historical simulation period to fourteen observations extending from the first half of 1966 to the second half of 1972 for cattle on farm, and from the second half of 1966 to the first half of 1973 for calves born and cattle imported. This extended period of historical simulation will, hopefully, be able to capture the adjustments exhibited by the two models in predicting the historical actuals. This will also provide us with a better basis in determining which model performs better in historical 'forecasting' for each region. The U-coefficients for the two regions are shown in Tables 4.3 and 4.4.

Table 4.3 Theil's U-coefficient for the Different Rows of Western Canada

Using Adjusted Actuals

	Linear Model	Multinomial Model
Row 1*	0.165762	0.108875
Row 2	0.081829	0.077503
Row 3	0.042185	0.142948
Row 4	0.237194	0.358618
Row 5	0.504062	0.296966
Row 6	0.080226	0.067128
Row 7	0.154540	0.129559
Row 8	0.038816	0.076586
Row 12	0.279743	0.279143

*Definitions of the rows are as in Table 3.1 of Chapter 3.

Table 4.4 Theil's U-coefficient for the Different Rows of Eastern Canada

Using Adjusted Actuals

	Linear Model	Multinomial Model
Row 1*	0.057365	0.083870
Row 2	0.086960	0.112059
Row 3	0.019448	0.166864
Row 4	0.238229	0.262037
Row 5	0.058298	0.271105
Row 6	0.059868	0.078909
Row 7	0.010948	0.091475
Row 8	0.015665	0.555278
Row 9	0.499854	0.502814
Row 11	0.300116	0.191057
Row 12	0.332482	0.332482
Row 14	0.293226	0.293226

*Definitions of the rows are as in Table 3.2 of Chapter 3.

In general, the two models perform reasonably well in both regions, with the exception of the import rows. The relative inaccuracy of the import predictions is not surprising; imports of live cattle are usually more difficult to predict. The multinomial logit model displays better predictive efficiency in the Western Canada region, while the linear regression model shows better predictive efficiency in the Eastern Canada region.[2] The greatest difference occurs in row 5 (beef heifers on farm) for the Western Canada region and row 8 (bulls on farm) for the Eastern Canada region. Unfortunately, there is no intuitively simple explanation of these results.

The use of Theil's U-coefficient is helpful in assessing the predictive efficiency of the simulations. However, the U-coefficient fails to provide some other important information about the simulated results. It does not indicate whether the simulated results are overestimates or underestimates. It also fails to indicate the magnitude of the deviations of the simulated results from the actuals. To overcome these difficulties, two additional calculations are performed. First, the mean proportionate errors are calculated.[3] This measure indicates whether, on average the predictions overestimate or underestimate the actuals. The calculated means are presented in Tables 4.5 and 4.6.

Table 4.5 The Mean Proportion Error for the Different Rows of Western Canada

Using Adjusted Actuals

	Linear Model	Multinomial Model
Row 1*	-0.106664	-0.091329
Row 2	-0.070221	-0.048800
Row 3	0.051657	0.064921
Row 4	0.546421	0.626957
Row 5	1.400693	0.572350
Row 6	0.148200	0.110986
Row 7	-0.186129	-0.165493
Row 8	0.071350	0.119714
Row 12	1.360729	1.360729

*Definitions of the rows are as in Table 3.1 of Chapter 3.

Table 4.6 The Mean Proportion Error for the Different Rows of Eastern Canada

Using Adjusted Actuals

	Linear Model	Multinomial Model
Row 1*	-0.098914	-0.132137
Row 2	-0.100714	-0.127529
Row 3	0.013743	-0.215429
Row 4	0.461150	0.543529
Row 5	-0.072021	0.299907
Row 6	-0.104014	-0.125471
Row 7	0.000093	-0.094096
Row 8	-0.025293	0.620700
Row 9	0.753007	0.663100
Row 11	0.762914	-0.100621
Row 12	0.872136	0.872136
Row 14	-0.047421	-0.047421

*Definitions of the rows are as Table 3.2 of Chapter 3.

Tables 4.3 and 4.4 indicate that, on average, three rows are underestimated and six rows overestimated for Western Canada, while six rows are underestimated and six overestimated for Eastern Canada. The mean percentage of underestimation ranges from 7.46 to 18.99 for Western Canada and 2.01 to 9.71 for Eastern Canada. The mean percentage overestimates range from 4.56 to 13.7 for Western Canada and 0.55 to 78.10 in Eastern Canada. The poorest estimates are again seen to be associated with the import rows.

The mean proportionate errors do not indicate the degree of dispersion of the prediction errors : two different sets of estimates with the same mean errors may have quite different error distributions and predictive efficiency. We therefore calculate an additional measure, the mean <u>absolute</u> proportionate error.[4] The results are presented in Tables 4.7 and 4.8.

Table 4.7 The Absolute Mean Proportion Error for the Different Rows of Western Canada

Using Adjusted Actuals

	Linear Model	Multinomial Model
Row 1*	0.154707	0.129486
Row 2	0.113393	0.117457
Row 3	0.080271	0.256593
Row 4	0.546421	0.728914
Row 5	1.402550	0.588221
Row 6	0.148200	0.110986
Row 7	0.202200	0.172136
Row 8	0.071350	0.119714
Row 12	1.568843	1.568843

*Difinitions of the rows are as in Table 3.1 of Chapter 3.

Table 4.8 The Absolute Mean Proportion Error for the Different Rows of Eastern Canada

Using Adjusted Actuals

	Linear Model	Multinomial Model
Row 1*	0.098914	0.132137
Row 2	0.120843	0.160643
Row 3	0.027971	0.227057
Row 4	0.464893	0.543786
Row 5	0.082200	0.329300
Row 6	0.104014	0.125471
Row 7	0.015336	0.106886
Row 8	0.029050	1.232371
Row 9	1.473079	1.390471
Row 11	0.843628	0.349607
Row 12	2.154936	2.154936
Row 14	0.178371	0.178371

*Definitions of the rows are as in Table 3.2 of Chapter 3.

Comparing Table 4.5 with Table 4.7 and Table 4.6 with Table 4.8, we can see that in most cases the value for the absolute mean proportion error change. In particular, in row 3 (dairy heifers on farm) in Western Canada the mean proportion error based on the Adjusted Actual was 5.16%, but 8.03% for the absolute mean proportion error. Change also occurred in row 9 (imports of calves from the United States), row 12 (imports of heifers and steers from Eastern Canada) and row 14 (imports of dairy males and females from the United States) for the Eastern Canada region. These drastic differences in the value of the mean proportion error and the absolute mean proportion error indicate that the degree of the dispersion of the prediction error are quite large and are not captured by the simple mean proportion error measurement. On the other hand, if we have a case where the value for the absolute mean proportion error equals the mean proportion error it indicates that the over- or underestimation is consistent throughout the simulated period. For example, row 1 (calves born) of Eastern Canada.

4.3 Policy Simulations

The historical simulation experiments discussed in the previous section provide us with two useful items of information. They yield information concerning the effectiveness and accuracy of our estimation of the transition probabilities using the linear regression and multinomial logit models for the two regions. The experiments also provide a means to determine which model performs better in historical 'forecasting' for each region. Such information is very useful if we decide to limit further simulation experiments to one model for one region.

In this section we will investigate the effects of certain exogenous changes in the system and consider how such changes would affect the cattle industry, as described by our models. Basically, the exogenous changes are all historical, which means that if certain exogenous variables had behaved in a manner different from what history has recorded we can estimate what would have happened to the cattle industry. Such simulation experiments are not purely an academic exercise, but rather an important element in understanding the performance and behavior of the cattle industry. The experiments allow us to examine the nature and behavior of our models if such unexpected exogenous changes do occur within the system. We can then see how would such changes affect the Canadian cattle industry and in what fashion. This is definitely a very valuable and useful exercise. The exogenous variables that we will experiment with are basically income and the price variables. We will discuss further the selection of variables, and the results, as we proceed.

<u>Policy 1</u> : <u>A four percent semi-annual increase in personal income</u>

We select the change in personal income as a possible policy simulation for several reasons. First, real income, (which is defined as the per capita disposable income minus the farm income deflated by CPI) enters into every equation. Secondly, the steady 4% semi-annual increase is approximately equal to 8% annually, or roughly the maximum set up by the Anti-Inflation Board on wage increase under Bill C-73 (on December 3, 1975). The interesting question is, if the 8% annual increase in wages had been in operation since 1961, what might have happened to the Canadian cattle industry? To answer it, we will compare the new situation with a situation of no change in the system. For comparison purposes, we will examine only some of the important elements in the industry; namely, the retention of new born calves on farm, the retention of steers on farm, the retention of beef heifers on farm as replacement cows, the slaughter of new born calves, the slaughter of steers and the slaughter of beef heifers.[5] We will assign still another policy, a 8% semi-annual increase in personal income, which is large relative to actual experience, and compare this with both the 4% semi-annual increase and the <u>status quo</u>.

<u>Policy 2</u> : <u>An eight percent semi-annual increase in personal income</u>

This is designed specifically for comparison purposes. In this exercise we can assess the manner in which a 16% annual increase in wages would have affected the cattle industry.

Table 4.9 Comparison of Retention and Slaughter of Some Categories of Cattle Under Policy 1 and Policy 2 with the Status Quo Situation in Western Canada Using Multinomial Logit Model

RETENTIONS

	STATUS QUO			POLICY 1			POLICY 2		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
1966II	259.9*	575.4	23.0	263.1	576.0	22.7	132.8	545.1	50.8
1967I	2438.4	273.8	383.8	2438.8	275.5	373.3	2411.8	231.0	482.8
1967II	273.3	782.8	180.6	272.2	467.5	181.0	137.8	743.7	224.0
1968I	2421.2	394.4	156.9	2416.6	394.5	133.4	2390.0	328.0	149.8
1968II	244.2	643.9	13.4	242.0	638.6	13.0	6.5	586.2	441.6
1969I	2216.0	323.9	128.3	2193.3	320.8	104.3	2095.0	231.3	79.6
1969II	242.6	719.4	8.3	237.2	714.3	7.9	3.6	625.4	403.7

SLAUGHTERS

	STATUS QUO			POLICY 1			POLICY 2		
	(4)	(5)	(6)	(4)	(5)	(6)	(4)	(5)	(6)
1966II	4.5	303.7	4.1	4.4	303.6	4.1	3.2	307.2	1.8
1967I	16.0	276.6	2.4	16.0	275.8	2.6	16.7	280.4	0.5
1967II	4.2	419.1	2.9	4.2	418.4	2.8	3.8	431.5	0.3
1968I	15.5	342.0	1.0	15.5	394.5	1.2	16.7	344.5	0.0
1968II	3.6	351.0	3.0	3.6	351.1	2.6	0.2	370.2	0.2
1969I	13.8	312.0	1.4	13.8	310.6	1.5	15.0	315.6	0.0
1969II	1.6	399.8	4.0	1.6	400.2	3.5	0.0	412.6	0.4

*All the numbers are in thousands.

Note :
(1) New born calves
(2) On farm steers
(3) Beef heifers for breeding purposes
(4) New born female calves
(5) On farm steers
(6) On farm beef heifers

Table 4.10 Comparison of Retention and Slaughter of Some Categories of Cattle Under Policy 1 and Policy 2 with the Status Quo Situation in Eastern Canada Using Linear Regression Model

RETENTIONS

	STATUS QUO			POLICY 1			POLICY 2		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
1966II	708.0*	451.6	168.4	710.4	451.3	168.0	666.7	466.4	187.7
1967I	983.2	350.6	151.2	982.5	349.5	149.8	926.4	365.7	175.1
1967II	763.3	453.8	179.5	675.6	454.7	179.9	606.8	480.4	211.3
1968I	991.8	362.1	166.4	987.3	360.8	165.1	901.1	393.0	203.5
1968II	641.5	434.5	198.6	641.4	438.0	201.4	542.0	476.4	247.0
1969I	963.6	349.5	172.5	958.7	349.4	172.7	837.7	393.2	225.3
1969II	683.5	427.5	203.3	682.0	430.8	206.3	548.7	479.1	267.5

SLAUGHTERS

	STATUS QUO			POLICY 1			POLICY 2		
	(4)	(5)	(6)	(4)	(5)	(6)	(4)	(5)	(6)
1966II	65.2	299.2	10.8	65.2	299.5	10.8	65.6	285.5	10.4
1967I	99.1	269.9	9.0	99.1	297.9	9.0	99.5	277.6	9.8
1967II	50.7	312.8	10.0	50.7	312.9	9.8	51.0	329.9	0.0
1968I	90.2	312.1	9.2	90.3	312.8	9.2	89.9	286.9	14.1
1968II	44.3	319.1	10.8	44.3	317.9	10.5	44.0	381.2	0.0
1969I	85.1	322.1	10.2	85.1	321.9	10.3	83.8	285.3	21.2
1969II	38.9	321.9	14.2	38.9	320.5	14.2	38.1	276.9	0.0

*All the numbers are in thousands.

Note : (1) New born calves
(2) On farm steers
(3) Beef heifers for breeding purposes
(4) New born female calves
(5) On farm steers
(6) On farm beef heifers

In analyzing the impacts of the per capita income changes upon the cattle industry, we will examine the two regions separately. For Western Canada, we will compare the status quo situation with the two hypothetical situations using the multinomial logit model. For Eastern Canada, we will use the linear regression model to perform this comparison. In both regions the 4% semi-annual increase in personal income has only a very marginal effect on the cattle industry. This is because within our historical data period, per capita personal income followed roughly a 4% semi-annual increase. It is of greater interest to compare the 8% semi-annual increase in personal income with the status quo. In Western Canada, a 8% semi-annual increase in personal income causes a decrease in the retention of calves and steers throughout the entire simulation period. This decrease in retention is caused by the increase in consumer demand, which is reflected in the increase in the number of calves and steers slaughtered. The exercise, however, exhibits one contradiction. It is observed that the retention of beef heifers for breeding purposes increases in the first five periods of the analysis and then fluctuates. This outcome is difficult to explain, as is the result that the number of beef heifers slaughtered is smaller than it was under either the 4% personal income increase situation and the status quo! At this point, one might think that perhaps the number of heifers and steers exported from Western Canada could have been increasing (especially exports to Eastern Canada). Since the 8% semi-annual personal income increase is experienced in both the Western and Eastern Canada regions, and given the concentration of population in Eastern Canada this region will experience a much higher demand for beef. This unfortunately is not the case, as revealed by the models. There is a general increase in the import of heifers and steers into Eastern Canada, due to the 8% semi-annual increase in personal income, but the imports originated from the United Ststes only.

In Eastern Canada, the 8% semi-annual increase in personal income also causes a decrease in the retention of calves, a slight increase in the retention of steers, and an increase in the number of heifers retained for breeding. The 8% semi-annual increase in personal income also results in an increase in the slaughter of heifers, but a slight decrease in the number of steers slaughtered in each period.

Finally, it should be pointed out that as a result of this 8% semi-annual increase in personal income, the cattle industry in Eastern Canada will expand. The stocks of cattle at the end of each period appear to be larger than under the status quo situation.

Policy 3 : Subsidy scheme for heifers and steers for both Western Canada and Eastern Canada

In this policy analysis, we will examine the effect of the subsidy scheme on cattle production in operation in Canada since August 1974. Because this study covers only the period between 1959 and 1973, we will examine the effect of the scheme as if it had been in operation since 1966. The amount of the subsidy payment is a support level of $45.42 per hundred pounds for Grade A, B and C heifers and steers adjusted by the consumer price index.[6] In this policy simulation experiment we will establish a minimum price level for heifers and steers in Western Canada and Eastern Canada at the value indicated above.

Policy 4 : Constant steers price for both Western Canada and Eastern Canada

The purpose of Policy 3 is to ensure a guaranteed return for beef producers in Canada. In the subsequent policy simulation, we will examine the case where the return to the cattle producers was kept at a level which does not change throughout the analysis. Purposely, we will let heifers' prices vary just the way as recorded in history, and see how such a situation will affect the stocks of beef cows and steers at the end of each period.

Table 4.11 Comparison of Policy 3 and Policy 4 with the Status Quo Situation in Western Canada Using the Multinomial Logit Model

	STATUS QUO		POLICY 3		POLICY 4	
	Steers on farm	Beef cows on farm	Steers on farm	Beef cows on farm	Steers on farm	Beef cows on farm
1966I	1019.2*	2578.3	1019.2	2578.3	1019.2	2578.3
1966II	583.3	2385.2	570.5	2412.5	611.9	2374.9
1967I	1394.4	2580.7	433.6	2699.7	1734.0	2488.8
1967II	798.8	2391.8	290.1	2492.6	1008.6	2350.3
1968I	1123.6	2350.6	292.5	2308.6	1920.4	2317.8
1968II	672.7	2170.2	210.6	2127.2	1163.0	2233.5
1969I	1283.1	2135.1	231.7	1986.7	1941.1	2106.1

*All the numbers are in thousands.

Table 4.12 Comparison of Policy 3 and Policy 4 with the Status Quo Situation in Eastern Canada Using the Linear Regression Model

	STATUS QUO		POLICY 3		POLICY 4	
	Steers of farm	Beef cows on farm	Steers on farm	Beef cows on farm	Steers on farm	Beef cows on farm
1966I	759.9*	471.5	759.9	471.5	759.9	471.5
1966II	653.6	483.8	622.8	500.6	458.1	469.8
1967I	776.4	489.5	406.1	515.1	793.9	468.8
1967II	680.3	510.5	619.3	540.6	691.7	479.6
1968I	763.0	519.1	721.3	545.7	799.0	476.3
1968II	677.3	537.2	621.6	575.5	716.7	493.5
1969I	758.1	539.4	706.3	580.2	793.5	490.1

*All the numbers are in thousands.

First of all, we should expect that under a subsidy scheme for beef production, the producers would be inclined to keep more cattle for reproduction and sale. As a result, the total number of beef cows of farm should increase and this is observed in Eastern but not Western Canada. In Western Canada, the total number of beef heifers on farm did increase for the first four periods of our analysis but fell slightly below the status quo during the remaining 3 periods. The number of steers on farm under the subsidy scheme is always below the status quo situation for both regions. This could be caused by the fact that producers will tend to sell as many steers as possible under this favorable price situation. Under Policy 4, where the steer prices for both regions were held constant throughout the analysis, we expect that the number of beef cows on farm will decline as profit margins decline. This fact is observed in both regions. As for the number of steers kept on farm under this experiment, we should expect it to be less than with the status quo. This fact is observed in Western but not Eastern Canada. This contradiction is not easy to explain.

Policy 5 : An once-and-for-all increase in the United States steer price

The United States cattle industry is about 10 times the size of its Canadian counterpart. Since there is active trading of cattle between the United States and Canda, we can thus expect the United States steer price will have a predominant effect on the Canadian cattle industry. In this exercise we incorporate a sudden increase in the United States steer price by 100% in the second period of our analysis and then allow it to return all at once to the normal price level in the following periods. We would like to examine how such a sudden change in the United States price will affect the Canadian industry, and how long will the latter take to adjust to equilibrium (the status quo) if indeed equilibrium is attainable.

Policy 6 : A sudden increase in the United States steer price and with the price remaining at the new rate throughout the analysis

This analysis is an extension of the analysis discussed under Policy 5. This exercise will allow us to ascertain how a sustained high United States steer price will affect the Canadian industry, and in particular, how it will affect the number of beef cows on farm and the number of steers on farm at the end of each period.

Table 4.13 Comparison of Policy 5 and Policy 6 with the Status Quo Situation in Western Canada Using the Multinomial Logit Model

	STATUS QUO		POLICY 5		POLICY 6	
	Steers on farm	Beef cows on farm	Steers on farm	Beef cows on farm	Steers on farm	Beef cows on farm
1966I	1019.2*	2578.3	1019.2	2578.3	1019.2	2578.3
1966II	583.3	2385.2	583.3	2385.2	583.3	2385.3
1967I	1394.4	2580.7	1780.3	2580.8	1779.0	2579.9
1967II	798.8	2391.8	991.8	2544.5	988.4	2541.6
1968I	1123.4	2350.6	1217.3	2350.6	447.4	2325.0
1968II	672.7	2170.2	721.6	2202.6	246.3	2135.2
1969I	1283.1	2135.1	1319.8	2456.9	81.5	1979.0

*All the numbers are in thousands.

Table 4.14 Comparison of Policy 5 and Policy 6 with the Status Quo Situation in Eastern Canada Using the Linear Regression Model

	STATUS QUO		POLICY 5		POLICY 6	
	Steers on farm	Beef cows on farm	Steers on farm	Beef cows on farm	Steers on farm	Beef cows on farm
1966I	759.9*	471.5	759.9	471.5	759.9	471.5
1966II	653.6	483.8	650.1	482.1	650.1	484.2
1967I	776.4	489.5	936.0	488.3	823.6	482.4
1967II	680.3	510.5	772.2	506.8	781.4	457.1
1968I	763.0	519.1	817.3	515.1	835.4	315.4
1968II	677.3	537.2	711.9	533.9	894.1	226.2
1969I	758.1	539.4	780.4	537.0	850.6	264.5

*All the numbers are in thousands.

The results of the two policy simulations are very interesting. Under Policy 5 (an once-and-for-all increase in the United States steer price in the second period) we can see that there is no immediate effect on steers on farm and beef cows on farm in Western Canada. On the contrary, there is an immediate decrease in the number of steers on farm and the number of beef cows on farm in Eastern Canada. This is largely due to the fact that, as a result of the United States price increase, there is an immediate decrease in Canadian import of United States steers. As the United States steer price returns to its normal level in the third period, an increase in steers on farm is experienced in Eastern Canada. The system adjusts to its normal (status quo) level of steers on farm and beef cows on farm after four periods of simulation. This, however, is not the case in Western Canada, where the once-and-for-all increase in the United States steer price has caused a constant increase in the number of steers on farm as well as the number of beef cows on farm. The increase in the size of the breeding herd is an indication of the increase in the size of the cattle industry caused by the sudden increase in the United States steer price.

Under Policy 6 (an increase in the United States steer price, with the new price remaining throughout the analysis), the number of steers on farm decreases due to a favorable price situation in steers exported to the United States. The number of beef cows on farm, however, increases. This is consistent with what one might expect. A favorable United States steer market will undoubtedly lure Western Canada producers into expanding the industry. In

Eastern Canada, this policy has caused a contraction of the cattle industry, as reflected in the decrease in the number of beef cows on farm. This is difficult to explain, because as the United States steer price increases we would expect Eastern Canada to expand its industry in order that it will need to rely less upon the United States supply. The number of steers on farm in Eastern Canada remained fairly stable despite the increase in the United States price.

FOOTNOTES TO CHAPTER 4

1. The coefficient can be written as $U = (\sqrt{\Sigma(P_i - A_i)^2/N})/((\sqrt{\Sigma(A_i)^2/N} + (\sqrt{\Sigma(P_i)^2/N}))$ where P_i = predicted or simulated value, A_i = actual value and N = number of observations. A discussion of the U-coefficient can be found in Theil (1961), pp. 31-48. A revised version of the U-coefficient was suggested by Theil (1966, pp. 26-29) where the coefficient was redefined as $(\sqrt{\Sigma(P_i - A_i)^2/N})/(\sqrt{\Sigma(A_i)^2/N})$. This revised definition has the root-mean-square realized change in the denominator. This, of course, has its virtues as outlined by Theil. But, only the former U-coefficient has its values lie between 0 and 1, which is a definite advantage in understanding the predictive efficiency of the different models.

2. In Western Canada, five out of the nine U-coefficients calculated using the multinomial logit model have a smaller value than those based on the linear regression model. The situation is reversed in Eastern Canada, where a total of nine out of the possible twelve U-coefficients are smaller in value for the linear regression model than for the multinomial logit model.

3. The mean proportionate error is defined as $1/N\Sigma((P_i - A_i)/A_i)$ where P_i is the predicted value and A_i is the actual value.

4. The mean absolute proportionate error is defined as $1/N \left| \Sigma(P_i - A_i)/ A_i \right|$ where P_i is the predicted value and A_i is the actual value.

5. The retention of new born calves is defined as the number of calves retained on farm at t+1 from calves born in t+1. Retention of steers and beef heifers are defined as the number of steers and beef heifers retained on farm at t+1 from steers and replacement beef cows on farm on farm at t. Slaughter of new born calves, steers and beef heifers are defined in the similar fashion.

6. The $45.42 per hundred pounds subsidy scheme was announced by the federal government in August 1974.

CHAPTER 5 -- CONCLUDING REMARKS

The transition matrices which we have developed provide us with useful information regarding the distribution of cattle through time. It is a convenient way of summarizing the existing data series on cattle and disaggregating them into more detailed and useful categories. The transition probability matrices, on the other hand, provide us with information regarding the proportional distribution of cattle. In this present analysis, we have demonstrated how such probabilities can be treated as dependent variables to be explained by a set of economic variables. We have also shown the effects of changes in the exogenous variables on the performance of the industry. The transition probability matrices also provide us with information which is useful and normally not easily available, including for instance, the retention rates for different categories of cattle. These rates are actually the probabilities associated with their respective cells. The retention and slaughter rates are well explained by the regression analysis discussed in the previous sections. The death rates, however, are not very well explained in most cases.[1] This is caused by the way we selected the exogenous variables in our regression analysis. As explained in Chaper 3, Section 4, no critical analysis was attached to the performance of the different exogenous variables in the different death categories, when deciding upon the exogenous variables to be retained. A further look at the [illegible] of [illegible]tle is therefore necessary. A detailed discussion of the death rates can be found in Appendix III.

The present study of the Canadian cattle industry opens up a new way of analyzing the movements of cattle among the different categories and between the different regions. The transition matrices for the two regions have not only provided us with information regarding the movement of cattle, but also the structural changes of the industries through time.[2] Such knowledge is useful to both the policy makers and the individual cattle producers.

The transition matrices analysis of the cattle industry, however, fails to generate any price information which some people may regard as very important within the system. This is, of course, a shortcoming of the approach. However, it should not be used as an indication that the approach is not worth further investigation and experimentation. One of the main contributions of using the transition approach in analyzing the industry is that it generates data that are otherwise difficult to obtain; the approach also serves as a vehicle to reconcile the existing data series from different sources. The price variables of cattle, the income variables, and the price variables of different substitutes are all treated as exogeneous in the system. It is, therefore, necessary to rely on other sources to generate these exogenous variables for forecasting purposes.

This study is, to the best of the author's knowledge, the first one that uses the transition matrix approach in analyzing the cattle industry. It is, therefore, not surprising that it is not difficult to point out scope for improvement. First, there is the need to establish some sort of accuracy check in the transition matrices. As described in Chapter 3, the only information that we have in constructing the transition matrices is the row and column totals, and the procedures we used to fill up the cell entries involve using 'reasonable' assumptions and mechanical procedures. In order to generate more accurate and reliable transition matrices we might need additional information so that we can check the accuracy of the cell entries. One way of achieving this is to have a survey of the movements of the cattle among the different categories in some particular periods. Such information would allow us to check the accuracy of the transition matrices and would provide a basis for readjustment. Secondly, there are avenues to be explored in obtaining better equation estimates of the individual cell entries as presented in Chapter 3, Sections 4 and 5. If we can set up models for each individual cell entries and estimate those cells independently we might be able to come up with better estimates of the cattle flows from one category to another. This process will, of course, not preserve the adding up property of each row. Thirdly, in the discussion of the historical simulation as outlined in Chapter 4, Section 2, the conditional expectation of the row vector x_t at time t+1 is:

$$E(x_{t+1} \mid x_t) = x_t P_t \quad \text{----------}(5.1)$$

where P_t is the transition probability matrix. The conditional expectation of x_{t+2} is $x_t P_t P_{t+1}$, and so on. In general, the expected value at t+k, conditional on x_t, is given by:

$$E(x_{t+k}|x_t) = x_t P_t P_{t+1} \ldots P_{t+k-1} \quad \text{----------(5.2)}$$

This means that the value of x_{t+k} is conditioned upon the estimated value of x_{t+k-1}. As an alternative approach to this simulation exercise, we can have the expected value of any x_{t+n} ($n>0$) depends upon the actual value of x_{t+n-1} and not $x_t P_t P_{t+1} \ldots P_{t+n-1}$, or for that matter, the initial $\tilde{x}_t$. This approach will undoubtedly improve the results of 'forecasting' and historical simulation.

Finally, I would like to reemphasize that this study is the first attempt of its kind and the same transition matrix technique can be used in the analysis and study of other livestock industries.

FOOTNOTES TO CHAPTER 5

1. One way of looking at the structural change of the industry is by examining the change in the proportion of cattle slaughtered or retained through time.

2. Death rates of the different categories of cattle are defined as the percentage of death of cattle by natural causes in their respective categories.

Appendix I

Transition Matrices For Western Canada

Note: Definitions of the different rows and columns are those given in Table 3.1 and are presented as follow:

Row 1 Calves born during t+1
Row 2 Calves on farm at the end of t
Row 3 Steers on farm at the end of t
Row 4 Dairy heifers on farm at the end of t
Row 5 Beef heifers on farm at the end of t
Row 6 Dairy cows on farm at the end of t
Row 7 Beef cows on farm at the end of t
Row 8 Bulls on farm at the end of t
Row 9 Calves imported from Eastern Canada during t+1
Row 10 Calves imported from the United States during t+1
Row 11 Heifers and steers imported from Eastern Canada during t+1
Row 12 Heifers and steers imported from the United States during t+1
Row 13 Dairy male and female imported from Eastern Canada during t+1
Row 14 Dairy male and female imported from the United States during t+1

Column 1 Calves on farm at the end of t+1
Column 2 Steers on farm at the end of t+1
Column 3 Dairy heifers on farm at the end of t+1
Column 4 Beef heifers on farm at the end of t+1
Column 5 Dairy cows on farm at the end of t+1
Column 6 Beef cows on farm at the end of t+1
Column 7 Bulls on farm at the end of t+1
Column 8 Inspected slaughter of male calves during t+1
Column 9 Inspected slaughter of female calves during t+1
Column 10 Uninspected slaughter of calves during t+1
Column 11 Inspected slaughter of steers during t+1
Column 12 Inspected slaughter of heifers during t+1
Column 13 Inspected slaughter of cows during t+1
Column 14 Inspected slaughter of bulls during t+1
Column 15 Uninspected slaughter of cattle during t+1
Column 16 Calves died during t+1
Column 17 Cattle died during t+1
Column 18 Calves exported to Eastern Canada during t+1
Column 19 Calves exported to the United States during t+1
Column 20 Heifers and steers exported to Eastern Canada during t+1
Column 21 Heifers and steers exported to the United States during t+1
Column 22 Dairy male and female exported to Eastern Canada during t+1
Column 23 Dairy male and female exported to the United States during t+1

The time periods for the first transition matrix are the first half of 1959 for row 2 to row 8, and the second half of 1959 for row 1, row 9 to row 14. The second transition matrix refers to a period of six months after the first matrix, and so on.

Calendar period: Row 2 to Row 8 -- first half of 1959
Row 1 and Row 9 to Row 14 -- second half of 1959

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	252.3	0.0	0.0	0.0	0.0	0.0	0.0	6.8	6.4	2.3
ROW 2	1478.9	38.3	2.3	48.3	0.0	0.0	.8	43.6	41.3	14.7
ROW 3	0.0	362.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	170.1	0.0	18.8	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	345.1	0.0	3.9	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	759.7	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	1634.9	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	105.6	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	.6	0.0	.6	0.0	.6	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	1731.2	401.3	172.4	394.0	778.5	1639.4	106.4	50.4	47.7	17.0

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	3.1	0.0	8.9	13.0	0.0
ROW 2	1.8	1.0	0.0	0.0	3.5	21.2	3.9	57.3	84.1	37.0
ROW 3	186.0	0.0	0.0	0.0	4.3	0.0	4.7	0.0	0.0	49.8
ROW 4	0.0	2.6	0.0	0.0	1.1	0.0	1.3	0.0	0.0	0.0
ROW 5	0.0	102.3	0.0	0.0	4.4	0.0	4.8	0.0	0.0	50.6
ROW 6	0.0	0.0	48.2	0.0	4.5	0.0	5.9	0.0	0.0	0.0
ROW 7	0.0	0.0	103.4	0.0	9.5	0.0	10.5	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	13.8	2.6	0.0	3.0	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	.7	.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.2
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	188.4	106.1	151.6	13.8	29.9	24.5	33.2	66.2	97.1	137.6

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	293.0
ROW 2	15.4	0.0	.0	1893.4
ROW 3	20.8	0.0	0.0	627.9
ROW 4	0.0	0.0	.1	194.0
ROW 5	21.0	0.0	0.0	532.1
ROW 6	0.0	0.0	.6	818.0
ROW 7	0.0	0.0	0.0	1758.4
ROW 8	0.0	0.0	0.0	125.0
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	.2	0.0	0.0	3.0
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	57.3	0.0	.8	6244.8

Calendar period: Row 2 to Row 8 -- second half of 1959
Row 1 and Row 9 to Row 14 -- first half of 1960

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	1836.3	0.0	0.0	0.0	0.0	0.0	0.0	26.4	23.3	8.5
ROW 2	122.1	502.6	134.7	520.2	0.0	0.0	32.5	22.7	20.0	7.3
ROW 3	0.0	182.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	65.2	0.0	101.0	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	31.9	0.0	293.9	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	724.3	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	1526.4	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	92.8	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	.1	0.0	.1	0.0	.1	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	1958.4	684.8	199.9	552.2	825.3	1820.4	125.3	49.1	43.3	15.8

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	83.5	0.0	8.0	30.5	0.0
ROW 2	47.4	72.3	0.0	0.0	10.4	71.5	14.0	3.1	26.1	63.2
ROW 3	182.2	0.0	0.0	0.0	2.4	0.0	3.2	0.0	0.0	16.3
ROW 4	0.0	3.4	0.0	0.0	1.0	0.0	1.4	0.0	0.0	0.0
ROW 5	0.0	31.9	0.0	0.0	2.4	0.0	3.2	0.0	0.0	16.0
ROW 6	0.0	0.0	40.9	0.0	4.7	0.0	6.3	0.0	0.0	0.0
ROW 7	0.0	0.0	86.0	0.0	9.9	0.0	13.2	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	11.8	.6	0.0	.8	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	.2	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	229.8	107.7	126.9	11.8	31.4	155.0	42.1	11.1	56.6	95.5

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	2016.5
ROW 2	54.9	0.0	.1	1727.2
ROW 3	14.1	0.0	0.0	400.3
ROW 4	0.0	0.0	.1	172.0
ROW 5	13.9	0.0	0.0	393.1
ROW 6	0.0	0.0	.5	779.7
ROW 7	0.0	0.0	0.0	1635.4
ROW 8	0.0	0.0	0.0	106.1
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	0.0	0.0	0.0	.6
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	82.9	0.0	.7	7226.0

Calendar period: Row 2 to Row 8 -- first half of 1960
Row 1 and Row 9 to Row 14 -- second half of 1960

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	271.3	0.0	0.0	0.0	0.0	0.0	0.0	7.2	7.6	2.4
ROW 2	1516.3	53.6	1.2	62.0	0.0	0.0	1.1	44.8	47.5	14.8
ROW 3	0.0	396.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	174.4	0.0	12.2	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	351.0	0.0	15.3	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	765.2	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	1701.2	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	106.8	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	.2	0.0	.2	0.0	.1	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	1787.6	450.4	175.6	413.2	777.4	1716.6	107.9	52.0	55.1	17.2

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	3.4	0.0	10.9	9.7	0.0
ROW 2	2.1	1.1	0.0	0.0	3.4	21.4	3.7	68.3	60.9	45.7
ROW 3	205.0	0.0	0.0	0.0	3.0	0.0	4.1	0.0	0.0	55.7
ROW 4	0.0	6.3	0.0	0.0	2.8	0.0	2.8	0.0	0.0	0.0
ROW 5	0.0	107.0	0.0	0.0	3.7	0.0	3.9	0.0	0.0	53.5
ROW 6	0.0	0.0	50.5	0.0	5.7	0.0	6.1	0.0	0.0	0.0
ROW 7	0.0	0.0	101.5	0.0	11.6	0.0	12.4	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	14.7	3.0	0.0	2.1	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	.3	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.2
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	207.3	114.5	152.0	14.7	33.2	24.8	35.1	79.2	70.6	155.1

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	314.5
ROW 2	17.8	0.0	.0	1965.3
ROW 3	21.4	0.0	0.0	687.2
ROW 4	0.0	0.0	.2	200.6
ROW 5	21.2	0.0	0.0	554.1
ROW 6	0.0	0.0	.6	828.5
ROW 7	0.0	0.0	0.0	1826.7
ROW 8	0.0	0.0	0.0	125.4
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	0.0	0.0	0.0	1.0
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	61.0	0.0	.8	6503.3

Calendar period : Row 2 to Row 8 -- second half of 1960
Row 1 and Row 9 to Row 14 -- first half of 1961

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	2004.6	0.0	0.0	0.0	0.0	0.0	0.0	23.7	20.8	8.1
ROW 2	68.5	602.8	148.2	596.6	0.0	0.0	35.2	19.7	17.3	6.8
ROW 3	0.0	210.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	56.5	0.0	113.7	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	0.0	0.0	370.6	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	6.0	725.9	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	1604.3	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	94.1	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	.1	0.0	.1	0.0	.1	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2073.1	813.7	204.7	602.7	839.6	1975.1	129.3	43.4	38.1	14.9

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	77.4	0.0	10.1	11.8	0.0
ROW 2	4.8	103.2	0.0	0.0	10.7	64.2	13.3	8.3	9.8	62.7
ROW 3	210.7	0.0	0.0	0.0	2.7	0.0	3.3	0.0	0.0	17.5
ROW 4	0.0	3.0	0.0	0.0	1.0	0.0	1.3	0.0	0.0	0.0
ROW 5	0.0	8.0	0.0	0.0	2.5	0.0	3.1	0.0	0.0	16.0
ROW 6	0.0	0.0	40.8	0.0	4.6	0.0	5.8	0.0	0.0	0.0
ROW 7	0.0	0.0	90.1	0.0	10.2	0.0	12.7	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	12.5	.6	0.0	.8	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	.3	.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	215.8	114.4	130.9	17.5	32.3	141.6	40.3	18.4	21.6	96.3

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	2156.3
ROW 2	20.2	0.0	.1	1190.4
ROW 3	5.6	0.0	0.0	450.6
ROW 4	0.0	0.0	.1	175.6
ROW 5	5.2	0.0	0.0	413.4
ROW 6	0.0	0.0	.7	777.8
ROW 7	0.0	0.0	0.0	1717.3
ROW 8	0.0	0.0	0.0	108.0
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	0.0	0.0	0.0	.9
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	31.0	0.0	.9	7590.2

Calendar period: Row 2 to Row 8 -- first half of 1961
Row 1 and Row 9 to Row 14 -- second half of 1961

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	240.5	0.0	0.0	0.0	0.0	0.0	0.0	6.6	7.6	2.2
ROW 2	1514.9	9.7	.4	33.7	0.0	0.0	.2	43.8	51.0	14.3
ROW 3	0.0	422.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	169.4	0.0	14.7	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	391.5	0.0	0.0	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	770.0	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	1816.9	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	105.4	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	.1	0.0	.2	0.0	.1	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	1755.4	432.2	170.2	425.4	784.7	1821.8	105.6	50.4	58.6	16.5

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	3.5	0.0	16.6	31.4	0.0
ROW 2	.7	.6	0.0	0.0	1.1	23.3	1.3	110.7	212.2	17.1
ROW 3	214.3	0.0	0.0	0.0	1.6	0.0	4.2	0.0	0.0	62.8
ROW 4	0.0	13.2	0.0	0.0	2.6	0.0	3.1	0.0	0.0	0.0
ROW 5	0.0	102.5	0.0	0.0	2.1	0.0	2.5	0.0	0.0	36.6
ROW 6	0.0	0.0	0.0	0.0	6.3	0.0	7.4	0.0	0.0	0.0
ROW 7	0.0	0.0	51.3	0.0	14.6	0.0	14.8	0.0	0.0	0.0
ROW 8	0.0	0.0	117.1	0.0	2.8	0.0	3.6	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	17.4	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	.1	.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	215.1	116.3	168.4	17.4	32.5	26.8	38.6	127.3	243.6	116.5

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	308.8
ROW 2	28.0	0.0	.0	2062.9
ROW 3	102.4	0.0	0.0	809.7
ROW 4	0.0	0.0	.2	203.6
ROW 5	59.8	0.0	0.0	599.7
ROW 6	0.0	0.0	.6	835.5
ROW 7	0.0	0.0	0.0	1965.3
ROW 8	0.0	0.0	0.0	124.7
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	0.0	0.0	0.0	.5
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	190.2	0.0	.8	6914.6

Calendar period: Row 2 to Row 8 -- second half of 1961
Row 1 and Row 9 to Row 14 -- first half of 1962

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	1975.8	0.0	0.0	0.0	0.0	0.0	0.0	23.0	22.3	8.5
ROW 2	115.4	555.2	108.8	573.7	0.0	0.0	34.7	18.6	18.1	6.9
ROW 3	0.0	201.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	81.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	0.0	81.6	0.0	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	22.7	0.0	350.9	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	727.4	0.0	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	1690.8	0.0	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	93.6	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	.1	0.0	.1	0.0	.1	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2091.2	756.6	189.9	596.5	809.0	2041.9	128.3	41.6	40.4	15.4

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	81.1	0.0	24.7	25.0	0.0
ROW 2	30.8	76.1	0.0	0.0	10.5	65.6	14.5	20.0	20.3	34.6
ROW 3	201.4	0.0	0.0	0.0	2.8	0.0	3.6	0.0	0.0	9.5
ROW 4	0.0	4.3	0.0	0.0	1.0	0.0	1.4	0.0	0.0	0.0
ROW 5	0.0	22.7	0.0	0.0	2.9	0.0	3.5	0.0	0.0	9.3
ROW 6	0.0	0.0	42.2	0.0	4.7	0.0	6.5	0.0	0.0	0.0
ROW 7	0.0	0.0	98.2	0.0	10.9	0.0	15.1	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	10.2	.6	0.0	.9	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	.2	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	232.4	103.2	140.4	10.2	33.4	146.7	45.5	44.7	45.3	53.4

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	2160.3
ROW 2	45.5	0.0	.2	1749.7
ROW 3	12.5	0.0	0.0	430.4
ROW 4	0.0	0.0	.2	169.6
ROW 5	12.3	0.0	0.0	424.9
ROW 6	0.0	0.0	.9	781.7
ROW 7	0.0	0.0	0.0	1815.8
ROW 8	0.0	0.0	0.0	105.3
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	0.0	0.0	0.0	.7
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	70.3	0.0	1.3	7637.2

Calendar period: Row 2 to Row 8 -- first half of 1962
Row 1 and Row 9 to Row 14 -- second half of 1962

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	234.0	0.0	0.0	0.0	0.0	0.0	0.0	5.5	7.0	1.9
ROW 2	1587.1	18.1	.6	25.4	0.0	0.0	.3	38.3	48.6	13.3
ROW 3	0.0	482.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	164.1	0.0	11.0	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	411.9	0.0	21.4	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	723.0	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	1892.4	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	106.9	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	.2	0.0	.2	0.0	.1	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	1821.1	500.9	164.7	437.5	734.0	1913.9	107.2	43.8	55.6	15.2

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	3.6	0.2	14.3	32.2	0.0
ROW 2	.5	[illegible]	0.0	0.0	1.1	22.4	1.2	98.6	222.7	7.8
ROW 3	192.8	0.0	0.0	0.0	4.2	0.0	4.5	0.0	0.0	33.7
ROW 4	0.0	8.7	0.0	0.0	7.3	0.0	2.5	0.0	0.0	0.0
ROW 5	0.0	101.6	0.0	0.0	5.2	0.0	5.4	0.0	0.0	25.6
ROW 6	0.0	0.0	67.7	0.0	8.3	0.0	[illegible]	0.0	0.0	0.0
ROW 7	0.0	0.0	119.9	0.0	4.6	0.0	15.7	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	16.5	2.3	0.0	2.0	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	.1	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	193.4	110.7	187.6	16.5	36.0	26.0	34.9	112.9	254.9	67.1

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	302.1
ROW 2	9.1	0.0	.0	2092.0
ROW 3	34.2	0.0	0.0	756.9
ROW 4	0.0	0.0	.4	190.9
ROW 5	29.9	0.0	0.0	596.7
ROW 6	0.0	0.0	1.4	409.5
ROW 7	0.0	0.0	0.0	2087.7
ROW 8	0.0	0.0	0.0	128.4
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	0.0	0.0	0.0	.7
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	77.0	0.0	1.8	6919.8

Calendar period: Row 2 to Row 8 -- second half of 1962
Row 1 and Row 9 to Row 14 --first half of 1963

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	2045.5	0.0	0.0	0.0	0.0	0.0	0.0	17.8	15.9	6.1
ROW 2	141.3	579.1	107.4	655.5	0.0	0.0	38.7	14.6	13.1	5.0
ROW 3	0.0	236.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	75.1	0.0	83.1	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	26.3	0.0	359.5	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	689.1	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	1799.0	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	95.6	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	.1	0.0	.1	0.0	.1	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2186.8	815.2	182.5	681.9	772.2	2158.6	134.3	32.4	29.0	11.1

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	80.7	0.0	12.5	13.5	0.0
ROW 2	6.7	73.9	0.0	0.0	[illegible]	66.5	15.3	10.3	11.2	33.9
ROW 3	235.9	0.0	0.0	0.0	2.9	0.0	4.2	0.0	0.0	10.3
ROW 4	0.0	4.0	0.0	0.0	.9	0.0	1.4	0.0	0.0	9.0
ROW 5	0.0	26.3	0.0	0.0	2.5	0.0	3.7	0.0	0.0	0.0
ROW 6	0.0	0.0	84.7	0.0	6.2	0.0	6.2	0.0	0.0	0.0
ROW 7	0.0	0.0	90.3	0.0	11.0	0.0	16.1	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	10.2	.6	0.0	.9	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	.2	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	242.8	104.3	175.0	10.2	32.7	147.2	47.7	22.8	24.7	53.2

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	2212.0
ROW 2	40.6	0.0	.4	1823.7
ROW 3	12.3	0.0	0.0	501.6
ROW 4	0.0	0.0	.4	164.9
ROW 5	10.6	0.0	0.0	438.1
ROW 6	0.0	0.0	1.6	735.7
ROW 7	0.0	0.0	0.0	1916.4
ROW 8	0.0	0.0	0.0	187.3
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	0.0	0.0	0.0	.7
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	63.5	0.0	2.4	7900.5

Calendar period: Row 2 to Row 8 -- first half of 1963
Row 1 and Row 9 to Row 14 -- second half of 1963

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	260.5	0.0	0.0	0.0	0.0	0.0	0.0	4.7	5.5	1.6
ROW 2	1613.7	20.9	.4	38.7	0.0	0.0	.3	34.3	40.2	11.5
ROW 3	0.0	523.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	153.8	0.0	14.2	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	474.5	0.0	54.4	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	700.3	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	2029.5	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	113.9	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	.2	0.0	.2	0.0	.1	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	1874.2	544.7	154.2	513.4	714.5	2084.0	114.2	39.0	45.7	13.1

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	3.2	0.0	15.9	12.3	0.0
ROW 2	.6	.4	0.0	0.0	1.2	23.6	1.5	115.3	89.7	9.2
ROW 3	224.6	0.0	0.0	0.0	4.5	0.0	5.5	0.0	0.0	37.4
ROW 4	0.0	8.6	0.0	0.0	2.5	0.0	3.0	0.0	0.0	0.0
ROW 5	0.0	101.5	0.0	0.0	3.4	0.0	4.2	0.0	0.0	28.9
ROW 6	0.0	0.0	55.0	0.0	7.1	0.0	8.6	0.0	0.0	0.0
ROW 7	0.0	0.0	100.0	0.0	12.8	0.0	15.5	0.0	0.0	0.0
ROW 8	0.0	0.0	0.9	14.6	2.7	0.0	3.1	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	.2	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	225.4	110.5	155.9	14.6	34.1	26.8	41.4	131.2	102.0	75.6

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	303.7
ROW 2	4.7	0.0	.1	2206.0
ROW 3	19.1	0.0	0.0	814.9
ROW 4	0.0	0.0	.3	182.3
ROW 5	14.9	0.0	0.0	681.7
ROW 6	0.0	0.0	.9	771.9
ROW 7	0.0	0.0	0.0	2157.8
ROW 8	0.0	0.0	0.0	134.3
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	0.0	0.0	0.0	.8
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	38.7	0.0	1.3	7253.6

Calendar period: Row 2 to Row 8 -- second half of 1963
Row 1 and Row 9 to Row 14 -- first half of 1964

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	2099.6	0.0	0.0	0.0	0.0	0.0	0.0	16.9	17.4	6.1
ROW 2	233.1	699.0	89.0	742.9	0.0	0.0	40.5	15.6	15.6	5.7
ROW 3	0.0	262.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	84.0	0.0	64.4	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	48.4	0.0	397.6	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	675.5	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	1976.3	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	103.0	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	.6	0.0	.5	0.0	.6	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2332.7	961.8	173.0	791.8	739.9	2374.5	143.5	32.5	33.0	11.8

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	88.2	0.0	14.0	5.3	0.0
ROW 2	4.2	56.9	0.0	0.0	10.8	82.0	16.9	13.0	5.0	48.4
ROW 3	262.2	0.0	0.0	0.0	2.8	0.0	4.5	0.0	0.0	11.5
ROW 4	0.0	4.4	0.0	0.0	.8	0.0	1.3	0.0	0.0	0.0
ROW 5	0.0	48.4	0.0	0.0	2.7	0.0	4.2	0.0	0.0	12.8
ROW 6	0.0	0.0	32.2	0.0	3.7	0.0	5.8	0.0	0.0	0.0
ROW 7	0.0	0.0	94.1	0.0	10.9	0.0	17.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	10.5	.6	0.0	.9	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	1.4	.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	267.8	110.3	126.3	10.5	32.4	170.2	50.7	27.0	10.3	72.8

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	2247.2
ROW 2	10.9	0.0	.6	2086.6
ROW 3	3.2	0.0	0.0	546.4
ROW 4	0.0	0.0	.4	155.3
ROW 5	3.0	0.0	0.0	517.0
ROW 6	0.0	0.0	2.2	719.4
ROW 7	0.0	0.0	0.0	2098.4
ROW 8	0.0	0.0	0.0	115.0
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	0.0	0.0	0.0	3.8
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	17.1	0.0	3.2	8493.1

Calendar period: Row 2 to Row 8 -- first half of 1964
Row 1 and Row 9 to Row 14 -- second half of 1964

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	265.0	0.0	0.0	0.0	0.0	0.0	0.0	5.7	7.2	1.6
ROW 2	1984.1	1.9	.1	5.6	0.0	0.0	.1	43.1	54.4	12.4
ROW 3	0.0	[illegible]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	145.2	0.0	13.9	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	541.9	0.0	44.1	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	667.7	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	2242.5	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	123.8	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	.3	0.0	.4	0.0	.2	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2249.0	540.6	145.3	547.9	681.6	2286.8	123.9	48.8	61.6	14.0

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	3.5	0.0	22.3	7.1	0.0
ROW 2	.1	.1	0.0	0.0	.2	26.4	.3	167.8	53.4	2.5
ROW 3	280.4	0.0	0.0	0.0	6.5	0.0	7.3	0.0	0.0	77.7
ROW 4	0.0	9.3	0.0	0.0	2.7	0.0	3.0	0.0	0.0	0.0
ROW 5	0.0	122.7	0.0	0.0	.4	0.0	5.0	0.0	0.0	53.2
ROW 6	0.0	0.0	63.4	0.0	4.4	0.0	6.3	0.0	0.0	0.0
ROW 7	0.0	0.0	113.3	0.0	8.0	0.0	18.1	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	15.9	0.0	2.4	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	15.6	2.5	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	.3	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	280.8	132.2	179.7	15.6	40.0	29.9	45.6	190.1	60.5	133.5

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	312.4
ROW 2	1.3	0.0	0.0	2353.7
ROW 3	40.4	0.0	0.0	970.5
ROW 4	0.0	0.0	.5	176.4
ROW 5	27.8	0.0	0.0	749.0
ROW 6	0.0	0.0	1.3	766.6
ROW 7	0.0	0.0	0.0	2395.8
ROW 8	0.0	0.0	0.0	144.8
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	0.0	0.0	0.0	1.1
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	69.4	0.0	1.8	7896.8

Calendar period: Row 2 to Row 8 -- second half of 1964
Row 1 and Row 9 to Row 14 -- first half of 1965

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	2269.6	0.0	0.0	0.0	0.0	0.0	0.0	23.4	29.1	8.3
ROW 2	179.6	699.6	82.7	787.9	0.0	0.0	41.4	21.5	26.7	7.7
ROW 3	0.0	243.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	72.5	0.0	67.2	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	34.9	0.0	444.1	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	635.2	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	2136.7	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	110.7	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	.1	0.0	.1	0.0	.1	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2449.2	942.7	155.2	822.9	702.4	2580.9	152.1	44.9	55.8	16.0

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	98.9	0.0	27.6	14.9	0.0
ROW 2	44.2	104.2	0.0	0.0	13.4	90.6	20.1	25.2	13.7	69.6
ROW 3	262.9	0.0	0.0	0.0	3.3	0.0	5.0	0.0	0.0	19.2
ROW 4	0.0	3.8	0.0	0.0	.9	0.0	1.3	0.0	0.0	0.0
ROW 5	0.0	34.9	0.0	0.0	3.3	0.0	4.9	0.0	0.0	18.8
ROW 6	0.0	0.0	37.8	0.0	4.1	0.0	6.1	0.0	0.0	0.0
ROW 7	0.0	0.0	127.2	0.0	13.6	0.0	20.4	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	11.9	.7	0.0	1.1	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	.3	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	307.4	143.0	165.0	11.9	39.3	189.5	58.9	52.8	28.6	107.6

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	2671.8
ROW 2	36.1	0.0	.5	2264.5
ROW 3	10.6	0.0	0.0	563.4
ROW 4	4.7	0.0	.3	146.8
ROW 5	4.6	0.0	0.0	550.7
ROW 6	0.0	0.0	1.8	665.0
ROW 7	0.0	0.0	0.0	2297.6
ROW 8	0.0	0.0	0.0	124.4
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	0.0	0.0	0.0	.8
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	55.9	0.0	2.6	9104.6

Calendar period: Row 2 to Row 8 -- first half of 1965
Row 1 and Row 9 to Row 14 -- second half of 1965

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	[illegible]	[illegible]	0.0	0.0	0.0	0.0	0.0	6.3	0.5	2.4
ROW 2	1845.6	[illegible]	.1	13.6	0.0	0.0	.1	48.7	68.1	18.3
ROW 3	0.0	[illegible]	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0
ROW 4	0.0	0.0	127.6	0.0	4.5	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	[illegible]	0.0	2.5	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	626.8	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	2365.4	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	125.9	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	.2	0.0	.2	0.0	.9	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2167.6	570.4	127.7	535.6	631.3	2367.9	125.9	55.0	74.6	20.7

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	3.4	0.0	17.2	30.3	9.5
ROW 2	.6	.2	0.0	0.3	.4	26.6	.4	133.2	235.3	10.1
ROW 3	276.6	0.0	0.0	0.0	1.9	0.0	1.8	0.0	0.0	[illegible]
ROW 4	0.0	15.5	0.0	0.0	2.0	0.0	2.0	0.0	0.0	[illegible]
ROW 5	0.0	139.5	0.0	0.0	2.2	0.0	2.1	0.0	0.0	0.0
ROW 6	0.0	0.0	[illegible]	0.0	9.6	0.0	4.3	0.0	0.0	0.0
ROW 7	0.0	0.0	[illegible]	0.0	27.5	0.0	26.6	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	4.2	0.0	.7	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	19.6	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	277.7	155.7	265.1	19.6	47.7	30.0	44.2	150.4	265.6	116.3

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	320.6
ROW 2	18.9	0.0	.0	2462.6
ROW 3	91.3	0.0	0.0	975.9
ROW 4	0.0	0.0	.7	157.3
ROW 5	108.0	0.0	0.0	634.1
ROW 6	0.0	0.0	3.0	712.0
ROW 7	0.0	0.0	0.0	2616.1
ROW 8	0.0	0.0	.3	154.2
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	.8
ROW 14	0.0	0.0	0.0	0.0
TOTAL	218.2	0.0	4.0	8253.4

Calendar period: Row 2 to Row 8 -- second half of 1965
Row 1 and Row 9 to Row 14 -- first half of 1966

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	2337.8	0.0	0.0	0.0	0.0	0.0	0.0	21.5	28.0	10.3
ROW 2	107.0	755.5	89.5	710.1	0.0	0.0	34.9	18.2	23.0	8.4
ROW 3	0.0	267.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	53.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	40.3	70.3	0.0	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	0.0	421.7	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	575.4	0.0	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	2166.4	[illegible]	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	111.2	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	.1	0.0	.1	0.0	.1	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0
TOTAL	2444.8	1023.1	142.5	750.5	645.7	2588.3	146.1	39.7	51.0	19.1

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	94.7	0.0	27.6	34.3	0.0
ROW 2	18.7	170.4	0.0	0.0	14.3	80.1	10.6	23.3	29.0	59.8
ROW 3	267.6	0.0	0.0	0.0	3.8	0.0	5.0	0.0	0.0	17.6
ROW 4	0.0	2.4	0.0	0.0	.0	0.0	1.1	0.0	0.0	0.0
ROW 5	0.0	40.3	0.0	0.0	3.6	0.0	4.6	0.0	0.0	16.5
ROW 6	0.0	0.0	47.2	0.0	6.2	0.0	5.5	0.0	0.0	0.0
ROW 7	0.0	0.0	177.1	0.0	15.7	0.0	20.5	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	.0	0.0	1.1	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	13.6	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	.3	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	286.6	[illegible]	224.3	13.6	43.3	174.8	56.4	50.9	63.3	93.9

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	2554.3
ROW 2	43.9	0.0	.0	2162.6
ROW 3	13.0	0.0	0.0	574.3
ROW 4	0.0	0.0	.5	120.5
ROW 5	12.2	0.0	0.0	559.2
ROW 6	0.0	0.0	2.3	634.6
ROW 7	0.0	0.0	0.0	2319.8
ROW 8	0.0	0.0	0.0	126.5
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	0.0	0.0	0.0	.0
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	69.1	0.0	3.6	9100.7

Calendar period: Row 2 to Row 8 -- first half of 1966
Row 1 and Row 9 to Row 14 -- second half of 1966

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TOTAL	2113.0	[illegible]	119.2	505.1	583.2	2376.0	123.1	40.0	57.8	20.9

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TOTAL	261.4	[illegible]	260.7	16.3	49.5	27.4	42.8	227.7	179.1	156.4

	COL 21	COL 22	COL 23	TOTAL
ROW 1	[illegible]	[illegible]	[illegible]	[illegible]
ROW 2	[illegible]	[illegible]	[illegible]	[illegible]
ROW 3	[illegible]	[illegible]	[illegible]	[illegible]
ROW 4	[illegible]	[illegible]	[illegible]	[illegible]
ROW 5	[illegible]	[illegible]	[illegible]	[illegible]
ROW 6	[illegible]	[illegible]	[illegible]	[illegible]
ROW 7	[illegible]	[illegible]	[illegible]	[illegible]
ROW 8	[illegible]	[illegible]	[illegible]	[illegible]
ROW 9	[illegible]	[illegible]	[illegible]	[illegible]
ROW 10	[illegible]	[illegible]	[illegible]	[illegible]
ROW 11	[illegible]	[illegible]	[illegible]	[illegible]
ROW 12	[illegible]	[illegible]	[illegible]	[illegible]
ROW 13	[illegible]	[illegible]	[illegible]	[illegible]
ROW 14	[illegible]	[illegible]	[illegible]	[illegible]
TOTAL	176.4	0.0	1.9	8642.1

Calendar period: Row 2 to Row 8 -- second half of 1966
Row 1 and Row 9 to Row 14 -- first half of 1967

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TOTAL	2377.1	479.4	120.9	795.2	592.0	2592.9	151.6	32.3	42.3	15.4

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ROW 14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TOTAL	304.8	175.4	176.1	0.0	41.9	185.6	52.1	86.0	3.9	112.3

	COL 21	COL 22	COL 23	TOTAL
ROW 1	[illegible]	[illegible]	[illegible]	[illegible]
ROW 2	[illegible]	[illegible]	[illegible]	[illegible]
ROW 3	[illegible]	[illegible]	[illegible]	[illegible]
ROW 4	[illegible]	[illegible]	[illegible]	[illegible]
ROW 5	[illegible]	[illegible]	[illegible]	[illegible]
ROW 6	[illegible]	[illegible]	[illegible]	[illegible]
ROW 7	[illegible]	[illegible]	[illegible]	[illegible]
ROW 8	[illegible]	[illegible]	[illegible]	[illegible]
ROW 9	[illegible]	[illegible]	[illegible]	[illegible]
ROW 10	[illegible]	[illegible]	[illegible]	[illegible]
ROW 11	[illegible]	[illegible]	[illegible]	[illegible]
ROW 12	[illegible]	[illegible]	[illegible]	[illegible]
ROW 13	[illegible]	[illegible]	[illegible]	[illegible]
ROW 14	[illegible]	[illegible]	[illegible]	[illegible]
TOTAL	5.9	0.0	1.5	8862.9

Calendar period: Row 2 to Row 8 -- first half of 1967
Row 1 and Row 9 to Row 14 -- second half of 1967

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	242.4	0.0	0.0	0.0	0.0	0.0	0.0	4.6	0.0	2.0
ROW 2	1855.7	11.4	.0	0.2	0.0	0.0	.1	35.4	67.4	15.0
ROW 3	0.0	593.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	111.9	0.0	10.7	9.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	492.6	0.0	0.0	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	531.1	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	2336.3	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	122.0	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	1.9	0.0	1.5	0.0	1.8	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2098.1	605.3	111.9	502.4	541.8	2345.0	122.7	40.0	70.4	17.0

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.4	3.0	0.0	0.0	0.0	3.2	0.0	29.1	11.6	0.0
ROW 2	.3	.7	0.0	0.0	1.2	25.2	1.0	231.1	90.2	10.9
ROW 3	268.1	0.0	0.0	0.0	0.5	0.4	0.9	0.0	0.0	10.4
ROW 4	0.4	2.3	0.0	0.0	1.4	0.0	1.8	0.0	0.0	0.0
ROW 5	0.0	173.1	0.0	0.0	4.3	0.0	3.5	0.0	0.0	82.1
ROW 6	0.0	0.0	45.2	0.0	18.4	0.0	3.6	0.0	0.0	0.0
ROW 7	0.0	0.0	193.3	0.0	7.1	0.2	15.3	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	14.4	0.0	0.0	5.7	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	.7	.9	0.0	0.0	.1	0.0	0.0	0.0	0.0	.8
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.4	0.6	0.0	0.0	0.0	0.3	0.0	0.0
TOTAL	270.2	176.3	238.2	14.8	49.6	28.4	40.8	260.0	101.8	171.7

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	301.5
ROW 2	1.0	0.0	.0	2358.0
ROW 3	14.3	0.0	0.0	968.5
ROW 4	0.0	0.0	.3	127.4
ROW 5	15.1	0.0	0.0	786.0
ROW 6	0.0	0.0	1.1	585.2
ROW 7	0.0	0.0	0.0	2563.1
ROW 8	0.0	0.0	0.0	149.8
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	.2	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	31.4	0.0	1.5	7840.4

Calendar period: Row 2 to Row 8 -- second half of 1967
Row 1 and Row 9 to Row 14 -- first half of 1968

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	2219.2	0.0	0.0	0.0	0.0	0.0	0.0	15.7	23.8	6.9
ROW 2	80.6	689.1	77.6	704.9	0.0	0.0	35.0	13.6	20.8	5.9
ROW 3	0.0	276.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	44.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	0.0	61.8	0.0	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	36.6	0.0	386.1	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	490.5	0.0	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	2127.6	0.0	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	110.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	.1	0.0	.1	0.0	.1	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2299.8	965.8	122.4	741.0	552.3	2513.8	145.0	29.3	44.4	12.4

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	92.1	0.0	35.6	14.2	0.0
ROW 2	18.7	161.9	0.0	0.0	13.1	79.6	15.9	30.8	12.3	77.3
ROW 3	276.6	0.0	0.0	0.0	3.8	0.0	4.5	0.0	0.0	2.4
ROW 4	0.0	2.6	0.0	0.0	.3	0.0	.8	0.0	0.0	0.0
ROW 5	0.0	36.5	0.0	0.0	3.1	0.0	3.7	0.0	0.0	28.5
ROW 6	0.0	0.0	38.0	0.0	3.4	0.0	4.8	0.0	0.0	0.0
ROW 7	0.0	0.0	164.8	0.0	14.6	0.0	17.5	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	9.9	.8	0.0	.9	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	.2	.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	295.5	201.0	202.8	9.9	39.4	171.7	47.1	66.4	26.5	172.6

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	2407.5
ROW 2	44.1	0.0	.5	2001.2
ROW 3	14.1	0.0	0.0	600.3
ROW 4	0.0	0.0	.3	110.9
ROW 5	11.7	0.0	0.0	400.2
ROW 6	0.0	0.0	1.3	537.1
ROW 7	0.0	0.0	0.0	2324.5
ROW 8	0.0	0.0	0.0	121.6
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	0.0	0.0	0.0	.0
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	69.9	0.0	2.1	8482.1

Calendar period: Row 2 to Row 8 -- first half of 1968
Row 1 and Row 9 to Row 14 -- second half of 1968

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL10
ROW 1	231.5	0.0	0.0	0.0	0.0	0.0	0.0	3.6	5.9	2.2
ROW 2	1830.7	.7	.2	6.9	0.0	0.0	.1	28.7	47.2	17.5
ROW 3	0.0	543.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	107.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	451.5	0.0	0.0	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	499.1	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	2275.5	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	117.2	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	.1	0.0	.2	0.0	.1	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2062.2	544.6	107.6	458.6	568.7	2275.6	117.3	32.3	53.1	19.7

	COL11	COL12	COL13	COL14	COL15	COL16	COL17	COL18	COL19	COL20
ROW 1	0.0	0.0	0.0	0.0	0.0	2.9	0.0	30.8	0.0	0.0
ROW 2	.3	.3	0.0	0.0	1.0	23.1	.7	246.3	[illegible]	7.0
ROW 3	294.4	0.0	0.0	0.0	10.5	0.0	7.6	0.0	0.0	81.2
ROW 4	0.0	2.7	0.0	0.0	.4	0.0	.6	0.0	0.0	0.0
ROW 5	0.0	198.5	0.0	0.0	6.7	0.0	9.3	0.0	0.0	51.8
ROW 6	0.0	0.0	39.4	0.0	4.8	0.0	3.3	0.0	0.0	0.0
ROW 7	0.0	0.0	194.4	0.0	23.7	0.0	16.4	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	7.3	0.0	5.3	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	13.8	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	.2	.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	294.9	201.7	233.8	13.8	54.9	26.0	38.4	277.1	29.9	139.9

	COL21	COL22	COL23	TOTAL
ROW 1	0.0	0.0	0.0	285.8
ROW 2	2.0	0.0	.1	2387.9
ROW 3	23.4	0.0	0.0	960.7
ROW 4	0.0	0.0	.5	121.8
ROW 5	14.9	0.0	0.0	737.7
ROW 6	0.0	0.0	[illegible]	549.4
ROW 7	0.0	0.0	0.0	2500.4
ROW 8	0.0	0.0	.7	144.3
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	0.0	0.0	0.0	.9
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	40.3	0.0	4.0	7588.5

Calendar period: Row 2 to Row 8 -- second half of 1968
Row 1 and Row 9 to Row 14 -- first half of 1969

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL10
ROW 1	2210.3	0.0	0.0	0.0	0.0	0.0	0.0	11.4	15.4	5.4
ROW 2	46.3	690.4	69.7	716.5	0.0	0.0	38.0	9.9	13.3	4.6
ROW 3	0.0	255.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	43.3	0.0	59.2	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	10.5	0.0	406.0	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	463.6	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	2087.7	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	105.0	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	.2	0.0	.2	0.0	.2	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2256.6	946.0	113.0	727.2	522.8	2493.9	143.0	21.3	28.7	10.0

	COL11	COL12	COL13	COL14	COL15	COL16	COL17	COL18	COL19	COL20
ROW 1	0.0	0.0	0.0	0.0	0.0	[illegible]	0.0	28.0	6.2	0.0
ROW 2	46.5	[illegible]	0.0	0.0	16.4	81.6	16.9	24.3	5.4	60.2
ROW 3	255.4	.8	0.0	0.0	4.3	0.0	4.5	0.0	0.0	17.8
ROW 4	0.0	2.3	0.0	0.0	.4	0.0	.9	0.0	0.0	0.0
ROW 5	0.0	10.5	0.0	0.0	3.6	0.0	3.8	0.0	0.0	14.9
ROW 6	0.0	0.0	31.7	0.0	4.0	0.0	4.2	0.0	0.0	0.0
ROW 7	0.0	0.0	141.9	0.0	18.1	0.0	18.5	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	.4	0.0	1.0	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	.4	.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	302.3	195.6	173.6	9.9	48.2	175.8	49.7	52.3	11.6	92.9

	COL21	COL22	COL23	TOTAL
ROW 1	0.0	0.0	0.0	2370.6
ROW 2	31.0	0.0	1.2	2055.7
ROW 3	9.2	0.0	0.0	546.6
ROW 4	0.0	0.0	.6	187.2
ROW 5	7.7	0.0	0.0	456.9
ROW 6	0.0	0.0	3.1	566.6
ROW 7	0.0	0.0	0.0	2266.9
ROW 8	0.0	0.0	.1	316.0
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	0.0	0.0	0.0	1.2
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	47.9	0.0	5.0	8428.1

Calendar period: Row 2 to Row 8 -- first half of 1969
Row 1 and Row 9 to Row 14 -- second half of 1969

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	249.6	0.0	0.0	0.0	0.0	0.0	0.0	1.8	2.4	8.1
ROW 2	1954.7	3.6	.4	8.8	0.0	0.0	.1	14.3	19.5	1.7
ROW 3	0.0	544.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	98.6	0.0	6.5	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	466.6	0.0	1.5	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	487.9	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	2352.0	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	118.3	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	.2	0.0	.3	0.0	.3	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2204.3	548.5	99.0	475.7	494.4	2353.8	118.4	16.1	21.9	9.8

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	3.2	0.0	25.8	.8	0.0
ROW 2	.2	.3	0.0	0.0	1.1	25.6	1.0	209.3	6.6	4.1
ROW 3	292.5	0.0	0.0	0.0	14.4	0.0	13.4	0.0	0.0	61.1
ROW 4	0.0	4.6	0.0	0.0	1.4	0.0	1.4	0.0	0.0	0.0
ROW 5	0.0	207.6	0.0	0.0	7.0	0.0	6.5	0.0	0.0	29.3
ROW 6	0.0	0.0	25.7	0.0	4.2	0.0	3.9	0.0	0.0	0.0
ROW 7	0.0	0.0	115.2	0.0	10.6	0.0	17.3	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	12.9	6.5	0.0	5.9	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	.2	.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	292.9	212.7	141.0	12.9	53.2	28.8	49.4	235.1	7.4	94.5

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	279.8
ROW 2	1.6	0.0	.1	2246.8
ROW 3	23.4	0.0	0.0	949.5
ROW 4	0.0	0.0	1.0	113.4
ROW 5	11.3	0.0	0.4	724.9
ROW 6	0.0	0.0	2.9	524.7
ROW 7	0.0	0.0	0.0	2503.0
ROW 8	0.0	0.0	.4	144.3
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	0.0	0.0	0.0	1.3
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	36.2	0.0	4.8	7510.7

Calendar period: Row 2 to Row 8 -- second half of 1969
Row 1 and Row 9 to Row 14 -- first half of 1970

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	2386.6	0.0	0.0	0.0	0.0	0.0	0.0	6.6	7.4	10.0
ROW 2	44.5	750.0	75.9	858.4	0.0	0.0	40.8	5.7	6.4	8.8
ROW 3	0.0	262.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	36.2	0.0	58.9	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	1.5	0.0	451.5	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	461.7	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	2215.9	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	108.4	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	.2	0.0	.2	0.0	.2	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2431.1	1012.4	112.1	860.1	520.6	2667.7	149.2	12.3	13.8	18.8

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	100.8	0.0	27.8	.3	0.0
ROW 2	42.8	168.0	0.0	0.0	13.7	87.8	18.3	24.3	.2	47.2
ROW 3	262.1	0.0	0.0	0.0	3.4	0.0	4.5	0.0	0.0	13.0
ROW 4	0.0	1.9	0.0	0.0	.6	0.0	.8	0.0	0.0	0.0
ROW 5	0.0	1.5	0.0	0.0	3.0	0.0	3.9	0.0	0.0	11.3
ROW 6	0.0	0.0	22.9	0.0	3.1	0.0	4.1	0.0	0.0	0.0
ROW 7	0.0	0.0	106.4	0.0	14.6	0.0	19.6	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	8.5	.7	0.0	1.0	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	.5	.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	305.4	171.6	129.3	8.5	39.2	188.6	52.2	52.1	.5	71.5

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	2539.6
ROW 2	15.8	0.0	1.7	2210.1
ROW 3	4.3	0.0	0.0	549.6
ROW 4	0.0	0.0	.8	99.2
ROW 5	3.8	0.0	0.0	476.6
ROW 6	0.0	0.0	3.8	495.1
ROW 7	0.0	0.0	0.0	2357.0
ROW 8	0.0	0.0	.1	118.7
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	0.0	0.0	0.0	1.4
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	23.9	0.0	6.4	8847.3

Calendar period: Row 2 to Row 8 --first half of 1970
Row 1 and Row 9 to Row 14 -- second half of 1970

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL10
ROW 1	270.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	1.6	1.6
ROW 2	2104.0	.1	.1	9.2	0.0	0.0	.0	8.2	12.5	12.5
ROW 3	0.0	521.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	46.9	0.0	7.7	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	595.4	0.0	60.5	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	473.1	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	2506.5	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	124.6	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	.5	0.0	8.1	0.0	3.7	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2374.0	522.3	47.0	613.1	480.7	2570.7	124.6	10.4	14.1	14.1

	COL11	COL12	COL13	COL14	COL15	COL16	COL17	COL18	COL19	COL20
ROW 1	0.0	0.0	0.0	0.0	0.0	3.6	0.0	27.1	.4	0.0
ROW 2	.1	.1	0.0	0.0	.1	27.8	.1	212.1	3.1	.4
ROW 3	300.4	0.0	0.0	0.0	25.3	0.0	26.1	0.0	0.0	103.1
ROW 4	0.0	6.1	0.0	0.0	.4	0.0	.4	0.0	0.0	0.0
ROW 5	0.0	177.3	0.0	0.0	1.8	0.0	1.9	0.0	0.0	7.4
ROW 6	0.0	0.0	29.1	0.0	2.2	0.0	2.2	0.0	0.0	0.0
ROW 7	0.0	0.0	102.1	0.0	7.5	0.0	7.6	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	10.3	5.3	0.0	5.6	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	.5	3.0	0.0	0.0	.1	0.0	.1	0.0	0.0	.3
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	301.0	186.5	131.2	10.3	42.7	31.3	44.0	239.2	3.5	111.2

	COL21	COL22	COL23	TOTAL
ROW 1	0.0	0.0	0.0	305.5
ROW 2	.1	0.0	.0	2391.4
ROW 3	19.2	0.0	0.0	995.8
ROW 4	0.0	0.0	1.0	110.3
ROW 5	1.3	0.0	0.0	846.0
ROW 6	0.0	0.0	5.5	512.1
ROW 7	0.0	0.0	0.0	2624.1
ROW 8	0.0	0.0	1.1	146.7
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	.1	0.0	0.0	16.3
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	20.7	0.0	7.6	7948.2

Calendar period: Row 2 to Row 8 -- second half of 1970
Row 1 and Row 9 to Row 14 -- first half of 1971

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL10
ROW 1	2607.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3	6.8	3.7
ROW 2	30.9	764.7	49.4	922.7	0.0	0.0	53.5	4.5	5.8	3.1
ROW 3	0.0	244.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	62.9	0.0	69.1	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	5.4	0.0	576.8	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	434.1	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	2377.6	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	109.8	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	2.2	0.0	2.2	0.0	3.9	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2637.9	1011.4	112.3	930.3	503.2	2958.4	163.3	9.8	12.6	6.8

	COL11	COL12	COL13	COL14	COL15	COL16	COL17	COL18	COL19	COL20
ROW 1	0.0	0.0	0.0	0.0	0.0	114.3	0.0	26.5	.1	0.0
ROW 2	68.3	177.7	0.0	0.0	15.2	96.6	26.8	22.3	.1	34.8
ROW 3	246.5	0.0	0.0	0.0	3.3	0.0	5.7	0.0	0.0	8.3
ROW 4	0.0	1.1	0.0	0.0	.5	0.0	.8	0.0	0.0	0.0
ROW 5	0.0	5.2	0.0	0.0	2.1	0.0	3.8	0.0	0.0	5.5
ROW 6	0.0	0.0	28.2	0.0	2.3	0.0	4.0	0.0	0.0	0.0
ROW 7	0.0	0.0	117.1	0.0	9.3	0.0	16.5	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	10.1	.8	0.0	1.4	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	4.5	2.4	0.0	0.0	.1	0.0	.1	0.0	0.0	.2
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	319.3	186.4	145.3	10.1	33.6	210.9	59.2	48.8	.2	48.8

	COL21	COL22	COL23	TOTAL
ROW 1	0.0	0.0	0.0	2763.8
ROW 2	15.4	0.0	1.8	2333.5
ROW 3	3.7	0.0	0.0	515.1
ROW 4	0.0	0.0	.6	95.0
ROW 5	2.4	0.0	0.0	601.3
ROW 6	0.0	0.0	2.8	471.3
ROW 7	0.0	0.0	0.0	2520.6
ROW 8	0.0	0.0	.1	122.2
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	.1	0.0	0.0	15.8
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	21.6	0.0	5.3	9435.5

Calendar period: Row 2 to Row 8 -- first half of 1971
Row 1 and Row 9 to Row 14 -- second half of 1971

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL10
ROW 1	283.9	0.0	0.0	0.0	0.0	0.0	0.0	1.1	1.4	.6
ROW 2	2222.3	.6	.2	51.8	0.0	0.0	.1	9.1	11.5	4.5
ROW 3	0.0	556.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	89.3	0.0	8.1	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	644.4	0.0	51.8	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	433.8	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	2740.8	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	137.2	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	.1	0.0	1.3	0.0	.5	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2506.2	557.2	89.5	697.5	441.8	2793.1	137.3	10.2	12.9	5.1

	COL11	COL12	COL13	COL14	COL15	COL16	COL17	COL18	COL19	COL20
ROW 1	0.0	0.0	0.0	0.0	0.0	4.1	0.0	27.8	1.1	0.0
ROW 2	.1	.5	0.0	0.0	.5	33.2	.5	223.1	9.1	1.2
ROW 3	274.5	0.0	0.0	0.0	25.8	0.0	31.1	0.0	0.0	78.9
ROW 4	0.0	9.9	0.0	0.0	.6	0.0	.7	0.0	0.0	0.0
ROW 5	0.0	200.6	0.0	0.0	1.5	0.0	1.9	0.0	0.0	4.7
ROW 6	0.0	0.0	45.2	0.0	3.1	0.0	3.7	0.0	0.0	0.0
ROW 7	0.0	0.0	121.5	0.0	8.4	0.0	10.1	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	14.8	2.9	0.0	3.6	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	274.6	211.5	166.7	14.8	42.8	37.3	51.7	250.9	10.2	84.8

	COL21	COL22	COL23	TOTAL
ROW 1	0.0	0.0	0.0	320.0
ROW 2	.3	0.0	.1	2568.7
ROW 3	18.1	0.0	0.0	985.0
ROW 4	0.0	0.0	.8	109.4
ROW 5	1.1	0.0	0.0	906.0
ROW 6	0.0	0.0	4.3	490.1
ROW 7	0.0	0.0	0.0	2880.8
ROW 8	0.0	0.0	.4	159.0
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	0.0	0.0	0.0	2.3
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	19.5	0.0	5.6	8421.2

Calendar period: Row 2 to Row 8 -- second half of 1971
Row 1 and Row 9 to Row 14 -- first half of 1972

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL10
ROW 1	2628.8	0.0	0.0	0.0	0.0	0.0	0.0	5.2	6.1	3.4
ROW 2	139.2	766.8	92.1	967.8	0.0	0.0	50.1	4.5	5.3	2.9
ROW 3	0.0	261.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	8.2	0.0	77.0	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	61.7	0.0	531.8	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	399.9	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	2550.1	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	118.0	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	1.8	0.0	1.8	0.0	1.8	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2768.0	1030.3	100.3	1031.3	476.9	3083.7	168.1	9.7	11.4	6.3

	COL11	COL12	COL13	COL14	COL15	COL16	COL17	COL18	COL19	COL20
ROW 1	0.0	0.0	0.0	0.0	0.0	116.9	0.0	36.1	.3	0.0
ROW 2	57.4	147.7	0.0	0.0	13.4	102.5	22.2	31.6	.2	46.9
ROW 3	251.7	0.0	0.0	0.0	3.0	0.0	[illegible]	0.0	0.0	11.6
ROW 4	0.0	.4	0.0	0.0	.5	0.0	.8	0.0	0.0	0.0
ROW 5	0.0	61.5	0.0	0.0	3.7	0.0	6.2	0.0	0.0	14.5
ROW 6	0.0	0.0	22.4	0.0	2.4	0.0	3.0	0.0	0.0	0.0
ROW 7	0.0	0.0	142.4	0.0	14.9	0.0	24.7	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	14.3	.7	0.0	1.2	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	3.5	2.4	0.0	0.0	.1	0.0	.1	0.0	0.0	.3
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	312.6	212.1	164.8	14.3	38.6	219.4	64.0	67.7	.5	73.2

	COL21	COL22	COL23	TOTAL
ROW 1	0.0	0.0	0.0	2796.7
ROW 2	4.1	0.0	2.0	2456.7
ROW 3	7.2	0.0	0.0	[illegible]
ROW 4	0.0	0.0	.7	87.6
ROW 5	2.4	0.0	0.0	682.3
ROW 6	0.0	0.0	3.5	632.1
ROW 7	0.0	0.0	0.0	2732.0
ROW 8	0.0	0.0	.1	134.3
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	0.0	0.0	0.0	11.8
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	14.1	0.0	6.3	9873.6

Calendar period: Row 2 to Row 8 -- first half of 1972
Row 1 and Row 9 to Row 14 -- second half of 1972

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL10
ROW 1	293.9	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.2	.6
ROW 2	2327.8	4.6	1.0	49.0	0.0	0.0	.2	8.2	9.6	5.2
ROW 3	0.0	598.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	90.1	0.0	4.5	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	672.7	0.0	107.6	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	418.4	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	2866.3	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	139.5	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	1.0	0.0	4.3	0.0	2.4	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2621.7	604.2	91.1	726.0	422.9	2976.3	139.7	9.2	10.8	5.8

	COL11	COL12	COL13	COL14	COL15	COL16	COL17	COL18	COL19	COL20
ROW 1	0.0	0.0	0.0	0.0	0.0	3.9	0.0	28.3	5.0	0.0
ROW 2	.2	.5	0.0	0.0	1.3	31.7	1.6	230.2	40.5	5.0
ROW 3	301.7	0.0	0.0	0.0	14.8	0.0	14.8	0.0	0.0	64.8
ROW 4	0.0	2.4	0.0	0.0	.6	0.0	.5	0.0	0.0	0.0
ROW 5	0.0	199.2	0.0	0.0	4.5	0.0	5.1	0.0	0.0	19.7
ROW 6	0.0	0.0	34.8	0.0	4.2	0.0	4.7	0.0	0.0	0.0
ROW 7	0.0	0.0	129.2	0.0	15.2	0.0	17.3	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	15.5	4.5	0.0	5.1	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	1.0	1.7	0.0	0.0	.1	0.0	.1	0.0	0.0	.3
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	302.9	203.8	164.0	15.5	45.2	35.6	51.0	258.5	45.5	89.8

	COL21	COL22	COL23	TOTAL
ROW 1	0.0	0.0	0.0	333.9
ROW 2	1.2	0.0	.2	2718.2
ROW 3	15.2	0.0	0.0	1011.8
ROW 4	0.0	0.0	.6	98.5
ROW 5	4.5	0.0	0.0	1012.4
ROW 6	0.0	0.0	6.2	468.3
ROW 7	0.0	0.0	0.0	3028.2
ROW 8	0.0	0.0	.5	165.1
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	.2	0.0	0.0	11.2
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	21.1	0.0	7.5	8848.1

Calendar period: Row 2 to Row 8 -- second half of 1972
Row 1 and Row 9 to Row 14 -- first half of 1973

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL10
ROW 1	2775.9	0.0	0.0	0.0	0.0	0.0	0.0	3.8	4.9	3.0
ROW 2	216.1	711.8	90.6	995.6	0.0	0.0	56.4	3.3	4.2	2.5
ROW 3	0.0	281.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	13.2	0.0	73.1	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	29.3	0.0	616.5	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	382.4	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	2720.7	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	121.8	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	0.0	.8	0.0	[illegible]	0.0	.8	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2992.0	994.5	103.8	1025.6	455.5	3338.0	178.2	7.1	9.1	5.5

	COL11	COL12	COL13	COL14	COL15	COL16	COL17	COL18	COL19	COL20
ROW 1	0.0	0.0	0.0	0.0	0.0	125.9	0.0	33.0	27.0	0.0
ROW 2	33.0	169.2	0.0	0.0	14.4	108.6	24.0	28.5	23.3	45.5
ROW 3	280.9	0.0	0.0	0.0	3.3	0.0	5.5	0.0	0.0	11.6
ROW 4	0.0	.7	0.0	0.0	.5	0.0	.8	0.0	0.0	0.0
ROW 5	0.0	29.3	0.0	0.0	4.0	0.0	6.7	0.0	0.0	14.0
ROW 6	0.0	0.0	0.0	0.0	2.3	0.0	3.9	0.0	0.0	0.0
ROW 7	0.0	0.0	21.2	0.0	16.4	0.0	27.3	0.0	0.0	0.0
ROW 8	0.0	0.0	148.1	0.0	.8	0.0	1.3	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	12.7	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 12	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	315.4	200.2	169.3	12.7	41.7	234.5	69.5	61.5	50.3	71.2

	COL21	COL22	COL23	TOTAL
ROW 1	0.0	0.0	0.0	2973.4
ROW 2	36.9	0.0	2.6	2565.5
ROW 3	8.9	0.0	0.0	541.2
ROW 4	0.0	0.0	.9	69.2
ROW 5	10.7	0.0	0.0	719.4
ROW 6	0.0	0.0	4.1	413.4
ROW 7	0.0	0.0	0.0	2912.5
ROW 8	0.0	0.0	.1	136.7
ROW 9	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	0.0	0.0	0.0	0.0
ROW 12	.1	0.0	0.0	5.1
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	56.6	0.0	7.7	10398.0

Appendix II

Transition Matrices For Eastern Canada

Note: Definitions of the different rows and columns are those given in Table 3.2 and are presented as follow:

Row 1 Calves born during t+1
Row 2 Calves on farm at the end of t
Row 3 Steers on farm at the end of t
Row 4 Dairy heifers on farm at the end of t
Row 5 Beef heifers on farm at the end of t
Row 6 Dairy cows on farm at the end of t
Row 7 Beef cows on farm at the end of t
Row 8 Bulls on farm at the end of t
Row 9 Calves imported from Western Canada during t+1
Row 10 Calves imported from the United States during t+1
Row 11 Heifers and steers imported from Western Canada during t+1
Row 12 Heifers and steers imported from the United States during t+1
Row 13 Dairy male and female imported from Western Canada during t+1
Row 14 Dairy male and female imported from the United States during t+1

Column 1 Calves on farm at the end of t+1
Column 2 Steers on farm at the end of t+1
Column 3 Dairy heifers on farm at the end of t+1
Column 4 Beef heifers on farm at the end of t+1
Column 5 Dairy cows on farm at the end of t+1
Column 6 Beef cows on farm at the end of t+1
Column 7 Bulls on farm at the end of t+1
Column 8 Inspected slaughter of male calves during t+1
Column 9 Inspected slaughter of female calves during t+1
Column 10 Uninspected slaughter of calves during t+1
Column 11 Inspected slaughter of steers during t+1
Column 12 Inspected slaughter of heifers during t+1
Column 13 Inspected slaughter of cows during t+1
Column 14 Inspected slaughter of bulls during t+1
Column 15 Unispected slaughter of cattle during t+1
Column 16 Calves died during t+1
Column 17 Cattle died during t+1
Column 18 Calves exported to Western Canada during t+1
Column 19 Calves exported to the United States during t+1
Column 20 Heifers and steers exported to Western Canada during t+1
Column 21 Heifers and steers exported to the United States during t+1
Column 22 Dairy male and female exported to Western Canada during t+1
Column 23 Dairy male and female exported to the United States during t+1

The time periods for the first transition matrix are the first half of 1959 for row 2 to row 8, and the second half of 1959 for row 1, row 9 to row 14. The second transition matrix refers to a period of six months after the first matrix, and so on.

Calendar period: Row 2 to Row 8 -- first half of 1959
Row 1 and Row 9 to Row 14 --second half of 1959

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	643.0	0.0	0.1	0.0	0.0	0.0	0.0	55.4	22.8	28.9
ROW 2	211.6	115.7	171.4	137.0	0.0	0.0	.6	79.6	32.6	40.6
ROW 3	0.0	152.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	179.1	0.0	154.6	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	46.6	0.0	155.3	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	1996.5	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	253.7	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	105.1	0.0	0.0	0.0
ROW 9	49.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	3.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	[illegible]	0.0	0.0
ROW 11	0.0	18.1	0.0	38.6	0.0	3.3	0.0	0.0	0.0	0.0
ROW 12	0.0	13.1	0.0	13.6	0.0	1.2	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	1218.6	520.8	501.1	235.6	2156.9	413.5	105.5	142.3	58.1	72.5

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	37.5	0.0	0.0	46.5	0.0
ROW 2	2.5	43.8	0.0	0.0	6.0	19.2	2.1	0.0	65.7	0.0
ROW 3	154.7	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0
ROW 4	0.0	6.6	0.0	0.0	5.5	0.0	1.6	0.0	0.0	0.0
ROW 5	0.0	25.0	0.0	0.0	12.6	0.0	3.9	0.0	0.0	0.0
ROW 6	0.0	0.0	54.9	0.0	10.6	0.0	9.6	0.0	0.0	0.0
ROW 7	0.0	0.0	74.5	0.0	35.2	0.0	10.9	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	21.5	1.0	0.0	.6	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	3.4	0.0	0.0	5.4	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	37.2	16.1	0.0	0.0	2.6	0.0	.6	0.0	0.0	0.0
ROW 12	17.6	4.6	0.0	0.0	.9	0.0	.3	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.9	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	218.6	92.7	139.4	21.5	153.6	70.1	32.1	0.0	119.2	0.0

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	844.4
ROW 2	.4	0.0	3.4	1261.1
ROW 3	.3	0.0	0.0	522.1
ROW 4	0.0	0.0	[illegible]	514.9
ROW 5	[illegible]	0.0	0.0	242.6
ROW 6	0.0	0.0	21.7	2113.8
ROW 7	0.0	0.0	0.0	376.3
ROW 8	0.0	0.0	1.3	130.3
ROW 9	0.0	0.0	0.0	46.3
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.1	0.0	0.0	113.9
ROW 12	0.0	0.0	0.0	47.2
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	.7	0.0	30.6	6234.8

Calendar period: Row 2 to Row 8 -- second half of 1959
Row 1 and Row 9 to Row 14 -- first half of 1960

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	1081.6	0.0	0.0	0.0	0.0	0.0	0.0	113.5	62.5	50.3
ROW 2	247.6	271.3	175.2	165.0	0.0	0.0	43.6	102.5	18.6	46.0
ROW 3	0.0	114.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	361.5	0.0	118.6	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	67.1	0.0	111.1	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	2021.6	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	267.1	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	87.9	0.0	0.0	0.0
ROW 9	5.2	0.0	0.0	0.0	0.0	0.0	0.0	2.9	.9	.9
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	26.[illegible]	0.0	19.5	0.0	.9	0.0	0.0	0.0	0.0
ROW 12	0.0	1.[illegible]	0.0	1.2	0.0	.1	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	1269.9	564.2	535.7	252.8	2140.2	379.1	131.5	218.1	81.7	97.7

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.9	0.0	0.0	0.0	49.4	0.0	0.0	60.7	0.0
ROW 2	4.6	16.6	0.0	0.0	4.7	44.7	1.5	0.0	55.0	0.0
ROW 3	196.7	0.0	0.0	0.0	3.6	0.0	1.1	0.0	0.0	0.0
ROW 4	0.0	0.0	0.0	0.0	5.8	0.0	1.2	0.0	0.0	0.0
ROW 5	0.0	55.0	0.0	0.0	11.4	0.0	3.6	0.0	0.0	0.0
ROW 6	0.0	0.0	40.1	0.0	71.8	0.0	8.9	0.0	0.0	0.0
ROW 7	0.0	0.0	31.6	0.0	45.4	0.0	15.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	15.6	.5	0.0	.1	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	.9	0.0	0.0	1.1	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	16.7	8.6	0.0	0.0	.9	0.0	.3	0.0	0.0	0.0
ROW 12	1.7	.3	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	.4	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	235.[illegible]	86.1	179.7	15.6	97.1	94.9	31.9	0.0	116.8	0.0

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	1314.3
ROW 2	[illegible]	0.0	3.6	1202.5
ROW 3	1.7	0.4	0.0	515.[illegible]
ROW 4	0.0	0.0	3.7	694.8
ROW 5	0.0	0.0	0.0	236.1
ROW 6	0.0	0.0	26.7	2131.9
ROW 7	0.0	0.0	0.0	479.[illegible]
ROW 8	0.0	0.0	.6	106.[illegible]
ROW 9	0.0	0.0	0.0	19.9
ROW 10	0.0	0.0	3.0	0.0
ROW 11	.5	0.0	0.0	94.0
ROW 12	0.0	0.0	0.0	4.5
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	[illegible]	0.0	34.0	6523.5

Calendar period: Row 2 to Row 8 -- first half of 1960
Row 1 and Row 9 to Row 14 -- second half of 1960

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	[illegible]	0.0	0.0	0.0	0.0	0.0	0.0	59.4	26.5	26.2
ROW 2	417.7	[illegible]	191.0	142.0	0.0	0.0	1.9	82.4	34.1	39.4
ROW 3	0.0	175.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.9	318.0	0.0	175.1	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	62.1	0.0	164.7	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	1983.2	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	255.7	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	181.2	0.0	0.0	0.0
ROW 9	53.8	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.6	6.1
ROW 11	0.0	41.2	0.0	19.5	0.0	3.9	0.4	0.0	0.0	0.0
ROW 12	0.0	2.5	0.0	2.2	0.0	.2	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	1280.4	515.0	509.0	226.4	2158.3	424.5	183.1	150.4	62.2	71.7

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	27.9	0.0	0.0	40.0	0.0
ROW 2	7.9	[illegible]	0.0	0.0	7.0	39.0	2.3	0.0	55.9	0.0
ROW 3	191.6	9.0	0.0	0.0	8.5	0.0	2.5	0.0	0.0	0.0
ROW 4	0.0	7.7	0.0	0.0	6.1	0.0	3.8	0.0	0.0	0.0
ROW 5	0.0	24.7	3.0	0.0	12.9	0.0	3.7	0.0	0.0	0.0
ROW 6	0.0	0.0	76.9	0.0	36.1	0.0	10.0	0.0	0.0	0.0
ROW 7	0.0	0.0	75.8	0.0	34.6	0.0	10.3	0.0	0.0	0.0
ROW 8	0.0	0.3	0.0	21.3	4.2	0.0	1.2	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	4.1	0.0	0.0	5.8	0.0
ROW 11	48.8	19.1	0.0	0.0	2.9	0.0	.4	0.0	0.0	0.0
ROW 12	1.8	[illegible]	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	249.1	92.4	150.7	21.3	111.0	71.0	32.6	0.0	101.7	0.0

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	858.9
ROW 2	.3	0.0	3.9	1259.2
ROW 3	1.7	0.0	0.0	559.9
ROW 4	0.0	0.0	3.9	531.6
ROW 5	2.6	0.0	0.0	250.9
ROW 6	0.0	0.0	21.5	2123.7
ROW 7	0.0	0.0	0.0	376.2
ROW 8	0.0	0.0	2.6	138.5
ROW 9	0.0	0.0	0.0	50.1
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.6	0.0	0.0	158.9
ROW 12	0.0	0.0	0.0	7.3
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	[illegible]	0.0	31.9	6345.1

Calendar period: Row 2 to Row 8 --second half of 1960
Row 1 and Row 9 to Row 14 -- first half of 1961

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	1087.9	0.0	0.0	0.0	0.0	0.0	0.0	108.5	42.7	54.5
ROW 2	223.1	308.9	161.9	193.0	0.0	0.0	43.2	97.7	38.5	49.2
ROW 3	0.0	[illegible]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	381.7	0.0	106.4	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	57.4	0.0	123.2	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	2036.2	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	290.2	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	86.0	0.3	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	1.5	1.7
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	23.9	0.0	15.1	0.0	.0	0.1	0.7	0.0	0.0
ROW 12	0.0	.7	0.0	.4	0.0	.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	1311.0	530.2	543.6	265.9	2142.6	414.3	130.0	209.7	82.7	105.4

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	51.4	0.0	0.0	40.9	0.0
ROW 2	[illegible]	19.5	0.0	0.0	5.6	45.1	1.7	0.0	36.9	0.0
ROW 3	234.6	0.0	0.0	0.0	2.0	0.0	.9	0.0	0.0	0.0
ROW 4	0.0	[illegible]	0.0	0.0	4.2	0.0	1.3	0.0	0.0	0.0
ROW 5	0.0	[illegible]	0.0	0.0	10.2	0.0	3.1	0.0	0.0	0.0
ROW 6	0.0	0.0	65.8	0.0	28.6	0.0	4.9	0.0	0.0	0.0
ROW 7	0.0	0.0	[illegible]	0.0	45.7	0.0	14.3	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	14.7	.5	0.0	.2	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	1.2	0.0
ROW 11	49.1	4.0	0.0	0.0	.7	0.0	.2	0.0	0.0	0.0
ROW 12	.1	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	[illegible]	40.2	118.3	14.7	98.6	96.4	30.6	0.0	79.0	0.0

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	1364.0
ROW 2	.4	0.0	4.7	1255.5
ROW 3	1.2	0.0	0.0	513.9
ROW 4	0.0	0.0	4.3	506.0
ROW 5	4.3	0.0	0.0	225.9
ROW 6	0.0	0.0	23.9	2169.6
ROW 7	0.0	0.0	0.0	472.0
ROW 8	0.0	0.0	.5	182.7
ROW 9	0.0	0.0	0.0	10.1
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.3	0.0	0.0	94.9
ROW 12	0.0	0.0	0.0	1.3
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	6.2	0.0	33.4	6654.5

Calendar period: Row 2 to Row 8 -- first half of 1961
.Row 1 and Row 9 to Row 14 -- second half of 1961 .

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL10
ROW 1	679.9	0.0	0.0	0.0	0.0	0.0	0.0	53.9	22.1	23.6
ROW 2	613.6	331.6	49.7	117.0	0.0	0.0	.6	70.6	32.0	47.0
ROW 3	0.0	175.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	457.6	0.0	65.7	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.3	72.1	0.0	144.9	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	2047.0	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	291.5	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	100.4	0.0	0.0	0.0
ROW 9	31.6	0.0	0.0	0.0	0.0	0.0	0.0	18.6	6.3	5.5
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	.5	0.0	0.0	0.0
ROW 11	0.0	33.6	0.9	25.0	0.0	1.3	0.0	0.0	0.0	0.0
ROW 12	4.0	.6	0.0	.6	0.0	.1	0.0	0.4	0.0	0.0
ROW 13	0.0	0.0	2.3	9.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0
TOTAL	1327.5	541.7	509.9	236.5	2113.6	437.9	101.5	142.8	60.9	76.2

	COL11	COL12	COL13	COL14	COL15	COL16	COL17	COL18	COL19	COL20
ROW 1	0.0	0.0	0.0	0.0	0.0	79.9	0.0	0.0	120.6	0.0
ROW 2	6.6	4.9	0.0	0.0	9.9	63.4	1.3	0.0	177.1	0.0
ROW 3	234.1	0.0	3.0	0.0	3.0	0.0	1.2	0.0	0.0	0.0
ROW 4	0.0	14.[illegible]	0.0	0.0	5.0	0.0	1.6	0.0	0.0	0.0
ROW 5	0.0	47.2	7.0	0.0	12.3	0.0	4.0	0.0	0.0	0.0
ROW 6	0.0	4.3	53.3	0.0	16.9	0.0	11.9	0.0	0.0	0.0
ROW 7	0.0	0.0	77.7	0.0	61.2	0.0	13.1	0.0	0.0	0.0
ROW 8	0.0	1.0	0.0	22.7	4.[illegible]	0.0	1.5	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.6	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	9.5	0.0	0.0	0.0	0.0
ROW 11	47.4	1.5	0.0	0.0	1.0	0.0	.3	0.0	0.0	0.0
ROW 12	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	[illegible]	89.1	147.6	22.7	109.0	79.5	34.9	0.0	321.3	0.0

	COL21	COL22	COL23	TOTAL
ROW 1	0.0	0.0	0.0	984.7
ROW 2	.9	0.0	2.1	1360.7
ROW 3	1.0	0.0	0.0	611.6
ROW 4	0.0	0.0	1.1	554.0
ROW 5	4.4	0.0	0.9	277.9
ROW 6	0.0	0.0	24.4	2190.9
ROW 7	0.0	0.0	0.0	423.7
ROW 8	0.0	0.0	1.1	111.8
ROW 9	0.0	0.0	0.0	131.4
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.4	0.0	0.0	129.3
ROW 12	0.0	0.0	0.0	1.5
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	6.3	[illegible]	12.9	6666.7

Calendar period: Row 2 to Row 8 -- second half of 1961
Row 1 and Row 9 to Row 14 -- first half of 1962

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL10
ROW 1	1045.9	0.0	0.0	0.0	0.0	0.0	0.0	104.5	38.9	59.3
ROW 2	263.8	374.3	104.2	212.6	0.0	0.0	37.3	99.6	37.1	56.7
ROW 3	0.0	317.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	428.6	0.0	73.0	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	59.9	0.0	131.5	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	2043.6	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	308.9	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	88.9	0.0	0.0	0.0
ROW 9	20.6	0.0	0.0	0.0	0.0	0.0	0.0	7.8	3.0	4.4
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	14.4	0.0	9.4	0.0	.5	0.0	0.0	0.0	0.0
ROW 12	0.0	.9	0.0	.6	0.0	.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	1330.3	704.7	532.8	282.6	2116.5	440.9	126.2	211.9	79.0	120.4

	COL11	COL12	COL13	COL14	COL15	COL16	COL17	COL18	COL19	COL20
ROW 1	0.0	0.0	0.0	0.0	0.0	57.0	0.0	0.0	60.0	0.0
ROW 2	6.4	44.6	0.0	0.0	5.7	54.4	2.0	0.0	57.2	0.0
ROW 3	231.6	0.0	0.0	0.0	3.2	0.0	1.1	0.0	0.0	0.0
ROW 4	0.0	10.7	0.0	0.0	4.5	0.0	1.6	0.0	0.0	0.0
ROW 5	0.0	29.0	0.0	0.0	10.7	0.0	3.8	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	34.5	0.0	12.1	0.0	0.0	0.0
ROW 7	0.0	0.0	53.7	0.0	48.0	0.0	16.7	0.0	0.0	0.0
ROW 8	0.0	0.0	75.4	0.0	.5	0.0	.2	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	14.4	0.0	4.1	0.0	0.0	4.4	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	24.1	3.5	0.0	0.0	.4	0.0	.2	0.0	0.0	0.0
ROW 12	.5	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	262.6	87.9	129.1	14.4	107.5	115.6	37.7	0.0	121.6	0.0

	COL21	COL22	COL23	TOTAL
ROW 1	0.0	0.0	0.0	1365.7
ROW 2	.8	0.0	3.3	1360.1
ROW 3	2.4	0.0	0.0	555.3
ROW 4	0.0	0.0	3.3	571.6
ROW 5	7.8	0.0	0.0	242.7
ROW 6	0.0	0.0	24.8	2168.7
ROW 7	0.0	0.0	0.0	449.2
ROW 8	0.0	0.0	.4	194.3
ROW 9	0.0	0.0	0.0	64.2
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.3	0.0	0.0	53.9
ROW 12	0.0	0.0	0.0	2.1
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	11.3	0.0	31.8	6846.4

Calendar period: Row 2 to Row 8 -- first half of 1962
Row 1 and Row 9 to Row 14 -- second half of 1962

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	634.0	0.0	0.0	0.0	0.0	0.0	0.0	41.4	25.8	33.3
ROW 2	664.0	74.4	37.2	148.6	0.0	0.0	.5	90.6	38.2	49.3
ROW 3	0.0	498.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	453.7	0.0	67.5	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	76.3	0.0	155.9	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	2010.7	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	305.1	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	95.5	0.0	0.0	0.0
ROW 9	73.2	0.0	0.0	0.0	0.0	0.0	0.0	10.1	4.2	5.4
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	17.3	0.0	24.9	0.0	1.1	0.0	0.0	0.0	0.0
ROW 12	0.0	.5	0.0	.7	0.0	.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	1372.7	590.8	490.9	249.7	2078.2	462.1	96.0	142.1	68.2	88.0

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	32.4	0.0	0.0	136.5	0.0
ROW 2	1.4	34.2	0.0	0.0	3.7	47.8	1.3	0.0	151.7	0.0
ROW 3	213.0	0.0	0.0	0.0	8.6	0.0	2.0	0.0	0.0	0.0
ROW 4	0.0	16.0	0.0	0.0	5.4	0.0	1.8	0.0	0.0	0.0
ROW 5	0.0	37.1	0.0	0.0	13.0	0.0	3.9	0.0	0.0	0.0
ROW 6	0.0	0.0	86.2	0.0	41.9	0.0	12.8	0.0	0.0	0.0
ROW 7	0.0	0.0	90.4	0.0	43.6	0.0	15.4	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	21.5	6.9	0.0	2.2	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	5.3	0.0	0.0	19.0	0.0
ROW 11	15.4	10.5	0.0	0.0	.9	0.0	.3	0.0	0.0	0.0
ROW 12	.1	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	229.9	97.9	176.6	21.5	123.9	85.5	38.8	0.0	306.9	0.0

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	903.0
ROW 2	.2	0.0	1.5	1365.4
ROW 3	2.6	0.0	0.0	725.4
ROW 4	0.0	0.0	2.7	546.9
ROW 5	3.9	0.0	0.0	290.0
ROW 6	0.0	0.0	20.9	2172.6
ROW 7	0.0	0.0	0.0	452.6
ROW 8	0.0	0.0	3.3	129.5
ROW 9	0.0	0.0	0.0	117.1
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.3	0.0	0.0	69.4
ROW 12	0.0	0.0	0.0	1.5
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	7.0	0.0	28.4	6774.2

Calendar period: Row 2 to Row 8 -- second half of 1962
Row 1 and Row 9 to Row 14 -- first half of 1963

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	1066.0	0.0	0.0	0.0	0.0	0.0	0.0	104.1	42.4	57.2
ROW 2	247.9	343.9	160.6	223.2	0.0	0.0	41.5	103.2	42.1	56.8
ROW 3	0.0	323.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	383.0	0.0	99.9	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	54.2	0.0	148.4	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	1998.1	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	320.4	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	84.3	0.0	0.0	0.0
ROW 9	10.0	0.0	0.0	0.0	0.0	0.0	0.0	4.1	1.7	2.2
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	13.2	0.0	8.5	0.0	.5	0.0	0.0	0.0	0.0
ROW 12	0.0	1.0	0.0	.6	0.0	.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	1323.9	681.1	543.6	286.5	2098.0	469.4	125.8	211.4	86.2	116.2

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	56.3	0.0	0.0	53.0	0.0
ROW 2	7.6	52.4	0.0	0.0	7.1	55.8	2.4	0.0	52.5	0.0
ROW 3	272.3	0.0	0.0	0.0	3.4	0.0	1.3	0.0	0.0	0.0
ROW 4	0.0	8.9	0.0	0.0	4.8	0.0	1.6	0.0	0.0	0.0
ROW 5	0.0	27.6	0.0	0.0	12.0	0.0	4.1	0.0	0.0	0.0
ROW 6	0.0	0.0	56.4	0.0	34.5	0.0	11.6	0.0	0.0	0.0
ROW 7	0.0	0.0	83.2	0.0	51.0	0.0	17.1	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	12.7	.5	0.0	.2	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	2.2	0.0	0.0	2.2	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	26.2	3.1	0.0	0.0	.5	0.0	.2	0.0	0.0	0.0
ROW 12	.8	.1	0.0	0.0	.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	306.9	92.1	139.6	12.7	114.2	114.3	38.4	0.0	107.7	0.0

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	1378.9
ROW 2	1.0	0.0	3.4	1401.2
ROW 3	2.7	0.0	0.0	603.0
ROW 4	0.0	0.0	2.9	501.1
ROW 5	8.6	0.0	0.0	254.9
ROW 6	0.0	0.0	20.6	2121.3
ROW 7	0.0	0.0	0.0	471.7
ROW 8	0.0	0.0	.3	98.0
ROW 9	0.0	0.0	0.0	22.4
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.4	0.0	0.0	52.5
ROW 12	0.0	0.0	0.0	2.6
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	12.7	0.0	27.2	6987.7

Calendar period: Row 2 to Row 8 -- first half of 1963
Row 1 and Row 9 to Row 14 -- second half of 1963

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	781.2	0.0	0.0	0.0	0.0	0.0	0.0	80.3	35.9	30.5
ROW 2	544.8	178.3	93.8	174.6	0.0	0.0	1.0	84.3	36.2	42.5
ROW 3	0.0	413.7	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
ROW 4	0.0	0.0	408.5	0.0	115.1	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	60.6	0.0	173.2	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	1961.2	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	313.1	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	96.9	0.0	0.0	0.0
ROW 9	[illegible]	0.0	0.0	0.0	0.0	0.0	0.0	13.8	5.8	6.9
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	[illegible]	0.0
ROW 11	0.0	21.2	0.0	16.6	0.0	1.0	0.0	0.0	0.0	0.0
ROW 12	0.0	.6	0.0	.5	0.0	.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	1336.0	613.0	502.3	252.0	2076.5	487.6	97.0	158.4	68.0	80.1

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	38.6	0.0	0.0	50.7	0.0
ROW 2	4.2	46.4	0.0	0.0	2.4	42.9	1.3	0.0	71.0	0.0
ROW 3	261.1	0.0	0.0	0.0	5.3	0.0	1.7	0.0	0.0	0.0
ROW 4	0.0	11.5	0.0	0.0	5.4	0.0	1.7	0.0	0.0	0.0
ROW 5	0.0	31.7	0.0	0.0	13.7	0.0	4.6	0.0	0.0	0.0
ROW 6	0.0	0.0	76.7	0.0	35.6	0.0	11.3	0.0	0.0	0.0
ROW 7	0.0	0.0	98.2	0.0	45.3	0.0	14.5	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	20.3	4.7	0.0	1.5	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.5	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	30.6	6.3	0.0	0.0	.8	0.0	.3	0.0	0.0	0.0
ROW 12	.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	296.1	96.1	174.9	20.3	118.0	80.5	37.0	0.0	133.2	0.0

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	899.3
ROW 2	.3	0.0	2.5	1320.5
ROW 3	1.6	0.0	0.0	683.6
ROW 4	0.0	0.0	3.2	545.3
ROW 5	3.9	0.0	0.0	287.5
ROW 6	0.0	0.0	20.1	2105.6
ROW 7	0.0	0.0	0.0	471.0
ROW 8	0.0	0.0	2.9	126.2
ROW 9	0.0	0.0	0.0	133.5
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.3	0.0	0.0	77.0
ROW 12	0.0	0.0	0.0	1.3
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	6.1	0.0	29.3	6650.5

Calendar period: Row 2 to Row 8 -- second half of 1963
Row 1 and Row 9 to Row 14 -- first half of 1964

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	1095.7	0.0	0.0	0.0	0.0	0.0	0.0	110.3	49.3	47.5
ROW 2	143.2	361.5	173.5	223.1	0.0	0.0	37.5	100.3	45.3	43.5
ROW 3	0.0	328.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	357.5	0.0	128.7	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	63.2	0.0	153.6	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	1961.5	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	337.3	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	83.2	0.0	0.0	0.0
ROW 9	10.3	0.0	0.0	0.0	0.0	0.0	0.0	5.7	2.4	2.4
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	18.1	0.0	11.6	0.0	.7	0.0	0.0	0.0	0.0
ROW 12	0.0	15.1	0.0	4.7	0.0	.6	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	1249.6	722.9	531.0	297.9	2096.2	492.8	120.7	216.5	96.0	93.4

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	56.9	0.0	0.0	55.7	0.0
ROW 2	.3	54.6	0.0	0.0	5.9	52.0	2.2	0.0	80.9	0.0
ROW 3	281.8	0.0	0.0	0.0	3.3	0.0	1.2	0.0	0.0	0.0
ROW 4	0.0	8.3	0.0	0.0	4.5	0.0	1.6	0.0	0.0	0.0
ROW 5	0.0	27.0	0.0	0.0	18.5	0.0	3.9	0.0	0.0	0.0
ROW 6	0.0	0.0	53.9	0.0	27.7	0.0	10.4	0.0	0.0	0.0
ROW 7	0.0	0.0	89.0	0.0	45.5	0.0	17.3	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	14.0	.5	0.0	.2	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0
ROW 11	36.9	4.0	0.0	0.0	.4	0.0	.2	0.0	0.0	0.0
ROW 12	30.3	3.3	0.0	0.0	.5	0.0	.2	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	349.3	98.1	142.9	14.0	98.4	111.9	37.5	0.0	139.6	0.0

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	1415.3
ROW 2	.5	0.0	4.1	1339.2
ROW 3	1.3	0.0	0.0	615.9
ROW 4	0.0	0.0	3.6	504.0
ROW 5	4.2	0.0	0.0	252.0
ROW 6	0.0	0.0	23.9	2083.7
ROW 7	0.0	0.0	0.0	489.1
ROW 8	0.0	0.0	.4	98.2
ROW 9	0.0	0.0	0.0	26.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.2	0.0	0.0	72.3
ROW 12	.2	0.0	0.0	59.6
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	6.4	0.0	32.0	6957.1

Calendar period: Row 2 to Row 8 -- first half of 1964
Row 1 and Row 9 to Row 14 -- second half of 1964

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	718.1	0.0	0.0	0.1	0.0	0.0	0.0	68.0	30.3	30.3
ROW 2	445.0	184.6	108.5	175.2	0.0	0.0	.2	87.8	39.1	30.1
ROW 3	0.0	415.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	342.0	0.0	127.0	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	57.0	0.0	174.2	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	1951.4	3.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	323.9	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	95.7	0.0	0.0	0.0
ROW 9	128.4	0.0	0.0	0.0	0.0	0.0	0.0	22.7	10.1	10.1
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	34.7	0.0	26.4	0.0	1.7	0.0	0.0	0.0	0.0
ROW 12	0.0	1.7	0.0	1.3	0.0	.1	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	1342.5	636.0	450.5	260.0	2079.3	499.8	95.9	178.5	79.6	70.5

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	31.8	0.9	0.0	35.2	0.0
ROW 2	4.9	49.2	0.0	0.0	5.8	41.2	[illegible]	0.0	45.5	0.0
ROW 3	298.1	0.0	0.0	0.0	5.5	0.0	1.7	0.0	0.0	0.0
ROW 4	0.0	1.8	0.0	0.0	5.4	0.0	1.6	0.0	0.0	0.0
ROW 5	0.0	55.2	0.0	0.0	14.4	0.0	.4	0.0	0.0	0.0
ROW 6	0.0	0.0	81.3	0.0	30.5	0.0	10.9	0.0	0.0	0.0
ROW 7	0.0	0.0	100.4	0.0	47.9	0.0	14.3	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	21.7	1.9	0.0	.4	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	10.6	0.0	0.0	11.8	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	57.3	12.5	0.0	0.0	1.4	0.0	.5	0.0	0.0	0.0
ROW 12	.2	.1	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	358.0	118.7	180.2	21.7	119.5	83.6	35.7	0.0	92.5	0.0

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	914.0
ROW 2	1.0	0.0	2.9	1292.3
ROW 3	5.1	0.0	0.0	726.4
ROW 4	0.0	0.0	3.2	532.1
ROW 5	13.1	0.0	0.0	298.5
ROW 6	0.0	0.0	20.4	2100.7
ROW 7	0.0	0.0	0.0	493.0
ROW 8	0.0	0.0	1.1	121.9
ROW 9	0.0	0.0	0.0	193.7
ROW 10	0.0	0.0	0.0	[illegible]
ROW 11	1.3	0.0	0.0	135.8
ROW 12	.1	0.0	0.0	3.5
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	20.6	0.0	27.6	6809.1

Calendar period: Row 2 to Row 8 -- second half of 1964
Row 1 and Row 9 to Row 14 -- first half of 1965

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	1086.3	0.0	0.0	0.0	0.0	0.0	0.0	133.8	56.8	56.4
ROW 2	149.1	388.9	141.1	220.0	0.0	0.0	38.6	115.5	49.0	48.6
ROW 3	0.0	351.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	365.4	0.0	109.1	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	53.4	0.0	153.7	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	1968.1	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	345.0	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	80.4	0.0	0.0	0.0
ROW 9	16.6	0.0	0.0	0.0	0.0	0.0	0.0	12.9	5.4	5.4
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	27.6	0.0	17.8	0.0	1.1	0.0	0.0	0.0	0.0
ROW 12	0.0	1.2	0.0	.8	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	1252.0	769.4	506.5	291.9	2077.2	499.8	119.0	262.1	111.2	110.4

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	56.3	0.0	0.0	73.6	0.0
ROW 2	7.0	48.7	0.0	0.0	5.4	48.6	2.0	0.0	63.7	0.0
ROW 3	281.3	0.0	0.0	0.0	3.4	0.0	1.2	0.0	0.0	0.0
ROW 4	0.0	10.1	0.0	0.0	4.2	0.0	1.5	0.0	0.0	0.0
ROW 5	0.0	31.4	0.0	0.0	10.3	0.0	3.7	0.0	0.0	0.0
ROW 6	0.0	0.0	61.2	0.0	29.9	0.0	10.9	0.0	0.0	0.0
ROW 7	0.0	0.0	94.7	0.0	46.4	0.0	16.8	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	15.2	.4	0.0	.1	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	5.4	0.0	0.0	7.3	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0
ROW 11	50.1	8.4	0.0	0.0	.8	0.0	.3	0.0	0.0	0.0
ROW 12	.3	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	338.7	118.8	155.9	15.2	101.0	110.3	36.7	0.0	144.6	0.0

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	1463.5
ROW 2	1.0	0.0	3.3	1358.6
ROW 3	3.0	0.0	0.0	440.8
ROW 4	0.0	0.0	3.1	493.5
ROW 5	9.0	0.0	0.0	261.4
ROW 6	0.0	0.0	21.9	2891.9
ROW 7	0.0	0.0	0.0	592.9
ROW 8	0.0	0.0	.3	96.5
ROW 9	0.0	0.0	0.0	52.5
ROW 10	0.0	0.0	0.0	0.9
ROW 11	.7	0.0	0.0	106.7
ROW 12	0.0	0.0	0.0	2.3
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	13.7	0.0	28.5	7062.9

Calendar period: Row 2 to Row 8 -- first half of 1965
Row 1 and Row 9 to Row 14 -- second half of 1965

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	801.0	0.0	0.0	0.0	0.0	0.0	0.0	74.0	33.7	30.0
ROW 2	446.1	86.1	43.3	134.3	0.0	0.0	.0	101.5	46.2	42.2
ROW 3	0.0	487.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	408.3	0.0	41.2	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	72.6	0.0	150.0	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	1936.0	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	323.7	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	88.2	0.0	0.0	0.0
ROW 9	89.5	0.0	0.0	0.0	0.0	0.0	0.0	16.6	7.6	7.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	29.8	0.0	31.5	0.0	1.4	0.0	0.0	0.0	0.0
ROW 12	0.0	.0	0.0	.0	0.0	.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	1236.6	603.5	452.0	238.5	2020.2	475.0	88.8	192.1	87.5	79.0

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	28.1	0.0	0.0	135.4	0.0
ROW 2	2.5	50.5	0.0	0.0	3.3	39.3	.9	0.0	145.0	0.0
ROW 3	288.9	0.0	0.0	0.0	6.2	0.0	1.8	0.0	0.0	0.0
ROW 4	0.0	17.7	0.0	0.0	5.0	0.0	1.4	0.0	0.0	0.0
ROW 5	0.0	45.6	0.0	0.0	12.4	0.0	3.6	0.0	0.0	0.0
ROW 6	0.0	0.0	118.1	0.0	41.3	0.0	11.8	0.0	0.0	0.0
ROW 7	0.0	0.0	127.9	0.0	45.1	0.0	11.4	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	25.0	4.6	0.0	1.3	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.4	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0
ROW 11	38.0	17.6	0.0	0.0	1.1	0.0	.3	0.0	0.0	0.0
ROW 12	.4	.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	328.4	131.5	246.0	25.0	120.0	74.4	34.5	0.0	351.7	0.0

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	903.6
ROW 2	.8	0.0	1.7	1285.6
ROW 3	7.4	0.0	0.0	989.9
ROW 4	0.0	0.0	3.3	520.1
ROW 5	15.0	0.0	0.0	209.1
ROW 6	0.0	0.0	27.5	2132.6
ROW 7	0.0	0.0	0.0	513.2
ROW 8	0.0	0.0	3.2	153.2
ROW 9	0.0	0.0	0.0	159.5
ROW 10	0.0	0.0	0.0	0.0
ROW 11	1.4	0.0	0.0	121.0
ROW 12	0.0	0.0	0.0	1.0
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	24.6	0.0	35.7	6846.9

Calendar period: Row 2 to Row 8 -- second half of 1965
Row 1 and Row 9 to Row 14 -- first half of 1966

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	994.9	0.0	0.0	0.0	0.0	0.0	0.0	128.1	57.5	50.3
ROW 2	152.4	382.2	79.3	203.4	0.0	0.0	29.9	109.9	49.3	43.2
ROW 3	0.0	330.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	385.6	0.0	61.4	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	65.5	0.0	128.0	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	1933.3	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	329.1	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	78.4	0.0	0.0	0.0
ROW 9	15.1	0.0	0.0	0.0	0.0	0.0	0.0	11.8	4.9	4.2
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	23.0	0.0	14.4	0.0	.6	0.0	0.0	0.0	0.0
ROW 12	0.0	.8	0.0	.5	0.0	.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	1162.4	737.7	464.9	284.2	1994.6	457.7	108.3	248.8	111.8	97.7

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	55.2	0.0	0.0	130.4	0.0
ROW 2	5.6	50.6	0.0	0.0	4.2	47.6	1.6	0.0	112.3	0.0
ROW 3	291.7	0.0	0.0	0.0	5.4	0.0	.8	0.0	0.0	0.0
ROW 4	0.0	22.3	0.0	0.0	3.7	0.0	1.2	0.0	0.0	0.0
ROW 5	0.0	37.1	0.0	0.0	9.5	0.0	3.1	0.0	0.0	0.0
ROW 6	0.0	0.0	71.2	0.0	33.7	0.0	11.9	0.0	0.0	0.0
ROW 7	0.0	0.0	101.6	0.0	48.2	0.0	14.5	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	13.0	.3	0.0	.1	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.1	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	67.8	4.1	0.0	0.0	.5	4.7	.2	0.0	0.0	0.0
ROW 12	.4	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	365.5	114.7	172.0	13.0	102.6	107.3	33.1	0.0	254.3	0.0

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	1417.0
ROW 2	.4	0.0	4.9	1264.4
ROW 3	1.2	0.0	0.0	620.9
ROW 4	0.0	0.0	5.4	469.5
ROW 5	4.6	0.0	0.0	267.8
ROW 6	0.0	0.0	49.4	2008.5
ROW 7	0.0	0.0	0.0	494.2
ROW 8	0.0	0.0	.5	92.3
ROW 9	0.0	0.0	0.0	50.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.3	0.0	0.0	93.7
ROW 12	0.0	0.0	0.0	1.8
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	6.4	0.0	60.1	6877.2

Calendar period: Row 2 to Row 8 -- first half of 1966
Row 1 and Row 9 to Row 14 -- second half of 1966

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	663.7	0.0	0.0	0.0	0.0	0.0	0.9	57.5	36.6	31.1
ROW 2	448.9	123.3	62.8	147.8	0.0	0.0	.1	64.6	29.7	35.1
ROW 3	0.0	459.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	370.9	0.0	86.7	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	75.6	0.0	154.7	0.0	0.0	0.0	0.0
ROW 6	0.3	0.0	0.0	0.0	1906.0	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	312.2	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	84.4	0.0	0.0	0.0
ROW 9	129.3	0.0	0.0	0.0	0.0	0.0	0.0	18.9	0.0	10.1
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	42.5	0.0	37.6	0.0	1.3	0.0	0.0	0.0	0.0
ROW 12	0.0	3.0	0.0	2.7	0.0	.1	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	1241.9	628.7	433.7	263.7	1992.7	468.0	85.1	141.0	66.7	76.4

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	33.1	0.0	0.0	173.9	0.0
ROW 2	3.6	39.8	0.0	0.0	3.5	37.4	1.0	0.0	196.1	0.0
ROW 3	292.2	0.0	0.0	0.0	5.2	0.0	1.5	0.0	0.0	0.0
ROW 4	0.0	11.8	0.0	0.0	6.1	0.0	1.2	0.0	0.0	0.0
ROW 5	0.0	41.9	0.0	0.0	13.7	0.0	4.1	0.0	0.0	0.0
ROW 6	0.0	0.0	72.0	0.0	33.6	0.0	10.0	0.0	0.0	0.0
ROW 7	0.0	0.0	99.3	0.0	46.0	0.0	13.9	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	17.7	4.1	0.0	1.3	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	10.8	0.0	0.0	56.5	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	62.6	14.6	0.0	0.0	1.6	0.0	.1	0.0	0.0	0.0
ROW 12	3.3	.8	0.0	0.0	.1	0.0	.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	361.6	108.8	171.3	17.7	111.5	81.3	33.6	0.0	426.5	0.0

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	865.7
ROW 2	.1	0.0	2.8	1197.3
ROW 3	1.1	0.0	0.0	759.9
ROW 4	0.0	0.0	4.1	678.9
ROW 5	2.7	0.0	0.0	292.7
ROW 6	0.0	0.0	33.1	2054.5
ROW 7	0.0	0.0	0.0	471.2
ROW 8	0.0	0.0	4.2	111.6
ROW 9	0.0	0.0	0.0	234.1
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.3	0.0	0.0	161.2
ROW 12	0.0	0.0	0.0	10.1
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0
TOTAL	4.2	0.0	44.2	6757.4

Calendar period: Row 2 to Row 8 -- second half of 1966
Row 1 and Row 9 to Row 14 -- first half of 1967

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	1008.9	0.0	0.0	0.0	0.0	0.0	0.0	121.9	53.0	44.1
ROW 2	113.2	393.0	104.8	240.0	0.0	0.0	35.0	99.5	43.3	36.0
ROW 3	0.0	335.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	353.7	0.0	69.0	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	71.1	0.0	143.4	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	1907.0	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	332.8	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	73.0	0.0	0.0	0.0
ROW 9	24.0	0.0	0.0	0.0	0.0	0.0	0.0	21.2	9.2	7.5
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	27.4	0.0	17.5	0.0	.8	0.0	0.0	0.0	0.0
ROW 12	0.0	2.8	0.0	1.8	0.0	.1	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	.1	0.0	.2	0.0	0.0	0.0
TOTAL	1146.1	758.2	458.5	330.4	1976.1	477.0	108.2	242.5	105.5	87.7

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	55.6	0.0	0.0	74.4	0.0
ROW 2	23.3	55.5	0.0	0.0	4.0	45.5	1.5	0.0	60.8	0.0
ROW 3	298.8	0.0	0.0	0.0	2.4	0.0	.9	0.0	0.0	0.0
ROW 4	0.0	9.7	0.0	0.0	3.0	0.0	1.1	0.0	0.0	0.0
ROW 5	0.0	37.4	0.0	0.0	10.3	0.0	4.0	0.0	0.0	0.0
ROW 6	0.0	0.0	48.1	0.0	26.9	0.0	10.2	0.0	0.0	0.0
ROW 7	0.0	0.0	80.7	0.0	44.5	0.0	17.3	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	12.5	.3	0.0	.1	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	9.5	0.0	0.0	12.8	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	57.4	6.1	0.0	0.0	.4	0.0	.2	0.0	0.0	0.0
ROW 12	5.0	.5	0.0	0.0	.1	0.0	.2	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	384.5	109.3	128.8	12.5	91.9	110.6	35.5	0.0	148.0	0.0

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	1357.9
ROW 2	.1	0.0	3.5	1259.1
ROW 3	.3	0.0	0.0	637.4
ROW 4	0.0	0.0	3.2	439.7
ROW 5	1.2	0.0	0.0	287.4
ROW 6	0.0	0.0	28.4	2820.3
ROW 7	0.0	0.0	0.0	675.3
ROW 8	0.0	0.0	.3	85.3
ROW 9	0.0	0.0	0.0	84.2
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.1	0.0	0.0	118.0
ROW 12	0.0	0.0	0.0	10.3
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	.3
TOTAL	1.6	0.0	35.4	6740.3

Calendar period: Row 2 to Row 8 -- first half of 1967
Row 1 and Row 9 to Row 14 -- second half of 1967

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	719.1	0.0	0.0	0.0	0.0	0.0	0.0	57.0	34.6	30.3
ROW 2	399.0	152.6	138.3	177.5	0.0	4.8	.1	60.8	26.3	32.2
ROW 3	0.0	460.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	310.2	0.0	130.9	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	74.0	0.0	190.7	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	1849.0	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	316.1	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	86.5	0.0	0.0	0.0
ROW 9	169.0	0.0	0.0	0.0	0.0	0.0	0.0	25.6	1.1	13.6
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	45.9	0.0	42.1	0.0	2.3	0.0	0.0	0.0	0.0
ROW 12	0.0	9.3	0.0	8.6	0.0	.5	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	.3	0.0	.2	0.0	0.0	0.0
TOTAL	1287.8	674.1	452.5	302.1	1980.2	510.1	86.8	143.4	62.0	76.1

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	35.1	0.0	0.0	61.0	0.0
ROW 2	3.6	43.4	0.0	0.0	4.0	37.5	1.4	0.0	64.9	0.0
ROW 3	280.9	0.0	0.0	0.0	6.0	0.0	2.1	0.0	0.0	0.0
ROW 4	0.0	7.8	0.0	0.0	3.8	0.0	1.3	0.0	0.0	0.0
ROW 5	0.0	40.7	0.0	0.0	16.8	0.0	5.8	0.0	0.0	0.0
ROW 6	0.0	0.0	60.4	0.0	26.9	0.0	9.2	0.0	0.0	0.0
ROW 7	0.0	0.0	99.9	0.0	44.3	0.0	14.9	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	17.9	1.5	0.0	.5	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	15.9	0.0	0.0	27.5	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	63.5	16.5	0.0	0.0	1.8	0.0	.6	0.0	0.0	0.0
ROW 12	12.9	3.1	0.0	0.0	.4	0.0	.1	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	359.9	111.6	160.3	17.9	105.6	88.5	35.8	0.0	153.4	0.0

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	927.1
ROW 2	.1	0.0	3.0	1147.0
ROW 3	.6	0.0	0.0	756.1
ROW 4	0.0	0.0	3.6	463.5
ROW 5	1.5	0.0	0.0	329.6
ROW 6	0.0	0.0	25.4	1970.9
ROW 7	0.0	0.0	0.0	475.8
ROW 8	0.0	0.0	1.5	107.9
ROW 9	0.0	0.0	0.0	262.7
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.2	0.0	0.0	172.9
ROW 12	.1	0.0	0.0	34.1
ROW 13	0.0	0.0	0.0	[illegible]
ROW 14	0.0	0.0	0.0	.5
TOTAL	2.5	0.0	33.5	6644.1

Calendar period: Row 2 to Row 8 -- second half of 1967
Row 1 and Row 9 to Row 14 -- first half of 1968

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	996.9	0.0	0.0	0.0	0.0	0.0	0.0	106.6	46.5	54.4
ROW 2	99.1	393.0	97.4	262.6	0.0	0.0	31.4	90.3	39.6	46.3
ROW 3	0.0	354.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	374.7	0.0	60.4	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	78.0	0.0	161.8	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	1862.6	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	357.6	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	73.1	0.0	0.0	0.0
ROW 9	15.0	0.0	0.0	0.0	0.0	0.0	0.0	13.6	6.0	7.1
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	30.3	0.0	19.9	0.0	.8	0.0	0.0	0.0	0.0
ROW 12	0.0	1.4	0.0	.9	0.0	.8	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	.1	0.0	.2	0.0	0.0	0.0
TOTAL	1111.0	783.2	472.1	361.4	1923.1	515.3	104.7	210.5	91.8	108.0

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	6.0	0.0	0.0	0.0	58.8	0.0	0.0	126.3	0.0
ROW 2	8.6	50.7	0.0	0.0	4.5	49.9	1.6	0.0	107.1	0.0
ROW 3	312.6	0.0	0.0	0.0	2.9	0.0	1.9	0.0	0.0	0.0
ROW 4	0.0	10.7	0.0	0.0	3.5	0.0	1.3	0.0	0.0	0.0
ROW 5	0.0	40.0	0.0	0.0	14.8	0.0	4.9	0.0	0.0	0.0
ROW 6	0.0	0.0	51.0	0.0	32.2	0.0	11.2	0.0	0.0	0.0
ROW 7	0.0	0.0	85.8	0.0	54.2	0.0	18.9	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	13.1	.3	0.0	.1	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	7.6	0.0	0.0	16.3	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	61.6	7.1	0.0	0.0	.7	0.0	.3	0.0	0.0	0.0
ROW 12	1.4	.2	0.0	0.0	.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	384.2	114.7	136.8	13.1	112.5	116.3	39.2	0.0	249.7	0.0

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	1389.6
ROW 2	.3	0.0	3.3	1291.4
ROW 3	.9	0.0	0.0	676.0
ROW 4	0.0	0.0	3.2	453.8
ROW 5	4.2	0.0	0.0	302.9
ROW 6	0.0	0.0	28.8	1986.8
ROW 7	0.0	0.0	0.0	511.0
ROW 8	0.0	0.0	.3	87.0
ROW 9	0.0	0.0	0.0	45.0
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.2	0.0	0.0	121.0
ROW 12	0.0	0.0	0.0	3.9
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	.3
TOTAL	5.6	0.0	35.6	6888.4

Calendar period: Row 2 to Row 8 -- first half of 1968
Row 1 and Row 9 to Row 14 -- second half of 1968

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL10
ROW 1	724.7	0.0	0.0	0.0	0.0	0.0	0.0	57.6	24.5	29.6
ROW 2	361.4	155.9	150.0	181.7	0.0	0.0	1.8	57.7	24.5	29.7
ROW 3	0.0	445.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	310.8	0.0	144.7	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	93.9	0.0	187.0	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	1806.3	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	330.8	0.0	0.0	0.0	0.0
ROW 8	[illegible]	0.0	0.0	0.0	0.0	0.0	82.8	0.0	0.0	0.0
ROW 9	160.6	0.0	0.0	0.0	0.0	0.0	0.0	28.6	12.2	14.7
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	37.3	0.0	31.1	0.0	1.2	0.0	0.0	0.0	0.0
ROW 12	0.0	.0	0.0	.6	0.0	.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	.2	0.0	.1	0.0	0.0	0.0
TOTAL	1274.3	658.5	460.8	306.7	1951.1	519.1	84.7	143.9	61.2	74.0

	COL11	COL12	COL13	COL14	COL15	COL16	COL17	COL18	COL19	COL20
ROW 1	0.0	0.0	0.0	0.0	0.0	33.3	0.0	0.0	54.6	0.0
ROW 2	4.1	47.2	0.0	0.0	3.3	33.4	1.1	0.0	54.9	0.0
ROW 3	312.5	0.0	0.0	0.0	4.8	0.0	1.5	0.0	0.0	0.0
ROW 4	0.0	7.9	0.0	0.0	3.5	0.0	1.1	0.0	0.0	0.0
ROW 5	0.0	52.5	0.0	0.0	19.6	0.0	6.4	0.0	0.0	0.0
ROW 6	0.0	0.0	53.5	0.0	24.3	0.0	8.0	0.0	0.0	0.0
ROW 7	0.0	0.0	115.6	0.0	52.4	0.0	17.2	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	.7	0.0	.2	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	20.1	0.0	16.5	0.0	0.0	27.2	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	57.1	12.8	0.0	0.0	1.1	0.0	.4	0.0	0.0	0.0
ROW 12	.6	.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	374.3	120.7	169.2	20.1	109.6	83.2	35.9	0.0	136.9	0.0

	COL21	COL22	COL23	TOTAL
ROW 1	0.0	0.0	0.0	929.6
ROW 2	.1	0.0	3.7	1112.8
ROW 3	.5	0.0	0.0	784.5
ROW 4	0.0	0.0	4.4	472.9
ROW 5	2.6	0.0	0.0	362.0
ROW 6	0.0	0.0	34.0	1926.1
ROW 7	0.0	0.0	0.0	516.1
ROW 8	0.0	0.0	1.0	104.9
ROW 9	0.0	0.0	0.0	279.9
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.1	0.0	0.0	141.2
ROW 12	0.0	0.0	0.0	1.0
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	.3
TOTAL	3.4	0.0	43.6	6631.2

Calendar period: Row 2 to Row 8 -- second half of 1968
Row 1 and Row 9 to Row 14 -- first half of 1969

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL10
ROW 1	1014.0	0.0	0.0	0.0	0.0	0.0	0.0	104.0	47.7	46.6
ROW 2	57.9	395.6	104.7	296.2	0.0	0.0	30.8	88.0	40.3	39.4
ROW 3	0.0	347.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	373.0	0.0	70.3	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	71.2	0.0	180.9	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	1825.7	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	362.7	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	71.2	0.0	0.0	0.0
ROW 9	8.2	0.0	0.0	0.0	0.0	0.0	0.0	12.3	5.7	5.7
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	22.9	0.0	15.3	0.0	.7	0.0	0.0	0.0	0.0
ROW 12	0.0	.7	0.0	.5	0.0	.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	.1	0.0	.2	0.0	0.0	0.0
TOTAL	1080.9	766.3	477.7	383.1	1896.1	544.4	102.2	204.3	93.7	91.7

	COL11	COL12	COL13	COL14	COL15	COL16	COL17	COL18	COL19	COL20
ROW 1	0.0	0.0	0.0	0.0	0.0	59.9	0.0	0.0	109.0	0.0
ROW 2	11.0	63.9	0.0	0.0	5.0	50.7	1.8	0.0	92.2	0.0
ROW 3	310.4	0.0	0.0	0.0	3.0	0.0	1.1	0.0	0.0	0.0
ROW 4	0.0	10.5	0.0	0.0	3.8	0.0	1.6	0.0	0.0	0.0
ROW 5	0.0	36.7	0.0	0.0	13.9	0.0	5.1	0.0	0.0	0.0
ROW 6	0.0	0.0	52.5	0.0	30.9	0.0	11.5	0.0	0.0	0.0
ROW 7	0.0	0.0	88.4	0.0	51.8	0.0	14.5	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	13.2	.4	0.0	.1	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	7.0	0.0	0.0	13.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	46.4	5.4	0.0	0.0	.6	0.0	.2	0.0	0.0	0.0
ROW 12	.6	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	369.4	116.2	140.9	13.2	109.3	117.6	40.8	0.0	214.2	0.0

	COL21	COL22	COL23	TOTAL
ROW 1	0.0	0.0	0.0	1382.0
ROW 2	.1	0.0	4.8	1282.3
ROW 3	.3	0.0	0.0	662.6
ROW 4	0.0	0.0	4.6	463.6
ROW 5	1.4	0.0	0.0	308.6
ROW 6	0.0	0.0	37.4	1956.1
ROW 7	0.0	0.0	0.0	522.4
ROW 8	0.0	0.0	.4	85.3
ROW 9	0.0	0.0	0.0	51.9
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.1	0.0	0.0	92.2
ROW 12	0.0	0.0	0.0	1.9
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	.3
TOTAL	1.9	0.0	47.3	6811.2

Calendar period: Row 2 to Row 8 -- first half of 1969
Row 1 and Row 9 to Row 14 -- second half of 1969

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	774.8	0.0	0.0	0.0	0.0	0.0	0.0	55.3	24.0	29.3
ROW 2	347.6	185.7	135.9	185.1	0.0	0.0	1.2	52.9	23.0	28.1
ROW 3	0.0	404.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	318.9	0.0	141.3	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	92.2	0.0	208.0	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	1774.3	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	351.8	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	81.1	0.0	0.0	0.0
ROW 9	163.6	0.0	0.0	0.0	0.0	0.0	0.0	24.9	10.8	13.3
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	24.0	0.0	14.9	0.0	.6	0.0	0.0	0.0	0.0
ROW 12	0.0	1.0	0.0	.6	0.0	.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	.3	0.0	.3	0.0	0.0	0.0
TOTAL	1286.0	615.5	454.9	292.9	1916.0	560.5	82.5	133.1	57.8	70.7

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	34.7	0.0	0.0	24.8	0.0
ROW 2	7.1	55.6	0.0	0.0	3.5	33.2	1.1	0.0	23.7	0.0
ROW 3	362.0	0.0	0.0	0.0	3.3	0.0	1.1	0.0	0.0	0.0
ROW 4	0.0	8.7	0.0	0.0	4.9	0.0	1.3	0.0	0.0	0.0
ROW 5	0.0	53.6	0.0	0.0	22.7	0.0	7.2	0.0	0.0	0.0
ROW 6	0.0	0.0	53.3	0.0	27.4	0.0	8.7	0.0	0.0	0.0
ROW 7	0.0	0.0	117.0	0.0	60.1	0.0	19.2	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	18.9	1.0	0.0	.3	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	15.6	0.0	0.0	11.2	0.0
ROW 11	49.8	5.9	0.0	0.0	.4	0.0	.2	0.0	0.0	0.0
ROW 12	1.1	.1	0.0	0.0	.0	0.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	419.9	123.9	170.3	18.9	122.6	83.5	39.1	0.0	59.7	0.0

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	942.9
ROW 2	.1	0.0	4.7	1098.3
ROW 3	.3	0.0	0.0	771.5
ROW 4	0.0	0.0	6.7	481.0
ROW 5	2.1	0.0	0.0	385.8
ROW 6	0.0	0.0	45.2	1909.0
ROW 7	0.0	0.0	0.0	548.1
ROW 8	0.0	0.0	1.6	102.9
ROW 9	0.0	0.0	0.0	239.4
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.1	0.0	0.0	96.1
ROW 12	0.0	0.0	0.0	2.9
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	.6
TOTAL	2.5	0.0	58.2	6568.4

Calendar period: Row 2 to Row 8 -- second half of 1969
Row 1 and Row 9 to Row 14 -- first half of 1970

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	1042.4	0.0	0.0	0.0	0.0	0.0	0.0	95.4	42.4	35.6
ROW 2	55.2	413.3	83.8	281.3	0.0	0.0	26.4	81.0	36.0	30.2
ROW 3	0.0	318.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	370.0	0.0	66.8	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	67.3	0.0	178.9	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	1777.2	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	392.1	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	67.8	0.0	0.0	0.0
ROW 9	8.3	0.0	0.0	0.0	0.0	0.0	0.0	12.4	5.5	4.5
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	17.2	0.0	10.6	0.0	.5	0.0	0.0	0.0	0.0
ROW 12	0.0	1.8	0.0	1.1	0.0	.1	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	.2	0.0	.2	0.0	0.0	0.0
TOTAL	1105.9	750.7	453.8	360.3	1844.1	571.5	94.4	188.8	83.9	70.3

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	60.1	0.0	0.0	105.5	0.0
ROW 2	78.5	47.9	0.0	0.0	4.4	51.0	1.8	0.0	89.6	0.0
ROW 3	298.8	0.0	0.0	0.0	2.3	0.0	.9	0.0	0.0	0.0
ROW 4	0.0	9.9	0.0	0.0	3.8	0.0	1.5	0.0	0.0	0.0
ROW 5	0.0	31.1	0.0	0.0	11.5	0.0	4.6	0.0	0.0	0.0
ROW 6	0.0	0.0	56.2	0.0	29.7	0.0	12.0	0.0	0.0	0.0
ROW 7	0.0	0.0	99.5	0.0	52.8	0.0	21.3	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	14.4	.3	0.0	.1	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	7.6	0.0	0.0	13.5	0.0
ROW 11	39.1	2.9	0.0	0.0	.4	0.0	.2	0.0	0.0	0.0
ROW 12	3.3	.3	0.0	0.0	.0	0.0	.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	419.7	102.0	155.7	14.4	104.9	118.7	42.3	0.0	208.6	0.0

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	1381.5
ROW 2	.2	0.0	6.8	1297.3
ROW 3	.4	0.0	0.0	620.9
ROW 4	0.0	0.0	7.1	458.8
ROW 5	2.0	0.0	0.0	295.4
ROW 6	0.0	0.0	57.7	1932.7
ROW 7	0.0	0.0	0.0	565.4
ROW 8	0.0	0.0	.6	83.3
ROW 9	0.0	0.0	0.0	51.7
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.1	0.0	0.0	71.0
ROW 12	0.0	0.0	0.0	6.6
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	.4
TOTAL	2.7	0.0	72.2	6764.9

Calendar period: Row 2 to Row 8 -- first half of 1970
Row 1 and Row 9 to Row 14 -- second half of 1970

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	777.5	0.0	0.0	0.0	0.0	0.0	0.0	50.5	20.2	24.2
ROW 2	325.4	202.7	129.1	199.3	0.0	0.0	4.1	48.6	19.5	23.3
ROW 3	0.0	399.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	314.8	0.0	120.9	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	71.4	0.0	225.5	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	1710.6	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	389.2	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	75.4	0.0	0.0	0.0
ROW 9	161.2	0.0	0.0	0.0	0.0	0.0	0.0	24.0	9.7	11.6
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	27.3	0.0	17.5	0.0	.9	0.0	0.0	0.0	0.0
ROW 12	0.0	19.7	0.0	12.6	0.0	.7	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	.2	0.0	.3	0.0	0.0	0.0
TOTAL	1264.1	649.1	443.9	300.8	1831.7	616.3	79.8	123.1	49.4	59.1

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	35.6	0.0	0.0	33.9	0.0
ROW 2	27.0	55.8	0.0	0.0	4.2	34.3	1.3	0.0	32.7	0.0
ROW 3	352.0	0.0	0.0	0.0	3.8	0.0	1.2	0.0	0.0	0.0
ROW 4	0.0	7.8	0.0	0.0	4.0	0.0	1.3	0.0	0.0	0.0
ROW 5	0.0	38.9	0.0	0.0	18.8	0.0	6.9	0.0	0.0	0.0
ROW 6	0.0	0.0	52.2	0.0	27.2	0.0	8.7	0.0	0.0	0.0
ROW 7	0.0	0.0	111.0	0.0	57.8	0.0	18.5	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	17.5	.6	0.0	.2	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	16.9	0.0	0.0	16.1	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	58.7	5.4	0.0	0.0	.8	0.0	.3	0.0	0.0	0.0
ROW 12	42.0	3.9	0.0	0.0	.4	0.0	.2	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	479.8	111.8	163.2	17.5	117.7	86.7	37.6	0.0	82.7	0.0

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	942.0
ROW 2	.1	0.0	7.5	1115.4
ROW 3	.6	0.0	0.0	757.1
ROW 4	0.0	0.0	9.0	457.7
ROW 5	2.9	0.0	0.0	363.4
ROW 6	0.0	0.0	61.4	1860.9
ROW 7	0.0	0.0	0.0	576.5
ROW 8	0.0	0.0	1.4	95.2
ROW 9	0.0	0.0	0.0	239.4
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.1	0.0	0.0	111.0
ROW 12	.1	0.0	0.0	79.7
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	.5
TOTAL	3.8	0.0	79.3	6597.9

Calendar period: Row 2 to Row 8 -- second half of 1970
Row 1 and Row 9 to Row 14 -- first half of 1971

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	1018.8	0.0	0.0	0.0	0.0	0.0	0.0	90.2	39.0	32.7
ROW 2	70.0	355.1	97.6	308.6	0.0	0.0	34.7	77.3	33.5	28.0
ROW 3	0.0	340.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	349.4	0.0	72.3	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	56.7	0.0	201.2	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	1676.3	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	438.5	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	63.1	0.0	0.0	0.0
ROW 9	9.0	0.0	0.0	0.0	0.0	0.0	0.0	10.6	4.6	4.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	11.7	0.0	7.6	0.0	.4	0.0	0.0	0.0	0.0
ROW 12	0.0	26.2	0.0	17.0	0.0	1.0	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	.3	0.0	.6	0.0	0.0	0.0
TOTAL	1098.3	733.1	447.0	389.9	1748.9	641.1	98.4	178.0	77.1	64.7

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	63.7	0.0	0.0	97.6	0.0
ROW 2	44.2	59.7	0.0	0.0	4.7	54.7	1.9	0.0	83.7	0.0
ROW 3	303.2	0.0	0.0	0.0	2.9	0.0	1.2	0.0	0.0	0.0
ROW 4	0.0	8.2	0.0	0.0	3.6	0.0	1.5	0.0	0.0	0.0
ROW 5	0.0	24.9	0.0	0.0	10.9	0.0	4.4	0.0	0.0	0.0
ROW 6	0.0	0.0	52.6	0.0	27.7	0.0	11.1	0.0	0.0	0.0
ROW 7	0.0	0.0	101.8	0.0	53.7	0.0	21.3	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	15.3	.3	0.0	.1	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	7.6	0.0	0.0	11.5	0.0
ROW 11	25.7	1.9	0.0	0.0	.3	0.0	.1	0.0	0.0	0.0
ROW 12	57.5	4.2	0.0	0.0	.7	0.0	.3	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	430.6	98.9	154.4	15.3	104.8	126.0	41.9	0.0	192.9	0.0

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	1341.9
ROW 2	.2	0.0	8.3	1262.3
ROW 3	.6	0.0	0.0	648.0
ROW 4	0.0	0.0	0.0	463.1
ROW 5	2.2	0.0	0.0	300.3
ROW 6	0.0	0.0	60.4	1828.6
ROW 7	0.0	0.0	0.0	615.2
ROW 8	0.0	0.0	.8	79.6
ROW 9	0.0	0.0	0.0	47.8
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.1	0.0	0.0	47.8
ROW 12	.1	0.0	0.0	109.9
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	.9
TOTAL	3.2	0.0	70.0	6722.5

Calendar period: Row 2 to Row 8 -- first half of 1971
Row 1 and Row 9 to Row 14 -- second half of 1971

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL10
ROW 1	724.0	0.0	0.0	0.0	0.0	0.0	0.0	46.1	17.9	22.5
ROW 2	322.9	276.0	48.9	225.3	0.0	0.0	1.9	46.5	18.0	22.3
ROW 3	0.0	341.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	338.9	0.0	88.8	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	121.1	0.0	192.8	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	1629.3	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	438.2	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	75.8	0.0	0.0	0.0
ROW 9	165.2	0.0	0.0	0.0	0.0	0.0	0.0	23.8	9.1	11.5
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	71.3	0.0	11.9	0.0	.3	0.0	0.0	0.0	0.0
ROW 12	0.0	5.3	0.0	3.0	0.0	.1	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	.6	0.0	.2	0.0	0.0	0.0
TOTAL	1212.1	694.4	387.8	361.3	1718.6	631.4	76.8	116.4	45.1	56.0

	COL11	COL12	COL13	COL14	COL15	COL16	COL17	COL18	COL19	COL20
ROW 1	0.0	0.0	0.0	0.0	0.0	37.9	0.0	0.0	43.4	0.0
ROW 2	62.5	44.9	0.0	0.0	1.9	38.2	.6	0.0	43.8	0.0
ROW 3	354.5	0.0	0.0	0.0	1.6	0.0	.5	0.0	0.0	0.0
ROW 4	0.0	11.2	0.0	0.0	3.1	0.0	1.0	0.0	0.0	0.0
ROW 5	0.0	53.7	0.0	0.0	16.4	0.0	5.3	0.0	0.0	0.0
ROW 6	0.0	0.0	43.5	0.0	24.1	0.0	7.5	0.0	0.0	0.0
ROW 7	0.0	0.0	120.3	0.0	66.1	0.0	20.7	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	1.7	0.0	.5	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	17.3	0.0	19.6	0.0	0.0	22.3	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	48.0	3.0	0.0	0.0	.3	0.0	.1	0.0	0.0	0.0
ROW 12	11.2	.7	0.0	0.0	.1	0.0	.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	476.2	113.5	163.8	17.3	116.3	95.6	36.3	0.0	109.5	0.0

	COL21	COL22	COL23	TOTAL
ROW 1	0.0	0.0	0.0	891.5
ROW 2	.1	0.0	3.7	1106.7
ROW 3	.3	0.0	0.0	738.7
ROW 4	0.0	0.0	7.5	450.5
ROW 5	3.1	0.0	0.0	392.9
ROW 6	0.0	0.0	57.9	1762.3
ROW 7	0.0	0.0	0.0	646.0
ROW 8	0.0	0.0	4.0	99.1
ROW 9	0.0	0.0	0.0	251.5
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.0	0.0	0.0	84.9
ROW 12	0.0	0.0	0.0	20.3
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	.6
TOTAL	3.5	0.0	73.1	6445.0

Calendar period: Row 2 to Row 8 -- second half of 1971
Row 1 Row 9 to Row 14 -- first half of 1972

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL10
ROW 1	1002.4	0.0	0.0	0.0	0.0	0.0	0.0	79.6	34.1	28.9
ROW 2	66.7	372.5	100.2	289.0	0.0	0.0	29.3	65.6	28.2	23.8
ROW 3	0.0	337.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	316.5	0.0	64.2	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	98.2	0.0	206.7	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	1641.2	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	457.0	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	63.6	0.0	0.0	0.0
ROW 9	14.3	0.0	0.0	0.0	0.0	0.0	0.0	13.9	6.1	5.1
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	18.1	0.0	10.8	0.0	.4	0.0	0.0	0.0	0.0
ROW 12	0.0	13.4	0.0	8.2	0.0	.3	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	.3	0.0	.6	0.0	0.0	0.0
TOTAL	1083.4	742.1	416.7	406.2	1705.7	664.3	93.5	159.1	68.4	57.8

	COL11	COL12	COL13	COL14	COL15	COL16	COL17	COL18	COL19	COL20
ROW 1	0.0	0.0	0.0	0.0	0.0	66.7	0.0	0.0	93.6	0.0
ROW 2	73.0	47.9	0.0	0.0	3.0	55.0	1.1	0.0	77.2	0.0
ROW 3	307.6	0.0	0.0	0.0	1.9	0.0	.7	0.0	0.0	0.0
ROW 4	0.0	6.1	0.0	0.0	2.6	0.0	.9	0.0	0.0	0.0
ROW 5	0.0	39.5	0.0	0.0	16.2	0.0	6.1	0.0	0.0	0.0
ROW 6	0.0	0.0	31.1	0.0	22.3	0.0	8.3	0.0	0.0	0.0
ROW 7	0.0	0.0	94.9	0.0	67.9	0.0	25.3	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	.2	0.0	.1	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	14.1	0.0	11.6	0.0	0.0	16.4	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	40.9	2.3	0.0	0.0	.3	0.0	.1	0.0	0.0	0.0
ROW 12	30.8	1.4	0.0	0.0	.2	0.0	.1	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	452.4	98.2	126.0	14.1	114.4	133.3	42.6	0.0	187.1	0.0

	COL21	COL22	COL23	TOTAL
ROW 1	0.0	0.0	0.0	1385.2
ROW 2	.5	0.0	5.8	1238.5
ROW 3	.3	0.0	0.0	648.2
ROW 4	0.0	0.0	5.7	396.3
ROW 5	2.5	0.0	0.0	369.1
ROW 6	0.0	0.0	53.1	1756.0
ROW 7	0.0	0.0	0.0	645.1
ROW 8	0.0	0.0	.5	78.5
ROW 9	0.0	0.0	0.0	67.4
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.1	0.0	0.0	73.0
ROW 12	.0	0.0	0.0	55.2
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	.9
TOTAL	3.0	0.0	65.1	6433.4

Calendar period: Row 2 to Row 8 -- first half of 1972
Row 1 and Row 9 to Row 14 -- second half of 1972

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	714.8	0.0	0.0	0.0	0.0	0.0	0.0	36.3	14.4	20.8
ROW 2	364.6	141.7	67.4	189.0	0.0	0.0	.6	37.7	15.0	21.6
ROW 3	0.0	394.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	330.9	0.0	79.7	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	132.2	0.0	198.5	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	1638.1	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	461.1	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	71.5	0.0	0.0	0.0
ROW 9	173.1	0.0	0.0	0.0	0.0	0.0	0.0	17.9	7.1	10.3
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	22.8	0.0	12.1	0.0	.3	0.0	0.0	0.0	0.0
ROW 12	0.0	14.9	0.0	7.8	0.0	.2	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	.6	0.0	.2	0.0	0.0	0.0
TOTAL	1254.6	623.8	398.3	341.2	1718.4	660.1	72.2	91.9	36.5	52.7

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	57.1	0.0
ROW 2	70.5	36.8	0.0	0.0	1.7	51.9	.6	0.0	59.3	0.0
ROW 3	363.6	0.0	0.0	0.0	1.5	0.0	.5	0.0	0.0	0.0
ROW 4	0.0	8.2	0.0	0.0	2.5	0.0	.8	0.0	0.0	0.0
ROW 5	0.0	56.3	0.0	0.0	19.5	0.0	6.6	0.0	0.0	0.0
ROW 6	0.0	0.0	34.2	0.0	22.3	0.0	7.6	0.0	0.0	0.0
ROW 7	0.0	0.0	117.4	0.0	76.4	0.0	26.2	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	15.7	2.8	0.0	.9	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	24.7	0.0	0.0	28.1	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	57.6	2.6	0.0	0.0	.3	0.0	.1	0.0	0.0	0.0
ROW 12	33.8	1.7	0.0	0.0	.2	0.0	.1	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	520.5	105.6	151.6	15.7	127.0	126.6	43.4	0.0	144.5	0.0

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	895.4
ROW 2	.1	0.0	2.9	1110.7
ROW 3	.3	0.0	0.0	760.8
ROW 4	0.0	0.0	5.1	427.2
ROW 5	3.2	0.0	0.0	416.4
ROW 6	0.0	0.0	46.4	1748.8
ROW 7	0.0	0.0	0.0	681.0
ROW 8	0.0	0.0	5.2	95.9
ROW 9	0.0	0.0	0.0	261.2
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.0	0.0	0.0	90.8
ROW 12	.0	0.0	0.0	58.7
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	.8
TOTAL	3.6	0.0	59.6	6547.8

Calendar period: Row 2 to Row 8 -- second half of 1972
Row 1 and Row 9 to Row 14 -- first half of 1973

	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10
ROW 1	1040.3	0.0	0.0	0.0	0.0	0.0	0.0	55.1	21.5	26.1
ROW 2	60.8	360.0	84.0	319.4	0.0	0.0	32.7	46.5	18.1	22.1
ROW 3	0.0	376.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 4	0.0	0.0	346.2	0.0	44.5	0.0	0.0	0.0	0.0	0.0
ROW 5	0.0	0.0	0.0	84.3	0.0	206.5	0.0	0.0	0.0	0.0
ROW 6	0.0	0.0	0.0	0.0	1630.7	0.0	0.0	0.0	0.0	0.0
ROW 7	0.0	0.0	0.0	0.0	0.0	[illegible]	0.0	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	0.0	0.0	0.0	59.3	0.0	0.0	0.0
ROW 9	12.2	0.0	0.0	0.0	0.0	0.0	0.0	9.2	3.7	4.4
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	0.0	17.0	0.0	10.2	0.0	.4	0.0	0.0	0.0	0.0
ROW 12	0.0	6.4	0.0	3.8	0.0	.1	0.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	.6	0.0	1.5	0.0	0.0	0.0
TOTAL	1113.3	769.8	430.2	417.7	1675.7	694.0	93.5	110.8	43.3	52.6

	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20
ROW 1	0.0	0.0	0.0	0.0	0.0	64.4	0.0	0.0	119.3	0.0
ROW 2	120.0	54.0	0.0	0.0	3.4	54.3	1.3	0.0	100.5	0.0
ROW 3	308.0	0.0	0.0	0.0	1.9	0.0	.8	0.0	0.0	0.0
ROW 4	0.0	7.6	0.0	0.0	2.6	0.0	1.0	0.0	0.0	0.0
ROW 5	0.0	33.1	0.0	0.0	13.9	0.0	5.5	0.0	0.0	0.0
ROW 6	0.0	0.0	34.5	0.0	25.9	0.0	10.3	0.0	0.0	0.0
ROW 7	0.0	0.0	91.6	0.0	69.0	0.0	27.2	0.0	0.0	0.0
ROW 8	0.0	0.0	0.0	13.8	.2	0.0	.1	0.0	0.0	0.0
ROW 9	0.0	0.0	0.0	0.0	0.0	11.0	0.0	0.0	20.3	0.0
ROW 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 11	40.3	2.0	0.0	0.0	.3	0.0	.1	0.0	0.0	0.0
ROW 12	14.3	.7	0.0	0.0	.1	0.0	.0	0.0	0.0	0.0
ROW 13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	482.5	97.4	126.1	13.8	117.3	129.7	46.5	0.0	240.0	0.0

	COL 21	COL 22	COL 23	TOTAL
ROW 1	0.0	0.0	0.0	1326.7
ROW 2	.3	0.0	5.7	1282.9
ROW 3	.8	0.0	0.0	637.9
ROW 4	0.0	0.0	5.5	407.3
ROW 5	5.5	0.0	0.0	348.9
ROW 6	0.0	0.0	55.6	1757.0
ROW 7	0.0	0.0	0.0	674.9
ROW 8	0.0	0.0	.5	73.9
ROW 9	0.0	0.0	0.0	60.8
ROW 10	0.0	0.0	0.0	0.0
ROW 11	.1	0.0	0.0	70.4
ROW 12	.0	0.0	0.0	25.5
ROW 13	0.0	0.0	0.0	0.0
ROW 14	0.0	0.0	0.0	2.1
TOTAL	6.7	0.0	67.3	6668.2

Appendix III Death Rates of Cattle

The study of death rates is very important, because only through the study of these rates for the different categories of cattle will we be able to achieve an adequate understanding of the problem in cattle production. Tables A.1 and A.2 present death rates of the different categories of cattle, for both the Western Canada and Eastern Canada. Death rates of the different categories of cattle are obtained from the transition probability matrices of the two regions.

A few observations can be made based on the tables. In both regions calves experience higher death rates than do all other categories of cattle. This is true for both new born calves as well as existing calf stocks on farm. In Western Canada, bulls also exhibit a fairly high death rate. In Eastern Canada, however, dairy cows seem to have a death rate which is higher than the other cattle categories except new born calves. All these observations seem reasonable enough, because we would expect that new born calves, young calves and cattle kept for reproduction purposes will have a high death rate.

One final observation relates to seasonal variations in death rates among some categories. To investigate the question of seasonal variation in death rates, regression analysis on the death rates is performed. The general procedure of such an analysis is to regress the different death rates upon a set of two independent variables, namely the seasonal dummy and the trend. Hence, we have the general form of the regression equation as:

$$\text{Death rate} = f(S; T)$$
$$= \alpha + \beta_0 S + \beta_1 T + \varepsilon$$

where S is the seasonal dummy with the first half of the year = 1 and the season half of the year = 0;

T is the trend variable with 1959II=1, 1960I=2, 1960II=3,..., and so on;

α, β_0, β_1 are parameters

and ε is the error term.

The regression results for the different death rates are listed in Table A.3 and A.4.

The regression results for the death rates clearly indicate that of the nine different categories of cattle in both regions, seven show definite seasonal variations in the rates. It is also interesting to find that the seasonal influence exerted on the death rates for the different categories is very much the same in both regions. Despite improvements in cattle care, our analysis reveals a slight upward trend in death rates among four of the nine categories of cattle in both Western and Eastern Canada. This result is consistent with an earlier study by Yang (1969) who found an upward trend in the death rates of various farm animals in many provinces.

Finally, in some categories of cattle, both the seasonal dummy and the trend variable can capture only a small part of the variation (or no variation) in the death rates. In those cases, the death rates are usually fairly constant.

Table A.1 Death Rates of Cattle in Western Canada

(Numbers of deaths per hundred cattle)

Time	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1959II	1.13	1.11	0.21	0.75	0.67	0.90	0.61	0.60	2.40
1960I	4.14	4.14	0.81	0.80	0.81	0.81	0.81	0.81	0.85
1960II	1.08	1.09	0.19	0.60	1.40	0.70	0.74	0.68	1.67
1961I	3.59	3.59	0.74	0.73	0.74	0.75	0.75	0.74	0.74
1961II	1.13	1.13	0.06	0.52	1.52	0.42	0.89	0.85	2.64
1962I	3.75	3.75	0.83	0.84	0.83	0.83	0.83	0.83	0.85
1962II	1.12	1.12	0.06	0.59	1.32	0.57	1.11	0.77	2.02
1963I	3.65	3.65	0.84	0.84	0.85	0.84	0.84	0.83	0.84
1963II	1.05	1.07	0.07	0.67	1.64	0.62	1.11	0.72	2.30
1964I	3.92	3.93	0.81	0.82	0.84	0.81	0.81	0.81	0.78
1964II	1.12	1.12	0.01	0.75	1.72	0.63	1.23	0.76	1.93
1965I	4.00	4.00	0.89	0.89	0.89	0.89	0.89	0.89	0.88
1965II	1.06	1.07	0.02	0.18	1.27	0.25	1.31	1.01	2.72
1966I	3.71	3.70	0.86	0.87	0.86	0.85	0.87	0.86	0.87
1966II	1.00	0.99	0.08	0.62	1.20	0.62	0.92	0.71	2.68
1967I	4.07	4.06	0.81	0.82	0.84	0.82	0.81	0.81	0.82
1967II	1.06	1.07	0.04	0.71	0.78	0.93	0.62	0.60	3.80
1968I	3.83	3.82	0.75	0.75	0.72	0.74	0.74	0.75	0.74
1968II	1.01	1.01	0.03	0.77	0.49	0.64	0.60	0.66	3.67
1969I	3.97	3.97	0.82	0.82	0.84	0.83	0.83	0.82	0.86
1969II	1.14	1.13	0.04	1.41	1.23	0.89	0.74	0.69	4.09
1970I	3.97	3.97	0.83	0.82	0.81	0.82	0.83	0.83	0.84
1970II	1.18	1.16	0.00	2.62	0.36	0.22	0.43	0.30	3.68
1971I	4.14	4.14	1.15	1.11	0.84	0.63	0.85	0.65	1.15
1971II	1.28	1.29	0.02	3.16	0.64	0.21	0.75	0.35	2.26
1972I	4.18	4.18	0.91	0.90	0.91	0.91	0.90	0.90	0.89
1972II	1.17	1.17	0.05	1.66	0.51	0.50	1.00	0.57	3.09
1973I	4.23	4.23	0.94	0.93	0.90	0.94	0.94	0.94	0.95

Note: (1) New born calves
(2) Calves die as calves
(3) Calves die in other categories other than calves
(4) Steers
(5) Dairy heifers
(6) Beef heifers
(7) Dairy cows
(8) Beef cows
(9) Bulls

Table A.2 Death Rates of Cattle in Eastern Canada

(Number of deaths per hundred cattle)

Time	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1959II	3.26	3.16	0.17	0.48	0.31	1.61	0.44	2.91	0.46
1960I	3.75	3.71	0.12	0.21	0.24	1.54	0.42	3.67	0.10
1960II	3.21	3.10	0.18	0.45	0.34	1.47	0.47	2.74	0.92
1961I	3.67	3.59	0.14	0.18	0.26	1.37	0.41	3.38	0.19
1961II	3.38	3.27	0.10	0.20	0.29	1.47	0.54	3.09	1.13
1962I	4.17	4.00	0.15	0.20	0.31	1.57	0.56	3.76	0.19
1962II	3.58	3.50	0.08	0.36	0.29	1.34	0.59	2.96	1.70
1963I	4.08	3.98	0.17	0.22	0.32	1.61	0.55	3.63	0.20
1963II	3.40	3.23	0.13	0.25	0.31	1.53	0.54	3.08	1.19
1964I	4.02	3.88	0.16	0.21	0.32	1.54	0.51	3.54	0.20
1964II	3.48	3.19	0.13	0.23	0.30	1.47	0.52	2.90	0.40
1965I	3.85	3.60	0.15	0.19	0.30	1.41	0.52	3.35	0.10
1965II	3.18	3.06	0.07	0.23	0.27	1.20	0.55	2.61	1.06
1966I	3.90	3.69	0.11	0.13	0.26	1.25	0.52	3.14	0.11
1966II	3.36	3.12	0.08	0.18	0.25	1.40	0.49	2.95	1.16
1967I	4.09	3.61	0.12	0.14	0.25	1.50	0.50	3.64	0.12
1967II	3.79	3.28	0.12	0.28	0.28	1.76	0.47	3.13	0.46
1968I	4.23	3.86	0.12	0.15	0.26	1.62	0.56	3.69	0.11
1968II	3.58	3.00	0.10	0.19	0.23	1.77	0.42	3.33	0.19
1969I	4.33	3.95	0.14	0.17	0.30	1.65	0.59	3.73	0.12
1969II	3.68	3.05	0.10	0.14	0.27	1.87	0.46	3.50	0.29
1970I	4.35	3.93	0.14	0.14	0.33	1.56	0.62	3.77	0.12
1970II	3.78	3.08	0.12	0.16	0.28	1.65	0.47	3.21	0.21
1971I	4.75	4.33	0.15	0.19	0.34	1.47	0.61	3.46	0.13
1971II	4.25	3.45	0.05	0.07	0.22	1.35	0.43	3.20	0.50
1972I	5.11	4.44	0.09	0.11	0.23	1.65	0.47	3.92	0.13
1972II	5.58	4.67	0.05	0.07	0.19	1.59	0.43	3.84	0.94
1973I	4.85	4.23	0.10	0.13	0.25	1.58	0.59	4.03	0.14

Note:
(1) New born calves
(2) Calves die as calves
(3) Calves die in other categories other than calves
(4) Steers
(5) Dairy heifers
(6) Beef heifers
(7) Dairy cows
(8) Beef cows
(9) Bulls

Table A.3 Regression Results on Death Rates for Western Canada

	Constant	Season	Trend	$\bar{R}^2$	DW
Calves born	0.9834 (16.845)	2.8210 (54.011)	0.0090 (2.784)	0.9909	1.7457
Calves on farm die as calves	3.8042 (62.113)	-2.8197 (-53.692)	0.0089 (2.742)	0.9908	1.7704
Calves on farm die as cattle	0.8460 (22.479)	-0.7929 (-24.571)	0.0007 (0.349)	0.9573	2.4361
Steers	0.2691 (1.158)	0.2582 (1.296)	0.0389 (3.156)	0.2536	2.4114
Dairy heifers	1.0637 (7.781)	0.2040 (1.740)	-0.0153 (-2.108)	0.1807	2.3162
Beef heifers	0.8627 (10.107)	0.0239 (0.327)	-0.0018 (-0.398)	-0.0679	1.6567
Dairy cows	0.8823 (11.193)	-0.2449 (-3.623)	-0.0042 (-1.005)	0.3030	1.8614
Beef cows	0.8951 (15.096)	-0.1622 (-3.190)	-0.0051 (-1.606)	0.2736	1.7033
Bulls	0.3891 (1.800)	1.9522 (10.530)	0.0315 (2.744)	0.8075	2.5598

Note: Numbers in brackets are t-ratios

$\bar{R}^2$ is the coefficient of determination corrected for degrees of freedom

DW is Durbin-Watson ratio

Number of observations is 28

Table A.4 Regression Results on Death Rates for Eastern Canada

	Constant	Season	Trend	$\bar{R}^2$	DW
Calves born	3.0021 (20.420)	0.4973 (3.781)	0.0484 (5.941)	0.6519	1.0888
Calves on farm die as calves	3.6046 (25.877)	-0.5965 (-4.994)	0.0206 (2.723)	0.5470	1.2591
Calves on farm die as cattle	0.1662 (13.920)	-0.0294 (-2.869)	-0.0022 (-3.504)	0.3910	1.9456
Steers	0.2878 (10.181)	0.0578 (2.385)	0.0079 (-5.266)	0.5508	2.4030
Dairy heifers	0.3139 (20.118)	-0.0120 (-0.899)	-0.0020 (-2.442)	0.1435	1.8764
Beef heifers	1.4421 (21.563)	0.0168 (0.293)	0.0054 (1.517)	0.0125	1.1787
Dairy cows	0.5193 (19.539)	-0.0428 (-1.879)	0.0008 (0.541)	0.0678	2.1125
Beef cows	3.3282 (33.236)	-0.4990 (-5.809)	0.0196 (3.685)	0.6408	0.9879
Bulls	0.3308 (2.417)	0.6123 (5.218)	-0.0127 (-1.751)	0.5225	2.0153

Note: Numbers in brackets are t-ratios
$\bar{R}^2$ is the coefficient of determination corrected for degrees of freedom
DW is Durbin-Watson ratio
Number of observations is 28

BIBLIOGRAPHY

Agriculture Canada. *Beef Cattle Performance Selection in Canada.* Publication Number 1480, 1972, Ottawa : Queen's Printer.

________. *Dairy Husbandary in Canada.* Publication Number 1439, 1971, Ottawa : Queen's Printer.

________. *Livestock and Meat Trade Report.* Ottawa : Queen's Printer, various issues.

________. *Livestock Market Review.* Ottawa : Queen's Printer, various issues.

Bacharach, M. *Biproportional Matrices and Input-Output.* Cambridge: Cambridge University Press, 1970.

Burmeister, C. A. "Cycle in Cattle Number." *The Livestock and Meat Situation.* Bureau of Agriculture Economics, U.S.D.A. March 1949.

Carvalby, Jose L. *On the Dynamics of Production and Expectations: A Time Series Analysis of the Cattle Industry.* Paper submitted to the Econometric Society III World Congress, Toronto, Canada, August 1975.

"Cattle." *Encyclopaedia Americana.* 1973, Vol. VI.

Champernowne, D.G. "A Model of Income Distribution." Economic Journal, 63:318-51, June 1953.

David, M. and T. Otsuki. "Forecasting Short-run Variation in Labor Market Activity." Review of Economics and Statistics, 49(1) : 68-77, 1968.

Dawson, D. A. and F. T. Denton. "Some Models for Simulating Canadian Manpower Flows and Related Systems." Socio-Economics Planning Science, VIII, 233-248, 1974.

Denton, F.T. "A Simulation Model of Month-to-Month Labor Force Movement in Canada." International Economic Review, XIV, Vol. 2, 293-311, June 1972.

Denton, F. T. "On the Aggregation Properties of Single-Equation Estimators for Equations with Identical Sets of Regressors." McMaster University Department of Economics Working Paper Number 77-01, May 1977.

Ezekiel, M. "The Cobweb Theorem." Quarterly Journal of Economics, Vol. LII, 225-280, February 1938.

Food Prices Review Board. Feed Grains Prices. Ottawa, June 1974.

Hart, P. E. and S. J. Prais. "The Analysis of Business Concentration, A Statistical Approach." Journal of the Royal Statistical Society, Series A, 119 : 150-175, October 1956.

Judge, G.G. and E.R. Swanson. "Markov Chains: Basic Concepts and

Suggested Uses in Agricultural Economics." Department of Agricultural Economics, Agricultural Experiment Station, University of Illionis College of Agriculture, Research Report, AEKR-49, December 1961.

Jarvis, Lovell S. "Cattle as Capital Goods and Ranchers as Portfolio Managers: An Application to the Argentine Cattle Sector." Journal of Political Economy, 489-520, May/June, 1974.

Kemeny, J.G. et. al. Finite Mathematical Structures. New York, Prentice-Hall, Inc., 1959.

Kemeny, J.G. and J. Laurie Snell. Finite Markov Chains. Princeton: De Van Nostrand Company, Inc., 1960.

Kerr, T.C. Determinants of Regional Livestock Supply in Canada. Agricultural Economics Research Council of Canada, Publication 15, 1968.

Kulshreshtha, S.N. and A.G. Wilson. "An Open Econometric Model of the Canadian Beef Cattle Sector." American Journal of Agricultural Economics, 54:84-91, 1972.

Langemeier, Larry and Russell G. Thompson. "Demand, Supply and Price Relationships for the Beef Sector, Post-World War II Period." Journal of Farm Economics, 49:169-183, February, 1967.

Lazar, F. "Regional Unemployment Rate Disparities in Canada: Some Possible Explanations." Canadian Journal of Economics, X, No. 1, 112-129, 1977.

Lee, T. C., G. G. Judge and A. Zellner. Estimating the Paramaters of the Markov Probability Model for Aggregate Time Series Data. Amsterdam : North-Holland Publishing Company, 1970.

Lohoar, J. S. "Prospects for Increasing Beef Supplies in Canada." Canadian Farm Economics, 4 : 1-8, April 1964.

Lorie, J. H. "Causes of Annual Fluctuations in the Production of Livestocks and Livestock Products." Supplement to the Journal of Business, University of Chicago Press, 1970.

MacAulay, T. G. "An Recursive Spatial Equilibrium Model of the North American Beef Industry for Policy Analysis." Unpublished Ph.D. thesis, University of Guelph, 1976.

Markov, A. A. "Investigation of an Important Case of Dependent Trails." Izvestia Acad. Nauk SPB, VI, Series I (Russian), 61, 1907.

Marshall, R. G. An Assessment of Demand, Supply and Trade Relationships Affecting Cattle, Beef, Hogs, and Pork Prices in Canada. Ottawa : Food Prices Review Board, May 1974.

________. Variations in Canadian Cattle Inventories and Marketing. Department of Agriculture Economics, Ontario Agriculture College, Guelph, Ontario, 1964.

Meek, John James. "Simulation of the Cattle-Calves Sub-sector in A Developed Economy with Special Reference to the Canadian

Cattle Herd." Unpublished Ph.D. Thesis, Michigan State University, 1975.

Pearson, F. A. et. al. A Series of Five Articles Published in Farm Economics, Cornell University, March 1953 to February 1954.

Report of the Federal Task Force of Agriculture. Canadian Agriculture in the Seventies, Ottawa : Queen's Printer, 1969.

Solow, R. "Some Long-run Aspects of the Distribution of Wage Income." Econometrica, 19 : 333-34, July 1951.

Statistic Canada. Livestock and Animal Product Statistics. Ottawa: Queen's Printer, various issues.

________. Quarterly Bulletin of Agricultural Statistics. Ottawa: Queen's Printer, various issues.

________. Report on Livestock Survey Cattle, Sheep, Horses. Ottawa : Queen's Printer, various issues.

________. Trade of Canada. Ottawa : Queen's Printer, various issues.

Theil, Henri. "A Multinomial Extension of the Linear Logit Model." International Economic Review, Vol. 10, Number 3, 251-259, October 1969.

________. Economic Forecasts and Policy. (2nd Revised Edition), Amsterdam : North-Holland Publishing Company, 1961.

________. Applied Economic Forecasting. Rand McNally and Company, 1966.

Tracz, O. S. and J. T. O'Mahony. "Empirical Transition Matrices." Department of Educational Planning, The Ontario Institute for Studies in Education, Educational Planning Occasional Paper, No. 6/71, 1971.

Tryfos, Peter. "Canadian Supply Functions for Livestock and Meat." American Journal of Agricultural Economics, 107-113, February 1974.

Yankowsky, Z. J. and F. Shefrin. Demand-Supply Projection for Canadian Agriculture - 1980. Canada Department of Agriculture, Economics Branch, Ottawa, 1968.

Yang, M. Y. A Statistical Analysis of Death Rates of Farm Animal in Canada. Research Division, Economics Branch, Canada Department of Agriculture , Ottawa, July 1969.

Yeh, M. H. "Consumer Demand for Beef and Pork in Canada." Canadian Journal of Agricultural Economics, 68-78, 1961.