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LIVESTOCK AND POULTRY PRODUCTION RISK IN THE UNITED STATES

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LIVESTOCK AND POULTRY PRODUCTION RISK IN THE UNITED STATES

The variability of economic variables--output, prices, interest rate--and the inability to predict this variability over time has considerable impact on decision making in the agricultural sector. It affects the ability of farms to expand and to maintain a stable standard of living. It also influences aggregate supply and the effectiveness of government intervention in agriculture. These and other economic decisions are made under conditions of risk and imperfect knowledge.

Farm managers, policy makers, and researchers all recognize the presence of risk with respect to future outcomes of economic variables and rely on some measure of this risk in their respective decision framework. The decision maker's subjective estimate is the appropriate measure of risk to use in making a decision. These subjective probabilities can be developed from the knowledge, experience and data available to the decision maker. Frequently decision makers rely on probability distributions developed from historical time series in forming their subjective estimates. The estimates of production variability presented in this report may help decision makers form their subjective estimates of production risk.

One of the major objectives of Regional Research Project S-232 is to measure and explain the riskiness of agricultural production in the United States across commodities and regions. One component of this objective is to estimate the livestock and poultry production risk based on the standard

statistical series available from the Crop and Livestock Reporting Service. The results of that effort are reported here.

This report summarizes livestock production variability for dairy cattle, beef cattle and swine. The variability for three types of poultry production--laying hens, broilers and turkeys--are also included. The analysis is based on data reported for the thirty-one year period 1959 through 1989. Data for this period were used to estimate production variability for each of the states participating in the regional project as well as several others required to complete meaningful estimates of production risk for each of the ten USDA supply regions.

The definition of the production variables for each specie is the starting point for this discussion. These variables are presented in formulae to calculate gross income by species in the next section of this report. As these equations indicate, dairy, beef, swine and laying hens have multiple outputs. Production variability is estimated for each of the output variables included in the gross income equations.

DEFINING LIVESTOCK AND POULTRY PRODUCTION VARIABLES

Gross income is expressed on a per head basis for poultry and on a per cow or sow basis for cattle and swine. Gross income for each specie is written as a function of the amount of output marketed and the commodity prices. The six gross income equations include 15 types of output for which production variability is estimated in later sections of this report. The subscript t in the equations refers to time in years.

Broiler Gross Income

Broiler Gross Income ($/head placed)$_t$ =

broilers produced per head placed (lbs/hd)$_t$ * broiler price ($/lb)$_t$. (1)

Chicken Gross Income

Chicken Gross Income ($/layer)$_t$ =

eggs produced per layer (eggs/layer)$_t$ * egg price ($/egg)$_t$

+ chicken sold per layer (lbs/layer)$_t$ * chicken price ($/lb)$_t$. (2)

Production risk for laying hens is measured as the variability in "eggs produced per layer," "chicken sold per layer" and their covariances.

Turkey Gross Income

Turkey Gross Income ($/head raised)$_t$ =

pounds of turkey produced per head raised (lbs/hd)$_t$ * turkey price ($/lb)$_t$. (3)

Dairy Gross Income

Gross Income Per Dairy Cow ($/milk cow)$_t$ =

milk produced (lbs/milk cow)$_t$ * milk price ($/lb)$_t$

+ dairy calf sales (lbs/milk cow)$_t$ * calf price ($/lb)$_t$

+ dairy steer & heifer sales (lbs/milk cow) * steer & heifer price ($/lb)$_t$

+ dairy cull cow sales (lbs/milk cow) * cow price ($/lb)$_t$. (4)

Dairy production risk is measured as the variability in "milk produced per milk cow," "dairy calf sales per milk cow," "steer & heifer sales per milk cow," "dairy cull cow sales per milk cow" and the pairwise covariances.

Beef Gross Income

Gross Income Per Beef Cow ($/beef cow)$_t$ =

beef calf sales (lbs/beef cow)$_t$ * calf price ($/lb)$_t$

+ beef steer & heifer sales (lbs/beef cow)$_t$ * steer & heifer price ($/lb)$_t$

+ beef cull cow sales (lbs/beef cow)$_t$ * cow price ($/lb)$_t$. (5)

Thus, beef production risk is measured as the variability in "beef calf sales per beef cow," "beef steer and heifer sales per beef cow," "beef cull cow sales per beef cow" and the pairwise covariances.

Hog Gross Income

Swine production data are reported for two biannual periods: December through May and June through November. These two biannual periods are referred to as "spring" and "fall," respectively. Annual gross income from farrow-to-finish swine in year t is equal to the sum of gross income generated in the two biannual periods.[1] Spring and fall gross income are given by:

Spring Gross Income Per Sow ($/sow)$_t$ =

market hog spring sales per sow (lbs/sow)$_t$ * barrow & gilt price ($/lb)$_t$

+ cull sow spring sales (lbs/sow)$_t$ * sow price ($/lb)$_t$. (6)

Fall Gross Income Per Sow ($/sow)$_t$ =

market hog fall sales (lbs/sow)$_t$ * barrow & gilt price ($/lb)$_t$

+ cull sow fall sales (lbs/sow)$_t$ * sow price ($/lb)$_t$. (7)

Thus, risk in hog production is measured as the variability in "market hog spring sales per sow farrowing," "cull sow spring sales per sow farrowing," "market hog fall sales per sow farrowing," "cull sow fall sales per sow farrowing" and the pairwise covariances.

Summary of Production Variables

To summarize, this report measures production risk of livestock and poultry enterprises as the variability in each of the following 15 types of output.

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[1]Pigs born Jun. 1 - Nov. 30 (i.e., fall) of year (t-1) are sold Dec. 1 - May 31 (i.e., spring) of year t. Pigs born Dec. 1 - May 31 of year t are sold Jun. 1 - Nov. 30 of year t.

Broilers	- pounds of broiler produced per broiler placed	(i)
Laying hens	- pounds of chicken sold per laying hen	(ii)
	- eggs produced per laying hen	(iii)
Turkeys	- pounds produced per head raised	(iv)
Per dairy cow	- pounds of milk produced	(v)
	- pounds of steer & heifer sales	(vi)
	- pounds of cull cow sales	(vii)
	- pounds of calf sales	(viii)
Per beef cow	- pounds of steer & heifer sales	(ix)
	- pounds of cull cow sales	(x)
	- pounds of calf sales	(xi)
Per sow	- pounds of cull sow sales in the spring	(xii)
	- pounds of cull sow sales in the fall	(xiii)
	- pounds of market hog sales in the spring	(xiv)
	- pounds of market hog sales in the fall	(xv)

Time series data are needed on each of these 15 variables to complete the estimates of production risk. While state data is published on each of the six livestock species, data is available only for the first five variables in the list above. That is, data is available only for the poultry production variables and for milk produced per milk cow. No data is available on the meat production variables defined above for dairy, beef and hogs. These data series had to be computed from the published series.

Published data on cattle report the combined sales in head of beef and dairy cattle, the combined sales in head of beef and dairy calves, and the combined sales in pounds of all cattle and all calves. The published data on hogs report the combined annual market hog sales and cull sow sales. Time

series on variables vi-xv were computed from the available published data. Appendix A describes (1) the procedure used to disaggregate the reported cattle data to obtain cattle and calf sales per dairy cow and per beef cow (variables vi-xi) and (2) the procedure used to disaggregate the reported hog data to obtain cull and market hog sales per sow (variables xii-xv).

MEASURING RISK

The variability in an economic time series can be divided into as many as four components. These are trend, seasonal fluctuations, cyclical movement and a residual containing random fluctuations. The trend may be defined as the long-term change in the mean value of the series. Variations of a rather regular nature within one year are termed seasonal fluctuations while those that extend beyond one year in length are referred to as cyclical movements. A model representing these components can be written as:

$$x_t = T(t) + S(t) + C(t) + R(t) \qquad (8)$$

where x_t denotes the observed series at time t, T(t) is the trend, S(t) is the seasonal component, C(t) is the cyclical component, and R(t) is a stationary process representing the random component and is the basis for formulating risk measures.

The components T(t), S(t) and C(t) reflect a permanent pattern or structure of the sequence $\{x_t\}$ and are sometimes referred to as the systematic component. Furthermore, they are considered deterministic[2], that is, future values can be accurately predicted from past and present values. Thus, it is

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[2]A time sequence Y_t is called deterministic if there exists a function of past and present values $f_t = f(Y_{t-j}, j = 0,1, 2,...)$ such that $E[(Y_{t+1} - f_t)^2] = 0$.

argued that decision makers can predict these three components and only the random component represents the uncertainty a decision maker faces. Let $\hat{x}_t = f(x_{t-j}, j = 1,2,...)$ denote the predicted value of the systematic part made in period t-1, where f is some function of past values. Once the series $\{\hat{x}_t\}$ is constructed, one can isolate the random component and compute a risk measure.

Two risk measures are encountered in the literature. One can be defined as the mean square forecast error from a series of one-step ahead forecasts (Young). Let $V_1 = E[(x_t - \hat{x}_t)^2]$ for t = 1, 2, ..., T, where V_1 denotes the mean square forecast error and E the expectation operator. The second risk measure is the variance of the series $\{d_t\}$, where $d_t = (x_t - \hat{x}_t)$ for t = 1, 2, ..., T, which represents deviations between the realized value and the predicted value. This measure can be written as $V_2 = E[(d_t)^2] - (E[d_t])^2$, where V_2 denotes the variance. Note that if $E[d_t] = 0$, the two risk measures coincide; otherwise, the estimated variability in $\{x_t\}$ is greater when V_1 is the selected risk measure.

The two risk measures, V_1 and V_2, have few common characteristics. First, they constitute absolute risk measures and as such are sensitive to the scale of measurement adopted. This problem can be avoided by using the index of relative variability, denoted Vr, which can be derived from either V_1 or V_2 as follows:

$$Vr_{(\cdot)} = \frac{V^*_{(\cdot)}}{B} * 100 \qquad (9)$$

where B is the average of x over the entire series $\{x_t\}$ or the average of x over a few recent observations. Second, they represent the usual risk inputs for the quadratic programming and MOTAD models of the expected value - variance framework. Both risk measures and subsequent risk inferences are

highly dependent on the function f used to estimate the long-term pattern and on any side conditions associated with the estimation process. Two procedures for estimating the long-term pattern or systematic component are discussed below.

Estimation of the Systematic Component

The production series being analyzed are composed of annual observations. Plots of these series against time were constructed and revealed no apparent cycles. When seasonal and/or cyclical components are present, simple procedures are available to remove them (Granger). Thus removal of the systematic component focuses on eliminating the trend component. In the remainder of this report, the systematic component and trend are used interchangeably. Equation 8, therefore, becomes,

$$x_t = T(t) + R(t) \qquad (8')$$

A traditional method of dealing with trend is to fit a simple function such as a polynomial, a Gompertz curve[3] or a logistic curve[4] (Granger). The fitted function provides a measure of the trend and the residuals provide an estimate of the random component, R(t). The choice of a specific function depends on the analyst's ability to discern some trend from a plot of the series against time.

A second method for dealing with a trend is to use a filter. Filters are frequently used to remove the random component present in the series $\{x_t\}$, leaving an estimate of the deterministic components. It is useful to distinguish between linear filters and nonlinear filters.

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[3]The Gompertz curve is given by: $\log x_t = a + br^t$, where a, b, r are parameters with $0 < r < 1$. Here, $T(t) = \exp(a + br^t)$.

[4]The logistic curve is given by: $x_t = 1/(a + br^t)$ or $1/x_t = a + br^t$, where a, b, r are parameters with $0 < r < 1$. Thus, $T(t) = (a + br^t)^{-1}$.

Linear Filters. A linear filter converts one time series, $\{x_t\}$, into another, $\{y_t\}$, by the linear operation:

$$y_t = \sum_{j=-\infty}^{\infty} a_j \, x_{t+j} \tag{10}$$

where the sequence $\{a_j\}$ denotes a series of weights (Granger and Newbold). When the series $\{a_j\}$ is finite and $\sum_j a_j = 1$, the filter in (10) is referred to as a moving average. It is the simple moving average when the moving average is symmetric and has equal weights. That is,

$$y_t = \frac{1}{2k+1} \sum_{j=-k}^{k} s_{t+j} \tag{11}$$

Another type of moving average considers only past and present values of x_t. This is usually referred to as an asymmetric or one-sided moving average and it is given by:

$$y_t = \sum_{j=0}^{k} a_j \, x_{t-j} \tag{12}$$

with $t-j \geq N_0$ where N_0 denotes the time reference of the first term in $\{x_t\}$. Applying (11) or (12) to a time series $\{x_t\}$ yields an estimate of the trend $\{\hat{T}_t\}$. The residual between x_t and $\hat{T}_t$ is an estimate of the random component.

Several properties of the moving average filter are noteworthy. First, it is a low-pass filter, i.e., it removes the random or high frequency component from a series $\{x_t\}$, to leave the estimated trend $\{\hat{T}_t\}$. Second, it is a linear filter. Finally, the weights $\{a_j\}$ are the solution to a system of least squares equations (Kendall and Stuart).

Despite its theoretical tractability (Judge, et al.) and its empirical popularity (Brink and McCarl; Mapp, et al.), the linear filters suffer from several limitations. First, the (simple) moving average fails to provide trend-values for the first k (and the last k) terms. Second, it is sensitive

to outliers or extreme observations in the series. Third, it performs poorly when the random component is non-Gaussian (Velleman; Gebski and McNeil). Finally, it acts not only on the trend component but on the other components of $\{x_t\}$ as well and in particular, it renders the random element somewhat smoother thus reducing its variance. Kendall and Stuart estimated the reduction in the variance of normally distributed $\{R_t\}$ for different values of k and different numbers of iterations of the simple moving average. For instance, a simple moving average of span 5 years (or k=2) applied on $\{x_t\}$ one time, reduces the variance of the random component by one-fifth.

Nonlinear Filters. The general approach draws upon the use of nonlinear smoothers such as running medians developed by Tukey in his exploratory data analysis approach. The simplest running median nonlinear filter, that of order 3, converts a time series, $\{x_t\}$, into a smooth series, $\{y_t\}$, by the nonlinear operation:

$$y_t = \text{median}(x_{t-1}, x_t, x_{t+1}) \tag{13}$$

The filter in (13) can be repeated on the resulting series $\{y_t\}$ until further resmoothing yields no further changes in the smoothed series. This repeated smoothing is denoted 3R.

Several other operations such as hanning, splitting, and twicing can be combined with the running median smoother to yield compound smoothers (Tukey, Velleman). Splitting, denoted by S, is an operation used to smooth two-point flat segments that usually result from the application of a running median filter on a time series. For the series $\{x_t\}$, let the smoothed series from the running median filter 3R be represented as $\{\ldots, y_{t-2}, y_{t-1}, y_t, y_{t+1}, y_{t+2}, \ldots\}$ and assume that y_t and y_{t+1} form a two-point flat segment (i.e., $y_t = y_{t+1}$). The operation of splitting can be defined as:

$$z_t = \text{median}\ (y_{t-1},\ y_t,\ 3y_{t-1} - 2y_{t-2}) \tag{14}$$

and

$$z_{t+1} = \text{median}\ (3y_{t+2} - 2y_{t+3},\ y_{t+1},\ y_{t+2})\ . \tag{15}$$

where z_t and z_{t+1} replace y_t and y_{t+1}, respectively. After splitting each two-point segment in $\{y_t\}$, the filter 3R is applied on the resulting series.

Another operation that can be combined with a running median filter is hanning. It consists of a weighted moving average of span three years given by:

$$y_t = \tfrac{1}{4}x_{t-1} + \tfrac{1}{2}x_t + \tfrac{1}{4}x_{t+1}\ . \tag{16}$$

Hanning is usually used to remove local variation that persists after outliers have been removed by a running median smoother. Finally, the operation twicing, denoted by "(twice)", involves smoothing the residuals (i.e., the difference between $\{x_t\}$ and $\{y_t\}$) by the same smoother used on the series $\{x_t\}$ and adding the result to the smoothed series $\{y_t\}$. Twicing is thus an operation used to guard against oversmoothing the series $\{x_t\}$.

A number of compound smoothers can be formed from running median smoothers and the above operations. 3RSSR, 3RSSH, 3RSSH(twice) are some examples of compound smoothers. The operations used and their sequencing are easily determined from the notation. For instance, the compound smoother 3RSSH(twice) implies the following steps.

- First, the original series $\{x_t\}$ is smoothed by the running median nonlinear filter of order 3. This is denoted 3R.
- Second, splitting is performed twice followed each time by 3R. That is S(3R)S(3R) where 3R is suppressed leaving SS.
- Third, hanning completes the smoothing of $\{x_t\}$ resulting in a series $\{y_t\}$. This is represented by H.

- Fourth, the compound smoother 3RSSH is applied to the residuals (i.e., difference of $\{x_t\}$ and $\{y_t\}$) and the smoothed residuals are added to $\{y_t\}$ to form the smoothed series $\{\hat{x}_t\}$. This is summarized by (twice).

The smoothed series $\{\hat{x}_t\}$ is an estimate of the deterministic component.

Unlike curve fitting and linear filter methods for describing a deterministic long-term pattern, nonlinear filters make no specific assumptions about the model generating the time series and about the probability distribution of the random component. Thus, nonlinear filters provide a method of finding long-term structure in time series data confounded with a random component from a wide range of distributions (Velleman). Another advantage of nonlinear filters over linear filters is their resistance to outlying observations.

Although nonlinear filters appear to be superior to linear filters, the authors did not find examples of their application to measuring agricultural risk. In this study, we compare the effectiveness of the nonlinear filter 3RSSH(twice) in smoothing (and subsequently the appropriateness of risk measures of) the U.S. regional livestock production data to that of two linear filters. The linear filters employed are a simple moving average of span 5 years and an unequally weighted asymmetric moving average with k=3. The following section briefly discusses the data sources used in this analysis. Results of the smoothing procedures and estimates of U.S. regional livestock production risk follow the discussion of the data sources.

SOURCES OF DATA

The data collected on poultry, cattle, milk and hogs were published by the United States Department of Agriculture (U.S.D.A.). Thirty-one years,

1959-1989, of annual data were collected. The specific sources of data by livestock species are as follows:

Poultry

-U.S.D.A. Commercial Broilers, Annual production and weekly placements, 1960-1973.

-U.S.D.A. Hatchery production, Annual Summary, 1974-1989.

-U.S.D.A. Chickens and Eggs, Final estimates, 1960-1987.

-U.S.D.A. Layers and Egg Production, Annual Summary, 1972-1989.

-U.S.D.A. Poultry Production and Value, Annual Summary, 1960-1989.

Hogs and Cattle

-U.S.D.A. Meat Animals Production, Disposition and Income, 1959-1989.

-U.S.D.A. Livestock Slaughter, Annual Slaughter, 1959-1989.

-U.S.D.A. Livestock and Meat Statistics, 1959-1987.

-State Agricultural Statistics, Annual Reports, 1959-1989.

-U.S.D.A. Cattle, 1972-1989.

-U.S.D.A. Livestock and Poultry Inventory, 1963-1971.

-U.S.D.A. Agricultural Statistics, 1956-1962.

Milk Production

-U.S.D.A. Dairy Statistics, 1959-1966.

-U.S.D.A. Milk Production, Disposition and Income, 1967-1989.

-State Agricultural Statistics, Annual Reports, 1959-1989.

The available data were collected for the 31 states participating in the regional project and 4 others judged to be of major importance in preparing more accurate estimates of risk at the regional levels. Resources were not available to collect the data from the following states: VT, NH, NJ, MD, DE, CT, MA, RI, MT, ID, UT, CO, and NM. The regional programming model of the

agricultural sector includes the first eight of these states in the Northeast Region, while the last five belong to the Mountain Region (House).

EMPIRICAL RESULTS

Estimates of livestock production risk are computed for each of the 10 U.S. regions[5] defined in the mathematical programming model of the agricultural sector (House). The risk estimates are obtained using the risk measure V_1, defined earlier, and are based on the deviations between the regional time series data and the smoothed series for the period 1972-1988. A list of these deviations by region is included in Appendix C. The livestock production time series for a region were constructed as a weighted average of the livestock production in the states that form that region. Descriptive statistics (e.g., mean, variance, coefficient of variation and tests for normality) of the regional time series are provided in Appendix B. Three smoothing procedures were employed on the regional series. The discussion compares the effectiveness of these smoothing procedures and describes the empirical risk measures by livestock species.

Smoothing Results from Nonlinear and Linear Filters

The nonlinear filter, 3RSSH(twice), and the linear filters, a simple 5-year symmetric moving average and an asymmetric 3-year moving average were applied to the 15 production series for each region. The relative effectiveness of the smoothing filters can be compared using the ratio of the mean square forecast error from a given filter to the variance of the original

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[5]Estimates for the Northeast region are based only on state data from NY, PA, and ME. Similarly, estimates for the Mountain region are based only on state data from WY, NV, and AZ.

series. A filter that includes all of the variation in the systematic component (i.e., $\hat{x}_t = x_t$ for all t) would have a ratio of zero, while a filter that results in more variation than the variance about the mean has a ratio greater than 100 percent. In general, the more variation a filter places in the systematic component, the closer the ratio is to zero. We denote this ratio, r(sm). It can be written as:

$$r(sm) = \frac{E[(x - sm(x))^2]}{var(x)} \cdot 100 \qquad (17)$$

where $sm(\cdot)$ is the smoothing function and x represents the random series. Tables 1a-1d give the computed r(sm) for livestock production variables in beef, dairy, hogs, and poultry, respectively. With the exception of the production variable "chicken sold per layer," in the Mountain Region, r(sm) for the nonlinear filter and the simple moving average linear filter do not exceed 100 percent. No deterministic component seems to be present in the pounds of chicken sold per layer in the Mountain Region. The r(sm) of the asymmetric (one-sided) moving average is strictly greater than those obtained from the nonlinear filter and the symmetric (two-sided) moving average for all production variables across regions. Based on this criterion, the asymmetric moving average is inferior[6] to the 3RSSH(twice) nonlinear filter and the symmetric simple moving average linear filter in predicting the deterministic component of the original series. For this reason, the remainder of the analyses are limited to the nonlinear filter and the simple moving average linear filter.

[6]Asymmetric moving average with one year length and asymmetric moving average with 3 year length and equal weights were also analyzed. Their r(sm) were larger than those of the 3 filters discussed above.

Table 1a: RATIO OF M.S.E OF DEVIATIONS FROM SMOOTHING PROCEDURE TO VARIANCE OF ORIGINAL SERIES IN PERCENT--BEEF

NONLINEAR SMOOTHING[a]

REGION	beef calves sold (LBS/ BEEF COW)	beef steer&heif sold (LBS/ BEEF COW)	beef cull cow sold (LBS/ BEEF COW)
corn belt	7.38^{+}	65.60	17.94
appalach	90.59^{-}	30.25^{-}	29.43*
delta sta	47.35*	27.05^{+}	38.99^{+}
lake sta	21.67	41.21	26.06
pacific	47.08^{+}	59.51^{+}	89.07
south pln	4.55*	13.38^{-}	36.98^{+}
north pln	31.12^{-}	29.68	18.87
southeast	66.07^{-}	27.22^{-}	38.50^{-}
northeast	92.77^{-}	59.00^{-}	54.30^{+}
mountain	19.28	66.65^{+}	71.33^{+}

EQUALLY WEIGHTED SYMMETRIC MOVING AVERAGE

corn belt	9.88^{+}	56.69	37.24
appalach	86.06	26.15	46.65
delta sta	35.72	20.89	36.30
lake stata	23.49	38.89	33.34
pacific	39.55^{+}	66.74	70.10
south pln	3.85^{-}	13.79	39.50
north pln	35.09*	32.58	42.76
southeast	47.30	31.38^{-}	39.50
northeast	71.64^{-}	44.47^{-}	42.55^{+}
mountain	17.31	60.14	59.33

UNEQUALLY WEIGHTED ASYMMETRIC MOVING AVERAGE

corn belt	19.17	138.81	107.73
appalach	149.11	58.69	115.73^{+}
delta sta	95.35	50.42	104.76^{+}
lake stata	45.40	82.23	102.59
pacific	85.77^{-}	110.89	144.32
south pln	15.16*	31.37	91.09^{+}
north pln	74.72	66.96	125.48
southeast	109.96^{-}	84.74	111.91
northeast	137.45^{-}	92.32	97.41
mountain	55.33	111.03	128.08*

[a]The *, + and - indicate the deviations that were found to differ significantly from the normal distribution. More specifically these three superscripts indicate:

+ = Shapiro-Wilk test significant at α = 5% level and positive skewness detected.

- = Shapiro-Wilk test significant at α = 5% level and negative skewness detected.

* = Shapiro-Wilk test significant at α = 5% level. No skewness detected.

Table 1b: RATIO OF M.S.E OF DEVIATIONS FROM SMOOTHING PROCEDURE TO VARIANCE OF ORIGINAL SERIES IN PERCENT--DAIRY

NONLINEAR SMOOTHING

REGION	milk produced (x1000LBS/ MILK COW)	dairy calves sold (LBS/ MILK COW)	dairy steer&heif sold (LBS/ MILK COW)	dairy cull cow sold (LBS/ MILK COW)
corn belt	0.37	5.15*	63.63*	26.37
appalach	0.35-	69.70	25.86	58.61+
delta sta	0.26*	48.57*	34.45+	58.06+
lake sta	0.42	8.41-	21.04-	44.37+
pacific	0.58	52.46+	68.10	75.36+
south pln	0.31-	4.70-	29.03-	62.22+
north pln	0.96-	53.26+	31.34+	51.91+
southeast	0.11-	79.36	53.74+	37.37+
northeast	0.43+	38.61	29.00-	94.08+
mountain	0.87+	8.22+	96.98	85.78

EQUALLY WEIGHTED SYMMETRIC MOVING AVERAGE

corn belt	2.20+	12.40+	61.35+	27.93
appalach	1.43+	72.59	25.20	66.40+
delta sta	2.01+	35.11	33.98+	54.23
lake stata	3.11+	11.08	27.95	44.92
pacific	2.31+	43.86+	71.61	74.60
south pln	1.34+	4.69*	24.17	53.55
north pln	2.96	43.62	42.28	52.11+
southeast	1.62+	59.88	50.07	44.87
northeast	3.16+	63.12	25.88-	84.38+
mountain	2.38	10.03*	92.06	90.36

UNEQUALLY WEIGHTED ASYMMETRIC MOVING AVERAGE

corn belt	8.52*	20.81+	145.24	88.83
appalach	6.77-	135.79	60.44	142.65+
delta sta	7.36	89.75	72.40	134.34
lake stata	8.53	31.24	61.12	125.12
pacific	7.39	84.37+	128.03	145.71
south pln	8.66	15.16-	53.17	123.46+
north pln	9.16-	98.62	84.82	130.69+
southeast	6.94-	133.39-	115.01	120.23
northeast	9.38-	121.34-	57.30	156.15+
mountain	7.89	28.53	150.78-	150.82

[a]The *, + and - indicate the deviations that were found to differ significantly from the normal distribution. More specifically these three superscripts indicate:

+ = Shapiro-Wilk test significant at α = 5% level and positive skewness detected.

- = Shapiro-Wilk test significant at α = 5% level and negative skewness detected.

* = Shapiro-Wilk test significant at α = 5% level. No skewness detected.

Table 1c: RATIO OF M.S.E OF DEVIATIONS FROM SMOOTHING PROCEDURE TO VARIANCE OF ORIGINAL SERIES IN PERCENT--HOGS

NONLINEAR SMOOTHING

REGION	SPRING CULL SOWS SOLD (LBS/SOW)	FALL CULL SOWS SOLD (LBS/SOW)	SPRING HOGS SOLD (LBS/SOW)	FALL HOGS SOLD (LBS/SOW)
corn belt	13.51	33.76^{+}	14.42*	17.52
lake stat	11.44	31.81^{+}	15.18	30.16^{-}
mountain	14.45*	19.94^{+}	37.96	59.08
south pln	7.40	22.61^{+}	27.90^{+}	18.13*
appalach	7.35^{+}	20.22^{+}	7.46	13.02
delta sta	3.76	16.47^{+}	3.98	5.55
northeast	6.84*	9.80^{+}	22.07	52.90
north pln	11.89	32.62^{+}	29.71	28.87^{+}
pacific	18.54	38.81^{+}	60.01^{+}	58.43^{+}
southeast	7.72*	23.05^{+}	16.97^{+}	29.41^{+}

EQUALLY WEIGHTED SYMMETRIC MOVING AVERAGE

corn belt	13.88	33.75	19.58	20.85
lake stat	13.43	32.21	25.74	34.65
mountain	10.84	20.53	42.28	66.56
south pln	10.19	23.35^{+}	29.67	22.63
appalach	8.92	21.67	9.90	17.92
delta sta	7.97	18.17^{+}	5.34	8.74
northeast	9.39	20.98	25.21	57.09
north pln	12.92	32.80	31.82	34.54
pacific	22.13	38.41^{+}	60.59^{+}	57.33
southeast	10.09	24.35^{+}	18.87	25.79

UNEQUALLY WEIGHTED ASYMMETRIC MOVING AVERAGE

corn belt	32.24	62.40	34.86	44.17
lake stat	30.54	60.09	44.61	60.35
mountain	29.33	43.33	66.88	119.11
south pln	24.56	48.49	54.71	41.76
appalach	21.18	44.68	24.23	41.42^{-}
delta sta	19.73	40.17	15.86	22.45^{+}
northeast	23.57	45.46^{+}	46.63	86.75
north pln	29.83	61.04	72.69	60.13
pacific	43.37	71.43^{+}	128.23	126.55
southeast	23.71	49.08	38.54	61.00

[a]The *, + and - indicate the deviations that were found to differ significantly from the normal distribution. More specifically these three superscripts indicate:

+ = Shapiro-Wilk test significant at α = 5% level and positive skewness detected.

- = Shapiro-Wilk test significant at α = 5% level and negative skewness detected.

* = Shapiro-Wilk test significant at α = 5% level. No skewness detected.

Table 1d: RATIO OF M.S.E OF DEVIATIONS FROM SMOOTHING PROCEDURE TO VARIANCE OF ORIGINAL SERIES IN PERCENT--POULTRY

NONLINEAR SMOOTHING

REGION	BROILERS PRODUCED PER HEAD PLACED (LBS/HD)	CHICKEN SOLD PER LAYER (LBS/LAYER)	EGGS PRODUCED PER LAYER (EGGS/LAYER)	TURKEYS PRODUCED PER HEAD RAISED (LBSxHD)
northeast	32.10	53.94^{-}	0.84^{-}	46.50
cornbelt	na	10.42^{+}	1.17	11.10^{+}
lake sta	na	33.28^{+}	2.50^{-}	24.42^{+}
mountain	na	101.92	14.99^{-}	na
south pln	5.00*	29.35^{-}	3.01^{-}	na
appala	2.96^{-}	17.78	1.09	5.08
delta	2.68	15.66^{+}	1.88^{-}	19.07*
north pln	na	23.68	1.54*	9.51^{-}
pacific	5.86^{+}	35.35^{+}	2.13	7.86
southeast	1.11	38.56^{+}	3.14	6.27^{-}

EQUALLY WEIGHTED SYMMETRIC MOVING AVERAGE

northeast	34.96	36.19	2.05	47.76
cornbelt	na	25.93	3.01	17.56
lake sta	na	30.13	4.86*	19.63
mountain	na	100.75	17.91	na
south pln	5.65	35.33	5.02	na
appala	5.56	21.54	1.52	11.17
delta	4.42	19.24^{+}	3.52	43.30^{+}
north pln	na	25.61	3.76^{+}	11.51
pacific	6.88	32.89	2.53	10.63
southeast	3.68^{+}	43.98	3.24	5.82

UNEQUALLY WEIGHTED ASYMMETRIC MOVING AVERAGE

northeast	62.21	88.53	7.09	94.97
cornbelt	na	55.24	8.04	43.74
lake sta	na	62.16^{+}	11.85	40.92
mountain	na	157.35^{+}	32.51	na
south pln	14.54	93.81	13.41	na
appala	11.67^{-}	43.28	9.89	34.72^{+}
delta	12.09	48.41	22.81^{+}	85.15
north pln	na	50.92	9.83^{-}	22.90
pacific	15.75	69.87	10.10	28.32
southeast	8.71	104.77	13.19	16.80

[a]The *, + and - indicate the deviations that were found to differ significantly from the normal distribution. More specifically these three superscripts indicate:

+ = Shapiro-Wilk test significant at α = 5% level and positive skewness detected.

- = Shapiro-Wilk test significant at α = 5% level and negative skewness detected.

* = Shapiro-Wilk test significant at α = 5% level. No skewness detected.

Continuing to use a low value of r(sm) as the criterion, the nonlinear filter performs better than the symmetric simple moving average linear filter across all regions for the following production variables: "milk produced per milk cow," "broilers produced per head placed," "eggs produced per layer," "cull sow fall sales per sow farrowing," and "market hog spring sales per sow farrowing." For the remaining livestock production variables, neither filter out-performs the other across all regions. However, the nonlinear filter is superior to the linear filter in 60 percent of these cases. Also, in those instances where the linear filter has smaller r(sm) than the nonlinear filter, the difference in their r(sm) does not exceed 20 percent. As noted earlier, when random deviations are distributed normally, the application of the linear filter results in a 20 percent reduction in the variance of the deviations. Thus, the nonlinear filter 3RSSH(Twice) seems to do a better job of estimating the deterministic component than the linear filter. Moreover, the nonlinear filter requires no specific distribution while Gaussian residuals are needed for optimal results with linear filters.

Three tests of normality were conducted on the original series and on the deviations resulting from each smoothing procedure. The first test is the Shapiro-Wilk test. This test statistic, denoted W, involves the ratio of two estimates of variance. The other two tests include the standard sample measures of skewness, denoted $\sqrt{b_1}$, and kurtosis, denoted b_2. All these tests are scale and origin invariant and hence are appropriate for testing the composite hypothesis that a random series, $\{x_t\}$, is a sample from a normal distribution with unknown mean and unknown variance. The test, W, provides the best omnibus measure of nonnormality (Shapiro, et al.). The other two

tests are more sensitive to directional departure from normality. However, these tests are usually dominated by W.

Results of these tests are presented in tables 1a-1d and in Appendix B for the deviations and the original series, respectively. These results identify all the variables for which the null hypothesis was rejected according to the W test (i.e., the probability is less than .05 that the underlying series is normal). Furthermore, for these variables, results of the skewness test are also presented since it is desirable to know the way in which these data depart from normality. Kurtosis test results for these variables and results for the directional tests on the remaining variables were not included to avoid cluttering the tables with additional footnotes.

Tables 1a-1d show that none of the production series smoothed with the nonlinear filter seems to have normally distributed deviations across all regions. On the other hand, with the linear filter, only the deviations for "broilers produced per head placed" and "cull sow spring sales per sow farrowing" seem to have a Gaussian distribution across all regions. Thus, both the smoothing effect of the linear filter on the random component and its limitations when the deviations are nonnormal (Gebski and McNeil) suggest the nonlinear filter rather than the linear filter should be used in estimating the deterministic component of the livestock production variables.

Livestock Production Variability

Tables 2a-2d present the index of relative variability of the production variables for beef, dairy, hogs, and poultry, respectively. The index of relative variability used is given by:

$$Vr = \frac{\{E[(x - sm(x))^2]\}^{\frac{1}{2}}}{\text{average } (x_{1984} \ldots x_{1988})} \cdot 100 \qquad (18)$$

where Vr denotes the index of relative variability. The average of x over the period 1984-88 is used rather than the mean of the whole series because the mean of the most recent five years is a better representation of the current expected value. We limit our discussion on the index of relative variability to the results obtained with the nonlinear filter. Estimates of Vr with the two linear filters are also provided in tables 2a-2d for comparison purposes.

Variability of beef production. The relative variability for all three beef production variables does not exceed 26 percent. The variability in beef calves sold per beef cow ranges from a low of 5.9% in the Corn Belt to a high of 25.7% in the Southern Plains. The variability of beef steers and heifers sold per beef cow is under 10% in all regions, except the Pacific, the Mountain, and the Northeast. The index of relative variability for beef cull cows sold per beef cow varies from a low of 8.5% in the Northern Plains to a high of 22.2% in the Mountain States.

Variability of dairy production. The relative variability for milk produced per milk cow is between .02% and .04% in all regions. The variability of dairy calves sold per dairy cow varies from a low of 4.7% in the Lake States Region to a high of 41.2% in the Pacific Region. The variability of dairy steer and heifer sold per milk cow is lower than 10% in all regions, except in the Pacific and Mountain Regions. The variability of dairy cull cows sold per milk cow varies from a low of 13.4% in the Corn Belt to a high of 45.6% in the Mountain states. Thus, the Mountain and Pacific Regions show high variability in dairy meat production variables.

A comparison of tables 2a and 2b suggests the following. First, the relative variability in cull cow sales is greater for dairy than beef across all regions. Second, dairy calf sales also show more variability than beef

Table 2a: COMPUTED INDEX OF RELATIVE VARIABILITY OF BEEF PRODUCTION VARIABLES (%)

NONLINEAR SMOOTHING

REGION	beef calves sold per beef cow	beef steer&heif sold per beef cow	beef cull cow sold per beef cow
corn belt	5.91	8.38	9.23
appalach	11.41	8.53	11.03
delta sta	18.46	8.82	14.45
lake sta	7.27	9.75	10.39
pacific	17.79	13.09	19.09
south pln	25.71	6.71	12.25
north pln	12.09	6.61	8.50
southeast	11.83	9.28	14.73
northeast	19.71	16.14	18.71
mountain	12.43	14.91	22.19

EQUALLY WEIGHTED SYMMETRIC MOVING AVERAGE

corn belt	6.84	7.79	13.30
appalach	11.12	7.93	13.88
delta sta	16.03	7.75	13.94
lake stat	7.57	9.47	11.75
pacific	16.31	13.87	16.93
south pln	23.65	6.81	12.66
north pln	12.84	6.92	12.79
southeast	10.01	9.97	14.92
northeast	17.32	14.01	16.57
mountain	11.77	14.16	20.23

UNEQUALLY WEIGHTED ASYMMETRIC MOVING AVERAGE

corn belt	9.53	12.19	22.62
appalach	14.63	11.88	21.86
delta sta	26.20	12.04	23.69
lake stat	10.53	13.77	20.61
pacific	24.02	17.88	24.29
south pln	46.95	10.27	19.23
north pln	18.73	9.93	21.91
southeast	15.26	16.38	25.11
northeast	23.99	20.18	25.06
mountain	21.05	19.24	29.73

Table 2b: COMPUTED INDEX OF RELATIVE VARIABILITY OF DAIRY PRODUCTION VARIABLES (%)

NONLINEAR SMOOTHING

REGION	milk produced per milk cow	dairy calves sold per milk cow	dairy steer&heif sold per milk cow	dairy cull cow sold per milk cow
corn belt	0.02	5.38	7.59	13.40
appalach	0.03	12.96	6.86	15.21
delta sta	0.03	18.91	8.13	19.97
lake sta	0.02	4.67	5.58	18.53
pacific	0.03	41.15	16.15	22.80
south pln	0.03	30.79	8.92	16.33
north pln	0.04	15.17	5.86	14.32
southeast	0.02	16.75	9.49	16.12
northeast	0.02	7.68	6.18	19.82
mountain	0.04	26.87	39.94	45.57

EQUALLY WEIGHTED SYMMETRIC MOVING AVERAGE

corn belt	0.05	8.34	7.46	13.79
appalach	0.06	13.22	6.77	16.19
delta sta	0.08	16.07	8.07	19.30
lake stat	0.06	5.35	6.43	12.78
pacific	0.07	32.01	16.56	22.68
south pln	0.05	30.78	8.14	15.15
north pln	0.07	13.73	6.81	14.35
southeast	0.06	14.55	9.16	17.66
northeast	0.06	9.81	5.84	18.77
mountain	0.07	29.68	38.91	46.77

UNEQUALLY WEIGHTED ASYMMETRIC MOVING AVERAGE

corn belt	0.09	10.81	11.47	24.59
appalach	0.14	18.08	10.49	23.73
delta sta	0.16	25.70	11.78	30.38
lake stat	0.10	8.99	9.51	21.33
pacific	0.12	44.40	22.14	31.70
south pln	0.13	55.32	12.07	23.01
north pln	0.13	20.65	9.64	22.72
southeast	0.13	21.72	13.88	28.90
northeast	0.10	13.61	8.68	25.54
mountain	0.12	50.05	49.80	60.43

Table 2c: COMPUTED INDEX OF RELATIVE VARIABILITY OF HOG PRODUCTION VARIABLES (%)

NONLINEAR SMOOTHING

REGION	SPRING CULL SOWS SOLD	FALL CULL SOWS SOLD	SPRING HOGS SOLD	FALL HOGS SOLD
corn belt	6.10	8.41	2.03	1.88
lake stat	5.78	8.33	2.17	3.00
mountain	8.06	8.12	4.45	4.77
south pln	5.34	8.05	5.67	4.63
appalach	5.91	7.83	2.83	3.60
delta sta	4.49	7.80	2.95	3.60
northeast	5.62	7.84	4.87	7.13
north pln	5.95	8.38	3.08	3.28
pacific	6.16	7.96	6.72	6.01
southeast	5.75	7.99	4.02	4.11

EQUALLY WEIGHTED SYMMETRIC MOVING AVERAGE

corn belt	6.19	8.41	2.37	2.05
lake stat	6.27	8.38	2.83	3.21
mountain	6.98	8.24	4.70	5.06
south pln	6.27	8.18	5.84	5.18
appalach	6.51	8.11	3.26	4.22
delta sta	6.54	8.19	3.41	4.52
northeast	6.58	8.07	5.21	7.40
north pln	6.20	8.40	3.19	3.59
pacific	6.73	7.92	6.75	5.96
southeast	6.57	8.21	4.24	3.85

UNEQUALLY WEIGHTED ASYMMETRIC MOVING AVERAGE

corn belt	9.43	11.44	3.16	2.98
lake stat	9.45	11.45	3.72	4.24
mountain	11.48	11.97	5.91	6.77
south pln	9.73	11.80	7.93	7.03
appalach	10.03	11.64	5.11	6.42
delta sta	10.28	12.18	5.88	7.24
northeast	10.42	11.88	7.08	9.13
north pln	9.42	11.46	4.81	4.73
pacific	9.43	10.80	9.82	8.85
southeast	10.08	11.66	6.06	5.92

Table 2d: COMPUTED INDEX OF RELATIVE VARIABILITY OF POULTRY PRODUCTION VARIABLES (%)

NONLINEAR SMOOTHING

REGION	BROILERS PRODUCED PER HEAD PLACED	CHICKEN SOLD PER LAYER	EGGS PRODUCED PER LAYER	TURKEYS PRODUCED PER HEAD RAISED
northeast	1.68	12.01	0.58	2.42
cornbelt	na	3.16	0.55	1.14
lake sta	na	4.83	0.56	1.67
mountain	na	18.40	2.78	na
south pln	1.61	8.31	1.01	na
appala	1.39	7.06	0.52	1.50
delta	1.11	8.33	0.54	1.81
north pln	na	6.19	0.56	2.60
pacific	2.05	7.53	0.61	1.20
southeast	0.64	5.07	0.80	2.87

EQUALLY WEIGHTED SYMMETRIC MOVING AVERAGE

northeast	1.75	9.83	0.91	2.45
cornbelt	na	4.99	0.88	1.44
lake sta	na	4.60	0.78	1.50
mountain	na	18.30	3.04	na
south pln	1.71	9.11	1.31	na
appala	1.90	7.77	0.61	2.23
delta	1.42	9.23	0.74	2.73
north pln	na	6.44	0.88	2.86
pacific	2.23	7.26	0.66	1.40
southeast	1.16	5.42	0.81	2.77

UNEQUALLY WEIGHTED ASYMMETRIC MOVING AVERAGE

northeast	2.33	15.38	1.69	3.46
cornbelt	na	7.28	1.44	2.27
lake sta	na	6.60	1.22	2.17
mountain	na	22.86	4.09	na
south pln	2.75	14.85	2.14	na
appala	2.75	11.01	1.57	3.93
delta	2.35	14.64	1.87	3.83
north pln	na	9.08	1.43	4.03
pacific	3.37	10.59	1.33	2.28
southeast	1.79	8.36	1.64	4.70

calf sales for all regions, except the Corn Belt, Lake States, and Northeast Regions. Third, the index of relative variability for steer and heifer sales is about the same for dairy and beef in all regions except the Mountain and the Northeast. Dairy steer and heifer sales are more variable in the Mountain Region, while beef steer and heifer sales are more variable in the Northeast.

Variability of hog production. The relative variability for the hog production variables does not exceed 8.5%. The index for cull sow sales per sow farrowing is larger in the fall than in spring for all regions. The variability of market hog sales per sow farrowing is about the same between fall and spring in all regions, except in the Northeast Region where fall sales are more variable than spring sales. Biannual market hog sales showed less relative variability than cull sow sales in the same period for all regions, except for spring sales in the Southern Plains. The variability of market hog sales and cull sow sales are lowest in the Corn Belt and Delta States, respectively.

Variability of poultry production. The index of relative variability for broiler produced per head placed is less than 2.2%. It varies from a low of 0.6% in the Southeast Region to a high of 2.1% in the Pacific Region. The index of relative variability for turkeys produced per head raised is under 3.0% with a high of 2.9% in the Southeast and a low of 1.1% in the Corn Belt.

Relative variability of chicken sold per layer is less than 18.5% for all regions except the Northeast and the Mountain states. The variability of eggs produced per layer varies from a low of 0.5% in the Appalachian Region to a high of 2.8% in the Mountain Region.

In summary, comparing livestock species we conclude that milk production is the least variable, followed by egg production, broilers and turkeys. The

index of relative variability for these livestock production activities is smaller than 3%. The meat production from beef and dairy are the most variable operations, with beef production showing less relative variability than dairy in most regions. Hog production and chicken sales show moderate variability.

On the other hand, comparing regions we found that the Corn Belt and Lake States show an index of relative variability lower than 11 percent for all fifteen livestock outputs, except for dairy cull cows. Furthermore, all regions, except Pacific, Mountain, and Southern Plains, have an index of relative variability not exceeding 20% for all livestock outputs. Thus, based on our results we can characterize the Pacific, Mountain, and Southern Plains Regions as high livestock production risk regions, the Lake States and Corn Belt as low livestock production risk regions, and the remaining five regions as moderate livestock production risk regions.

Correlations between Livestock Production Variables

Correlation coefficients were estimated for all possible pairs of the 150 variables (fifteen livestock production variables in each of 10 regions) defined earlier. The correlation estimates reported in Appendix D were based on the historical series over the last seventeen years, 1972-1988. No production was reported for 6 of the 150 variables and a total of 10,398 correlation coefficients (or a 144 x 144 correlation matrix) was derived. Obviously, a full analysis of the information contained in this matrix would be rather tedious. Thus, no attempt is made to explain either statistically nonsignificant correlation estimates or the cross-region correlation estimates; only significant correlation estimates within regions are discussed here. A t-test was performed to test the null hypothesis of no correlation

between two livestock production variables. With a significance level of .05, correlation estimates greater than .170 (and less or equal to one, of course) in absolute value are considered significant.

No effort has been made to identify the phenomena leading to the individual correlations reported. Changes in technology, the influence of drought on the timing of livestock sales, shifts in relative prices of the 15 types of output and changes in institutional constraints (such as capital availability, the dairy buyout program, etc.) all appear to have played an important role in determining the correlation coefficients reported in Appendix D. The disaggregation procedures that had to be used to calculate the individual series of meat sales, unfortunately, must also have contributed to some of the significant correlations. The following discussion notes correlations that have probably been influenced to a major extent by the disaggregation procedures. The role of other factors is left for analysts familiar with livestock and poultry production in the various regions to determine.

Correlations of Dairy Production Variables

Dairy correlation estimates ranged from -.632 for calf sales and cull cow sales in the Southern Plains Region to .546 for steer and heifer sales and cull cow sales in the Pacific Region. A negative correlation is observed between milk production and all three meat production variables in the Corn Belt, Delta States, and Southeast Regions. Negative correlations were also obtained for the pairs milk-steer and heifer sales and milk-cull cow sales in the Pacific Region. Moreover, a combination of negative and positive correlations were estimated between milk and the meat production variables. For instance, negative correlations for the pairs milk-steer and heifer sales

(calf sales) and milk-cull cow sales and positive correlation for the pair milk-calf sales (steer and heifer sales) were observed in the Northern, Appalachian, Southeast, and Southern (Northeast) Regions. Finally, a positive correlation was estimated for the pairs milk-calf sales and milk-steer and heifer sales in the Mountain Regions.

Like the correlation estimates between milk and the meat production variables, no uniform relationship across regions was observed between the meat production variables. In the Northern Plains Region, negative correlations were estimated between calf sales and cull cow sales. On the other hand, positive correlations were obtained for the pair steer and heifer sales-cull cow sales in the Pacific Region. For the remaining eight regions, cull cow sales were negatively correlated with calf sales and positively correlated with steer and heifer sales.

Correlation of Beef Production Variables

Beef correlation estimates varied from -.538 for the pair calf sales-cull cow sales in the Delta States Region to .917 between steer and heifer sales and cull cow sales in the Mountain Region. A positive correlation was estimated for the pair steer and heifer sales and cull cow sales in all ten regions. Negative correlations were observed only between calf sales and cull cow sales in the Southeast, Delta, Corn Belt, Appalachian, and Southern Plains Regions. All three pairs of beef meat production variables were positively correlated in the Northern Plains, Lake States, and Northeast Regions. Finally, each beef meat production variable was positively correlated with its corresponding dairy meat production variable. This result is not surprising given the methods used to obtain dairy and beef meat production estimates from the published aggregated cattle data (see Appendix A).

Correlation of Hog Production Variables

Hog correlation estimates ranged from -.601 for the pair cull sow spring sales-cull sow fall sales in the Corn Belt Region to .828 for the pair market hog fall sales-cull sow fall sales in the Northern Plains. Negative correlations were estimated between the two biannual cull sow sales for all ten regions. However, as expected (because of the method used to disaggregate annual market hog sales), positive correlations were estimated between the two biannual market hog sales for all ten regions. Furthermore, no positive correlations were estimated between spring sales of market hogs and cull sows. Finally, correlations between fall sales of market hogs and cull sows were either negative or nonsignificant in all regions except in the Northern Plains and Southeast Regions.

Correlation estimates between hog production variables and cattle production variables ranged from -.692 between dairy steer and heifer sales and market hogs spring sales in the Lake States Region to .584 for the pair dairy calf sales-cull sow fall sales in the Mountain Region. For pairs containing hog and dairy production variables, negative correlations were estimated in the Delta States, Pacific, and Southeast Regions, while positive correlations were estimated in the Southern Plains Region. Furthermore, for pairs with hog and beef production variables, negative correlations were observed in the Pacific, Northern Plains, Southeast, and Northeast Regions while positive correlations were observed in Southern Plains and the Mountain Regions.

Correlation of Poultry Production Variables

Correlation estimates between eggs produced and chicken sold varied from -.356 in the Southern Plains Region to .505 in the Lake States Region.

Positive correlations were estimated for the Corn Belt and Lake State Regions and negative correlations were estimated for the Southern Plains and the Northeast Regions. Moreover, for pairs with chicken and dairy production variables, negative correlations were obtained for the Pacific and Mountain Regions while positive correlations were obtained for the Northern and Northeast Regions. Similarly, chicken and beef production variables were negatively correlated in the Corn Belt, Appalachian, Southeast, and Lake States Regions and positively correlated in the Northern Plains and the Mountain Regions. However, no clear relationship was observed between chicken and the hog production variables.

For turkey produced, correlation estimates ranged from -.513 with market hogs spring sales in the Delta States Region to .610 with chicken sold in the Northern Plains Region. Correlation estimates between turkey produced and dairy production variables were negative in the Appalachian and Delta States Regions and positive in the Northern Plains and Northeast Regions. Pairs with turkey produced and beef production variables showed negative correlations in the Appalachian and Pacific Regions and positive correlations in the Lake States and Northern Plains Regions. Similarly, turkey produced was negatively correlated with hog production variables in the Lake States Region and positively correlated in the Norther Plains Region. Moreover, correlation estimates between turkey produced and chicken production variables are negative in the Delta States Region and positive in the Corn Belt, Appalachian, Lake States, Northern Plains, and Southeast Regions.

Finally, for broilers produced, correlation estimates ranged from -.695 with beef cull cow sales in the Delta States Region to .453 with dairy calf sales in the Appalachian Region. No clear relationships were observed between

broilers produced and hog, beef or dairy production variables, except in the Pacific Region where a positive correlation was observed between broilers produced and dairy production variables. On the other hand, correlation estimates for pairs with broilers produced and chicken production variables were negative in the Delta States Region and positive in the Appalachian, Pacific, and Southeast Regions. Furthermore, no negative correlations were observed between broilers and turkeys. The Delta States and Pacific Regions had positive correlations between broilers and turkeys.

SUMMARY

The major purpose of this report is to provide estimates of livestock and poultry production risk based on the standard statistical series available from the Crop and Livestock Reporting Service. This effort is a contribution to the completion of objective 1 of Regional Research Project S-232, "Quantifying Long-Run Agricultural Risks and Evaluating Farmer Responses to Risk." State level production series were collected or computed and aggregated to obtain estimates for each of ten U.S. production regions. The regional estimates of production variability and covariability were prepared and are reported here.

Production variability was estimated for broilers, laying hens, turkeys, dairy, beef and swine. Commercial production of most of these species involves the sale of multiple products. Thus, the variance and correlation of the random deviations was estimated for each of the following 15 types of output.

Broilers	- pounds of broiler produced per broiler placed
Laying hens	- pounds of chicken sold per laying hen

	- eggs produced per laying hen
Turkeys	- pounds produced per head raised
Per dairy cow	- pounds of milk produced
	- pounds of steer & heifer sales
	- pounds of cull cow sales
	- pounds of calf sales
Per beef cow	- pounds of steer & heifer sales
	- pounds of cull cow sales
	- pounds of calf sales
Per sow	- pounds of cull sow sales in the spring
	- pounds of cull sow sales in the fall
	- pounds of market hog sales in the spring
	- pounds of market hog sales in the fall

Time series data for the period 1959-1989 were used to prepare the estimates of production variability. State data on the first five variables were obtained from published sources. Annual series for the remaining ten meat production variables for dairy, beef and swine were computed from the more aggregate series reported. The procedures followed to disaggregate the cattle and swine meat sales into these ten variables are described in Appendix A.

The resulting 31-year time series of the 154 variables were characterized by outliers and nonnormality. A nonlinear filter method was used to remove the deterministic component of each series. The nonlinear procedure was selected because it makes no assumptions about the probability distribution of the underlying random component and because of its resistance to outlying observations.

The empirical results indicate milk production is the least variable, followed by egg production, broilers and turkeys. The index of relative variability for these production variables is less than 3% in all regions. The relative variability of swine sales per sow does not exceed 8.5%. Meat production from beef and dairy, however, tends to have greater relative variability than the other outputs analyzed. The variability of steer and heifer sales per cow is less than 10% for most regions for both beef and dairy. The variability in calf sales per cow ranges from 5.9% in the Corn Belt to 25.7% in the Southern Plains for beef, and from 4.7% in the Lake States to 41.2% in the Pacific for dairy. The relative variability of cull cow sales ranged form 8.5% in the Northern Plains to 22.2% in the Mountain states for beef and from 13.4% in the Corn Belt to 45.6% in the Mountain states for dairy.

The index of relative variability for all types of output, except dairy cull cow was less than 11% in the Corn Belt and Lake States Regions. With the exception of Pacific, Mountain, and Southern Plains Regions, the relative variability for all livestock outputs does not exceed 20 percent. These three regions can be considered as high livestock production risk regions and the Corn Belt and Lake States as low livestock production risk regions. The remaining five regions can be referred to as moderate livestock production risk regions.

Correlation coefficients were estimated for all pairs of the production variables (fifteen livestock production variables in each of 10 regions). With a significance level of .05, correlation estimates with an absolute value greater than .17 are considered significantly different than zero. The correlation coefficients presented in Appendix D can be used with the

estimates of the variance for each product in estimating the variability of gross returns and net returns for the individual enterprises and for combinations of enterprises.

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APPENDIX A

SETS OF EQUATIONS TO DISAGGREGATE REPORTED MARKETING DATA ON CATTLE AND HOGS

A.1 DISAGGREGATING CATTLE DATA

The two equations below define annual state gross income from beef and dairy in year t. Issues on data availability for variables in these gross income relationships are then identified.

A.1.1 GROSS INCOME

**beef gross income($/beef cow)$_t$** = [steer & heifer price($/cwt)$_t$ *
beef steer & heifer sales(lbs/beef cow)$_t$ / 100] +
[cow price($/cwt)$_t$ * cull beef cow sales(lbs/beef cow)$_t$ / 100] +
[calf price($/cwt)$_t$ * beef calf sales(lbs/beef cow)$_t$ / 100].

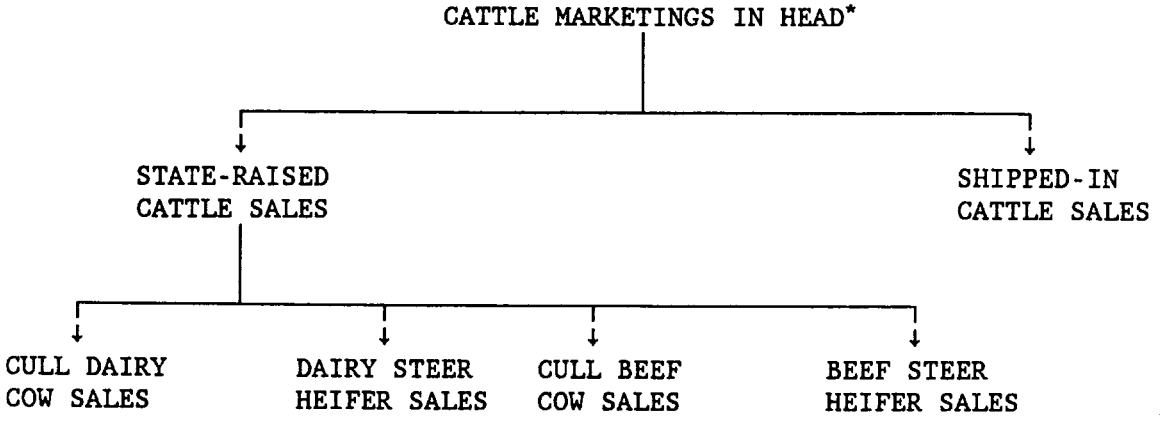
**dairy gross income($/milk cow)$_t$** = [milk price($/cwt)$_t$ *
milk production(lbs/milk cow)$_t$ / 100] +
[calf price($/cwt)$_t$ * dairy calf sales(lbs/ milk cow)$_t$ / 100] +
[steer & heifer price($/cwt)$_t$ *
dairy steer & heifer sales(lbs/milk cow)$_t$] +
[cow price($/cwt)$_t$ * cull dairy cow sales(lbs/ milk cow)$_t$ / 100].

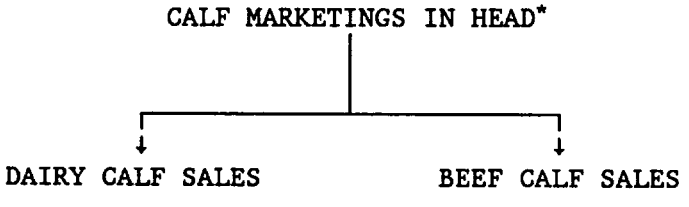
Data on milk production and on the prices farmers received for calves, steers & heifers, cows and milk are available in the "State Agricultural Statistics Annual Reports." The livestock prices reported are an average of both dairy and beef calves, steers & heifers, and cows. The available series on the quantity sold report the combined head of beef and dairy cattle, the combined head of beef and dairy calves, and the combined pounds of all cattle and all calves. Thus, published data are not available on the following sales variables in equations 1 and 2 above:

beef calf sales(lbs/beef cow)$_t$
beef steer & heifer sales(lbs/beef cow)$_t$
cull beef cow sales(lbs/beef cow)$_t$
dairy calf sales(lbs/milk cow)$_t$
dairy steer & heifer sales(lbs/milk cow)$_t$
cull dairy cow sales(lbs/cow)$_t$.

A procedure to calculate these 6 variables from data on calf and cattle marketings reported in the "State Agricultural Statistics Annual Reports" is illustrated in Charts A1 and A2. The disaggregation of cattle and calf sales (in head) is described in Chart A1. Chart A2 describes the disaggregation of pounds of cattle sales. Calf marketings are assumed equal to the sum of dairy calf sales and beef calf sales. Cattle marketings are assumed to include sales from cattle shipped into the state and sales of state-raised cattle. Finally, state-raised cattle sales are assumed equal to the sum of sales of beef steers & heifers, sales of cull beef cows, sales of dairy steers & heifers, and sales of cull dairy cows. The set of equations and identities to disaggregate cattle marketings and calf marketings into the 6 variables is given in section A.1.2.

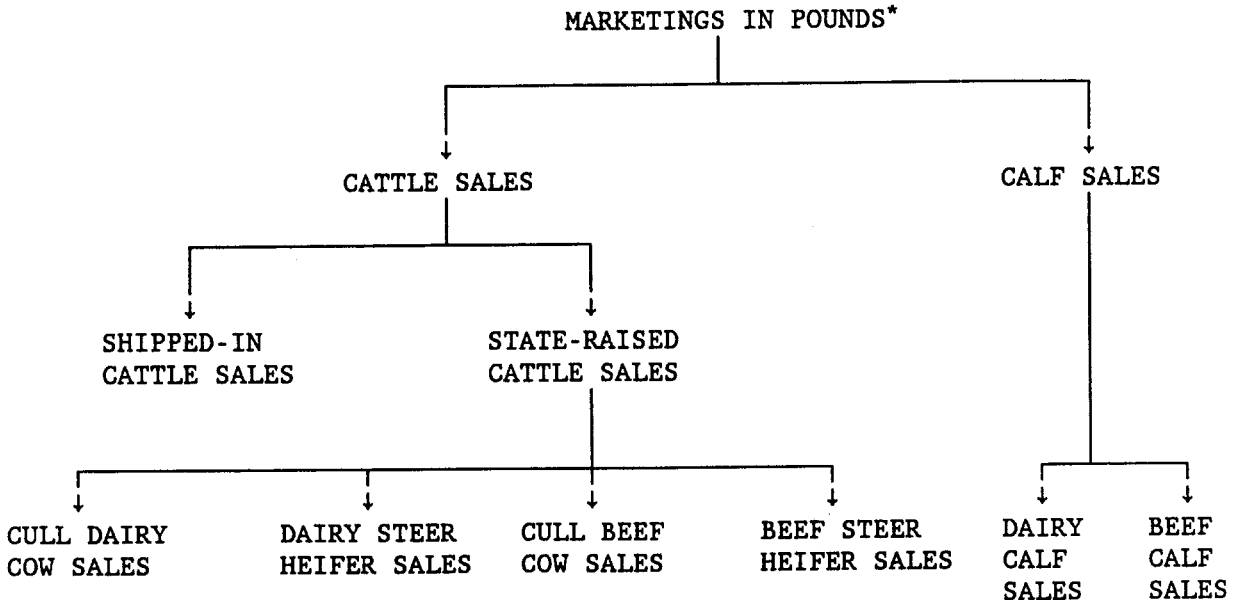
CHART A1: STEPS IN DISAGGREGATING CATTLE AND CALF MARKETINGS





*Data reported in the published series.

CHART A2: STEPS IN DISAGGREGATING MARKETINGS



*Data reported in the published series.

A.1.2 IDENTITIES AND EQUATIONS TO DISAGGREGATE STATE CATTLE AND CALVES DATA

The equations developed to disaggregate cattle marketings and calf marketings are presented in this section. A set of fifty-five equations is formulated to obtain annual estimates of the six variables mentioned above. Applying these equations over the period considered for analysis (i.e., 1959-1989) yields a time series on these variables.

A short description of notation used in the equations may be helpful. Underlined items denote variables that are determined by some equation in the set. The associated superscript indicates the number of the equation that calculates the underlined item. Nonunderlined items on the right hand side of the equations are variables on which data is available. Variable names in bold type are the needed six production variables for dairy and beef. Finally, the time subscript on variables "cows that have calved" refer to Jan 1 of that year while the time subscript on all other variables refers to the whole year.

A.1.2.1 SEPARATION OF MARKETINGS INTO SHIPPED-IN CATTLE SALES, STATE-RAISED CATTLE SALES, AND CALF SALES

Equations 1-9 separate "marketings" (in pounds) into sales from cattle shipped into the state, sales of cattle raised in the state, and calf sales. Equations 1 and 2 calculate the average farm slaughter rate and the average death rate for the state. Equations 3 and 4 use the average slaughter rate and the average death rate to estimate the number of head of cattle sold from in-shipments and from cattle raised in the state, respectively. Calf sales in pounds (equation 5) are assumed to come entirely from calves raised in the state. The average weight of calf slaughter, reported in U.S.D.A. Livestock Slaughter publications, is used to estimate pounds of calf sales. Then cattle sales in pounds (equation 6) are estimated by subtracting pounds of calf sales from the reported pounds of cattle and calf sales. The average weight of cattle sold, calculated in equation 7, is used to estimate pounds of cattle sales from inshipments (equation 8) and from cattle raised in the state (equation 9). The calf sales estimated in equation 5 are separated into dairy calf sales and beef calf sales while the cattle sales estimated in equation 9 are divided between steer & heifer sales and cull cow sales for dairy and beef.

1. $\text{farm slaughter rate}_t =$
   $\text{farm slaughter(hd)}_t \;/$
   $[\text{all cattle(hd)}_t + \text{calf crop(hd)}_t + \text{inshipment(hd)}_t]$

2. $\text{cattle death rate}_t =$
   $\text{cattle death(hd)}_t \;/\; [\text{all cattle(hd)}_t + \text{inshipment(hd)}_t]$

3. $\text{shipped-in cattle sales(hd)}_t =$
   $\text{inshipment(hd)}_{t-1} *$
   $[1 - (\underline{\text{farm slaughter rate}_{t-1}}^{1} + \underline{\text{cattle death rate}_{t-1}}^{2})]$

4. $\text{state-raised cattle sales(hd)}_t =$
   $\text{cattle marketings(hd)}_t - \underline{\text{shipped-in cattle sales(hd)}_t}^{3}$

5. calf sales(lbs)$_t$ =
   calf marketings(hd)$_t$ * average weight calf slaughter(lbs/calf)$_t$

6. cattle sales(lbs)$_t$ = marketings(lbs)$_t$ - calf sales(lbs)$_t$[5]

7. average weight cattle sold(lbs/hd)$_t$ =
   cattle sales(lbs)$_t$[6] / cattle marketings(hd)$_t$

8. shipped-in cattle sales(lbs)$_t$ =
   average weight cattle sold(lbs/hd)$_t$[7] * shipped-in cattle sales(hd)$_t$[3]

9. state-raised cattle marketed(lbs)$_t$ =
   cattle sales(lbs)$_t$[6] - shipped-in cattle marketed(lbs)$_t$[8]

A.1.2.2 ESTIMATION OF CULL DAIRY COW SALES AND CULL BEEF COW SALES

The state raised cattle sales are assumed to include cull cow sales and steer and heifer sales. Equations 10-26 estimate cull dairy cow sales and cull beef cow sales. These sales are based on (1) the U.S. ratio of cow slaughter to cattle slaughter and (2) ratios of dairy cows that have calved and beef cows that have calved to all cows that have calved. The farm slaughter rate is applied to the calf crop, all cattle, cows and steers and heifers in equations 10-13 to estimate the number of head slaughtered. The proportion of U.S. commercial slaughter that is made up of cows is calculated (equation 14) and the U.S. rate is applied in (15) to estimate commercial slaughter of cows at the state level. Total cull cow sales are assumed to be the sum of commercial slaughter and on-farm slaughter (equation 16). The total herd of cull cows for the state is divided between dairy and beef in equations 17-20. The average proportion of dairy and beef cows over a production period of 4 years is used to allocate cull cow sales between the two species. Additions to the breeding herd are calculated by equations 21 and 22, are assumed to come from the calves produced in the state. If the additions in 21 and 22 are negative in year t, additions to the breeding heard are set equal to 0 in 21a and 22a and the number of cull cows sold is adjusted in equations 21b and 22b. Then the pounds of cull cow sales per cow are calculated for dairy and beef in equations 23-26 using the average weight of cattle sold obtained in equation 7.

10. calf farm slaughter(hd)$_t$ = calf crop(hd)$_t$ * farm slaughter rate$_t$[1]

11. cattle farm slaughter(hd)$_t$ = all cattle(hd)$_t$ * farm slaughter rate$_t$[1]

12. cow farm slaughter(hd)$_t$ = cows that calved(hd)$_t$ * farm slaughter rate$_t$[1]

13. steers & heifers farm slaughter(hd)$_t$ =
    cattle farm slaughter(hd)$_t$[11] - cow farm slaughter(hd)$_t$[12]

14. U.S. cow commercial slaughter rate$_t$ =
    [U.S. federally inspected cow slaughter(hd)$_t$ /
    U.S. fed. insp. cattle slaughter(hd)$_t$] *
    [U.S. commercial cattle slaughter(hd)$_t$ /
    U.S. fed. insp. cattle slaughter(hd)$_t$]

15. state cow commercial slaughter(hd)$_t$ =
U.S. cow commercial cow slaughter rate$_t$[14] *
state-raised cattle sales(hd)$_t$[4]

16. cull cow sales(hd)$_t$ =
state cow commercial slaughter(hd)$_t$[15] + cow farm slaughter(hd)$_t$[12]

17. cull dairy cow sales(hd)$_t$ =
cull cow sales(hd)$_t$[16] * cull dairy cow proportion$_t$[19]

18. cull beef cow sales(hd)$_t$ =
cull cow sales(hd)$_t$[16] * cull beef cow proportion$_t$[20]

19. $$\text{cull dairy cow proportion}_t = \sum_{i=0}^{3} (\text{dairy cows that have calved(hd)}_{t-i}) \Big/ \sum_{i=0}^{3} (\text{all cows that have calved(hd)}_{t-i})$$

20. $$\text{cull beef cow proportion}_t = \sum_{i=0}^{3} (\text{beef cows that have calved(hd)}_{t-i}) \Big/ \sum_{i=0}^{3} (\text{all cows that have calved(hd)}_{t-i})$$

21. additions to dairy breeding herd(hd)$_t$ =
dairy cows that have calved(hd)$_{t+1}$ + cull dairy cow sales(hd)$_t$[17] -
{[1 - cattle death rate$_t$[2]] * dairy cows that calved(hd)$_t$}

21a. additions to dairy breeding herd(hd)$_t$ =
additions to dairy breeding herd(hd)$_t$ from eq. 21, if result of eq. 21 is ≥ 0,
or
0, if result of eq. 21 is < 0

21b. cull dairy cow sales(hd)$_t$ =
cull dairy cow sales(hd)$_t$ from eq. 17, if result of eq. 21 is ≥ 0
or,
cull dairy cow sales(hd)$_t$ from eq. 17 + | additions to dairy breeding herd(hd)$_t$ from eq. 21 | if result of eq. 21 is < 0

22. additions to beef breeding herd(hd)$_t$ =
beef cows that have calved(hd)$_{t+1}$ + cull beef cow sales(hd)$_t$[18] -
{[1 - cattle death ratet[2]] * beef cows that calved(hd)$_t$}

22a. additions to beef breeding herd(hd)$_t$ =
additions to beef breeding herd(hd)$_t$ from eq. 22, if result of eq. 22 is ≥ 0,
or
0, if result of eq. 22 is < 0

22b. cull beef cow sales(hd)$_t$ =
cull beef cow sales(hd)$_t$ from eq. 18, if result of eq. 22 is ≥ 0
or
cull beef cow sales(hd)$_t$ from eq. 18 + | additions to beef breeding herd(hd)$_t$ from eq. 22 | if result of eq. 22 is < 0

23. cull dairy cow sales(lbs)$_t$ =
cull dairy cow sales(hd)$_t^{21.b}$ * average weight cattle sold(lbs/hd)$_t^{7}$

24. cull dairy cow sales(lbs/milk cow)$_t$ =
cull dairy cow sales(lbs)$_t^{23}$ / milk cows that have calved(hd)$_t$

25. cull beef cow sales(lbs)$_t$ =
cull beef cow sales(hd)$_t^{22.b}$ * average weight cattle sold(lbs/hd)$_t^{7}$

26. cull beef cow sales(lbs/beef cow)$_t$ =
cull beef cow sales(lbs)$_t^{25}$ / beef cows that have calved(hd)$_t$

A.1.2.3 ESTIMATION OF DAIRY CALF SALES, DAIRY STEER & HEIFER SALES, BEEF CALF SALES, AND BEEF STEER & HEIFER SALES

Equations 27-55 are used to divide both calf marketings and steer and heifer marketing between dairy and beef. Only combined (dairy and beef) data on calves born and died are available at the state level. These data are used to calculate the average calving rate and calf death rate in equations 27 and 28. The average calving rate is applied to both dairy and beef to estimate the number of head of dairy and beef calves born in year t. Then equations 31 and 32 determine the number of dairy and beef calves available in year t for sale and farm slaughter as calves in that year and as steers and heifers in the following year. The sum of these variables equals calves born minus the sum of calf death and additions to the breeding herd. The proportion of these animals sold as calves in year t and the proportion sold as steers and heifers in t+1 is calculated in equations 33 through 37. The initial estimates of the head of dairy and beef calves sold in the state in year t are calculated with equations 38 and 39. These initial estimates are adjusted with equations 40-42 to make them equal the sum of calf marketings and farm calf slaughter calculated in equation 33. Then the pounds of calf sales per cow are computed with equations 43-46. The remaining equations follow a similar procedure to estimate the pounds of steer and heifer sales per cow. Notice that equations 49-50 keep the number of steers & heifers sold in line with the estimated steer & heifer marketings given in equation 34. Dairy steer & heifer sales and beef steer & heifer sales are given in equations 53 and 55, respectively.

27. calf death rate$_t$ = calf death(hd)$_t$ / calves born(hd)$_t$

28. calving rate$_t$ = calves born(hd)$_t$ / cows that have calved(hd)$_{t+1}$

29. dairy calves born(hd)$_t$ =
calving rate$_t^{28}$ * dairy cows that have calved(hd)$_{t+1}$

30. beef calves born(hd)$_t$ = calving rate$_t^{28}$ * beef cows that have calved(hd)$_{t+1}$

31. dairy calves available for sale(hd)$_t$ (as dairy calves in t and/or as dairy steers & heifers in (t+1)) =
{dairy calves born(hd)$_t^{29}$ * [1 - calf death rate$_t^{27}$]} -
additions to dairy breeding herd(hd)$_{t+1}^{21.a}$

32. beef calves available for sale(hd)$_t$ (as beef calves in t and/or as beef steers & heifers in (t+1)) =
beef calves born(hd)$_t^{30}$ * [1 - calf death rate$_t^{27}$]} -
additions to beef breeding herd(hd)$_{t+1}^{22.a}$

33. all calf sales(hd)$_t$ = calf marketings(hd)$_t$ + calf farm slaughter(hd)$_t^{10}$

34. all steer & heifer sales(hd)$_t$ =
state-raised cattle sales(hd)$_t^{4}$ + cattle farm slaughter(hd)$_t^{11}$ -
[cull dairy cow sales(hd)$_t^{21.b}$ + cull beef cow sales(hd)$_t^{22.b}$]

35. all calves sold as calves in t and as steers & heifers in t+1 (hd)$_t$ =
all calf sales(hd)$_t^{33}$ + all steer & heifer sales(hd)$_{t+1}^{34}$

36. proportion of all calf sales$_t$ =
all calf sales(hd)$_t^{33}$ / all calves sold(hd)$_t^{35}$

37. proportion of all steer & heifer sales$_t$ =
all steer & heifer sales(hd)$_t^{34}$ / all calves sold(hd)$_{t-1}^{35}$

38. dairy calf sales(hd)$_t$ =
dairy calves available for sale(hd)$_t^{31}$ * proportion of all calf sales$_t^{36}$

39. beef calf sales(hd)$_t$ =
beef calves available for sale(hd)$_t^{32}$ * proportion of all calf sales$_t^{36}$

40. difference in calf sales$_t$ =
all calf sales(hd)$_t^{33}$ - [dairy calf sales(hd)$_t^{38}$ + beef calf sales(hd)$_t^{39}$]

41. dairy calf sales(hd)$_t$ (corrected) =
dairy calf sales(hd)$_t^{38}$ + difference in calf sales$_t^{40}$ *
{dairy calf sales(hd)$_t^{38}$ / [dairy calf sales(hd)$_t^{38}$ +
beef calf sales(hd)$_t^{39}$]}

42. beef calf sales(hd)$_t$ (corrected) =
beef calf sales(hd)$_t^{39}$ + difference in calf sales$_t^{40}$ *
{beef calf sales(hd)$_t^{39}$ / [dairy calf sales(hd)$_t^{38}$ +
beef calf sales(hd)$_t^{39}$]}

43. dairy calf sales(lbs)$_t$ =
dairy calf sales(hd)$_t^{41}$ * average weight calf slaughter(lbs/hd)$_t$

44. dairy calf sales(lbs/milk cow)$_t$ =
dairy calf sales(lbs)$_t^{43}$ / milk cows that have calved(hd)$_{t+1}$

45. beef calf sales(lbs)$_t$ =
beef calf sales(hd)$_t^{42}$ * average weight calf slaughter(lbs/hd)$_t$

46. beef calf sales(lbs/beef cow)$_t$ =
beef calf sales(lbs)$_t^{45}$ / beef cows that have calved(hd)$_{t+1}$

47. dairy steer & heifer sales(hd)$_t$ =
dairy calves available for sale(hd)$_{t-1}^{31}$ *
proportion of all steer & heifer sales$_t^{37}$

48. beef steer & heifer sales(hd)$_t$ =
beef calves available for sale(hd)$_{t-1}^{32}$ *
proportion of all steer & heifer sales$_t^{37}$

49. difference in steer & heifer sales$_t$ =
all steer & heifer sales(hd)$_t^{34}$ -
[dairy S & H sales(hd)$_t^{47}$ + beef S & H sales(hd)$_t^{48}$]

50. dairy steer & heifer sales(hd)$_t$ (corrected) =
dairy S&H sales(hd)$_t^{47}$ +
difference in S & H sales$_t^{49}$ * {dairy S & H sales(hd)$_t^{47}$ /
[dairy S & H sales(hd)$_t^{47}$ + beef S & H sales(hd)$_t^{48}$]}

51. beef steer & heifer sales(hd)$_t$ (corrected) =
beef S & H sales(hd)$_t^{48}$ + difference in S & H sales$_t^{49}$ *
{beef S & H sales(hd)$_t^{48}$ / [dairy S & H sales(hd)$_t^{47}$ +
beef S & H sales(hd)$_t^{48}$]}

52. dairy steer & heifer sales(lbs)$_t$ =
dairy steer & heifer sales(hd)$_t^{50}$ * average weight cattle sold(lbs/hd)$_t^{7}$

53. dairy steer & heifer sold(lbs/milk cow)$_t$ =
dairy steer & heifer sales(lbs)$_t^{52}$ / milk cows that have calved(hd)$_t$

54. beef steer & heifer sold(lbs)$_t$ =
beef steer & heifer sales(hd)$_t^{51}$ * average weight cattle sold(lbs/hd)$_t^{7}$

55. beef steer & heifer sold(lbs/beef cow)$_t$ =
beef steer & heifer sales(lbs)$_t^{54}$ / beef cows that have calved(hd)$_t$

A.1.3 REMARKS

The lack of data on the sales by category of animal led to the development of the complex computational procedure above. Four limitations of using this procedure to disaggregate cattle and calf marketings between dairy and beef are emphasized in closing this section.

One limitation is the lack of data on cull cow sales. To overcome this, a time series on state commercial cow slaughter was estimated from published data on U.S. federally inspected cow slaughter. Thus, equation 15 shows the estimated state commercial cow slaughter for all states based on the same rate of U.S. commercial cow slaughter.

A second limitation is the lack of data on calf sales and steer & heifer sales for dairy and beef. Proportions of all calf sales and all steer & heifer sales were calculated assuming that calves are sold in the same year in which they are reported born and steers & heifers are sold the following year. These proportions were used for both dairy and beef.

A third limitation is the lack of data on the average slaughter weight by species. The average weight of commercially slaughtered calves is used for both dairy and beef. In addition, the average slaughter weight of cattle (equation 7) is applied to both species.

A fourth limitation is the discontinuity in the name and definition used for cow inventory in the State Agricultural Statistics Reports. The variable name "cows that have calved" is used since 1970 while "cows and heifers 2 years old & over" is the most comparable data available for 1970 and earlier. As expected, published estimates for these two variables for 1970 do not coincide. And with only one year of overlap it is difficult to extend either series to cover the years for which the series is not reported. Given this problem, the series from 1972-1988 is used to construct the risk measures for beef and dairy. To be consistent, the same period was considered for all the livestock products in this study.

A.2 DISAGGREGATING HOG DATA

Traditional farrow-to-finish swine operations have been characterized by sows farrowing two litters per year and a post-farrowing period of 150-200 days for finishing. Swine production data tend to be reported for two biannual periods--December through May and June through November. These two biannual periods are referred to as "spring" and "fall," respectively.[1] State spring and fall gross income from farrow-to-finish swine are defined below. Then issues on data availability for variables in the gross income relationships are identified.

A.2.1 GROSS INCOME

spring gross income($/sow)$_t$ =
[sow price($/cwt)$_t$ * cull sow spring sales(lbs/sow)$_t$ / 100] +
[barrow & gilt price($/cwt)$_t$ * market
hog spring sales(lbs/sow)$_t$ / 100].

fall gross income($/sow)$_t$ =
[sow price($/cwt)$_t$ * cull sow fall sales(lbs/sow)$_t$ / 100] +
[barrow and gilt price($/cwt)$_t$ * market
hog fall sales(lbs/sow)$_t$ / 100].

---

[1]Pigs born in Jun 1 - Nov 31 (i.e. fall) of year (t-1) are sold in Dec 1 - May 31 (i.e., spring) of year (t). Pigs born in Dec 1 - May 31 of year (t) are sold in Jun 1 - Nov 31 of year (t).

The subscript t in the gross income equations denotes year. The per unit "sow" used in gross income equations above refers to sow farrowings. Sow and barrow & gilt prices are average annual prices (rather not average biannual prices) that have been reported in "Agricultural Prices, Annual Summary." Published data on total hog marketings is available by state, but annual sales for each of the four production variables in the biannual gross income equations are not published. Thus, time series must be estimated for the following variables to calculate gross income per sow:

cull sow spring sales(lbs/sow)$_t$
market hog spring sales(lbs/sow)$_t$
cull sow fall sales(lbs/sow)$_t$
market hog fall sales(lbs/sow)$_t$.

Chart A3 illustrates the disaggregation procedure applied to the reported hog marketings. Hog marketings are assumed to include sales from hogs shipped into the state and sales of state-raised hogs. Furthermore, sales of state-raised hogs are assumed equal to the sum of cull sow sales in the fall, cull sow sales in the spring, market hog sales in the fall, and market hog sales in the spring. The set of equations and identities to disaggregate hog marketings data is given in section A.2.2.

A.2.2 IDENTITIES AND EQUATIONS TO DETERMINE MARKET HOGS AND CULL SOWS

A set of forty-one equations is formulated to obtain annual estimates of the four hog production variables. Underlined items denote variables that are determined by an equation in the set, and the associated superscript indicates the number of the equation that calculates the underlined item. The variables on the right hand side of the equations are those on which data is available. Variable names in bold type are the four production variables for which estimates are needed.

A.2.2.1 SEPARATION OF HOG MARKETINGS INTO SALES FROM SHIPPED-IN HOGS AND SALES FROM STATE-RAISED HOGS

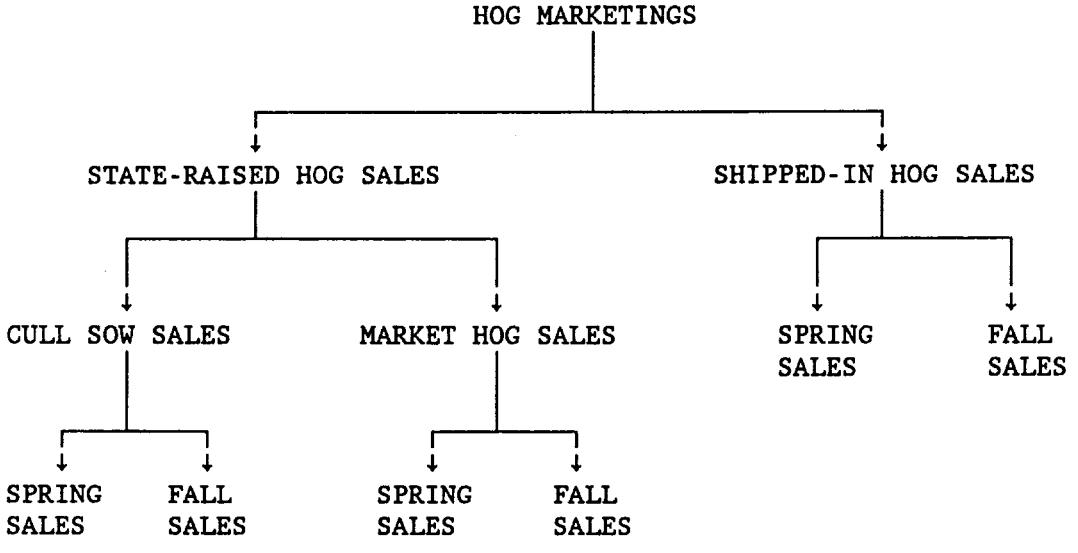
Equations 1-9 divide hog marketings between sales from hogs shipped into the state and sales from hogs raised-in the state. Shipped-in hog sales are then divided into spring sales and fall sales. The U.S. biannual average hog slaughter rates are calculated in equations 1 and 2. These averages are then applied to the state annual farm hog slaughter in equations 3 and 4 to obtain state biannual average hog slaughter. Annual hog death and inshipments are divided equally between fall and spring periods (equations 5-8).

1. U.S. spring hog slaughter rate$_t$ =
   U.S. spring hog slaughter(hd)$_t$ / U.S. annual hog slaughter(hd)$_t$

2. U.S. fall hog slaughter rate$_t$ =
   U.S. fall hog slaughter(hd)$_t$ / U.S. annual hog slaughter(hd)$_t$

3. spring farm slaughter rate$_t$ =
   [$\underline{\text{U.S. spring hog slaughter rate}_t}^{1}$ * farm slaughter(hd)$_t$] /
   [fall sow farrowing(hd)$_{t-1}$ + fall pig crop(hd)$_{t-1}$ + .5 * inshipment(hd)$_{t-1}$]

CHART A3: STEPS IN DISAGGREGATING HOG MARKETINGS



4. fall farm slaughter $rate_t$ =
   [U.S. fall hog slaughter $rate_t^2$ * farm slaughter$(hd)_t$] /
   [spring sow farrowing$(hd)_t$ + spring pig crop$(hd)_t$ + .5 * inshipment$(hd)_t$]

5. spring death $rate_t$ =
   .5 * death$(hd)_t$ /
   [fall sow farrowing$(hd)_{t-1}$ + fall pig crop$(hd)_{t-1}$ + .5 * inshipment$(hd)_{t-1}$]

6. fall death $rate_t$ =
   .5 * death$(hd)_t$ /
   [spring sow farrowing$(hd)_t$ + spring pig crop$(hd)_t$ + .5 * inshipment$(hd)_t$]

7. shipped-in hog spring sales$(hd)_t$ =
   .5 * inshipment$(hd)_{t-1}$ *
   [1 - (spring farm slaughter $rate_t^3$ + spring death $rate_t^5$)]

8. shipped-in hog fall sales$(hd)_t$ =
   .5 * inshipment$(hd)_t$ *
   [1 - (fall farm slaughter $rate_t^4$ + fall death $rate_t^6$)]

9. state-raised hog sales$(hd)_t$ =
   marketings$(hd)_t$ -
   [shipped-in hog spring sales$(hd)_t^7$ + shipped-in hog fall sales$(hd)_t^8$]

A.2.2.2 SEPARATION OF SALES OF STATE-RAISED HOGS INTO CULL SOW SALES AND MARKET HOG SALES

Sales of state-raised hogs are assumed to include cull sow sales and market hog sales. Equations 10-15 separate farm slaughter between sow and market hogs. Equations 16-21 determine fall and spring sales of cull sows and equations 23-30 estimate fall and spring sales of market hogs. Cull sow sales are based on U.S. sow culling rates calculated by equations 16 and 17. Identities 24 and 25 calculate additions to the breeding herd using changes in sow farrowings. Equations 28-30 keep market hog sales in line with the result of equation 23. Results of equations 10-15 and 18-30 are expressed in number of head.

10. sow spring farm slaughter$(hd)_t$ =
    spring farm slaughter $rate_t^3$ * fall sow farrowing$(hd)_{t-1}$

11. sow fall farm slaughter$(hd)_t$ =
    fall farm slaughter $rate_t^4$ * spring sow farrowing$(hd)_t$

12. market hog spring farm slaughter$(hd)_t$ =
    spring farm slaughter $rate_t^3$ * fall pig crop$(hd)_{t-1}$

13. market hog fall farm slaughter$(hd)_t$ =
    fall farm slaughter $rate_t^4$ * spring pig crop$(hd)_t$

14. hogs spring farm slaughter$(hd)_t$ =
    sow spring farm slaughter$(hd)_t^{10}$ + market hog spring farm slaughter$(hd)_t^{12}$

15. hogs fall farm slaughter(hd)$_t$ =
sow fall farm slaughter(hd)$_t$[11] + market hog fall farm slaughter(hd)$_t$[13]

16. U.S. spring sow culling rate$_t$ =
[U.S. spring sow federally inspected slaughter(hd)$_t$ /
U.S. fall sow farrowing(hd)$_{t-1}$] * [U.S. hog commercial slaughter(hd)$_t$ /
U.S. hog fed. insp. slaughter(hd)$_t$]

17. U.S. fall sow culling rate$_t$ =
[U.S. fall sow federally inspected slaughter(hd)$_t$ /
U.S. spring sow farrowing(hd)$_t$] * [U.S. hog commercial slaughter(hd)$_t$ /
U.S. hog fed. insp. slaughter(hd)$_t$]

18. sow spring commercial slaughter(hd)$_t$ =
U.S. spring sow culling rate$_t$[16] * fall sow farrowing(hd)$_{t-1}$

19. sow fall commercial slaughter(hd)$_t$ =
U.S. fall sow culling rate$_t$[17] * spring sow farrowing(hd)$_t$

20. cull sow spring sales(hd)t =
sow spring commercial slaughter(hd)$_t$[18] + sow spring farm slaughter(hd)$_t$[10]

21. cull sow fall sales(hd)t =
sow fall commercial slaughter(hd)$_t$[19] + sow fall farm slaughter(hd)$_t$[11]

22. cull sow sales(hd)$_t$ =
cull sow spring sales(hd)$_t$[20] + cull sow fall sales(hd)$_t$[21]

23. market hog sales(hd)$_t$ =
state-raised hog sales(hd)$_t$[9] + [hogs spring farm slaughter(hd)$_t$[14] +
hogs fall farm slaughter(hd)$_t$[15]] - cull sow sales(hd)$_t$[22]

24. spring additions to breeding herd(hd)$_t$ =
spring sow farrowing(hd)$_t$ - [(1- spring death rate$_t$[5]) *
fall sow farrowing(hd)$_{t-1}$] + cull sow spring sales(hd)$_t$[20]

24a. spring additions to breeding herd(hd)$_t$ =
spring additions to breeding herd(hd)$_t$ from eq. 24, if result of
eq. 24 is ≥ 0,
or
0, if result of eq. 24 is < 0

24b. cull sow spring sales(hd)$_t$ =
cull sow spring sales(hd)$_t$ from eq. 20, if result of eq. 24 is ≥ 0
or,
cull sow spring sales(hd)$_t$ from eq. 20 + | spring additions to
breeding herd(hd)$_t$ from eq. 24 | if result of eq. 24 is < 0

25. fall additions to breeding herd(hd)$_t$ =
fall sow farrowing(hd)$_t$ - [(1-fall death rate$_t$[6]) *
spring sow farrowing(hd)$_t$] + cull sow fall sales(hd)$_t$[21]

25a. fall additions to breeding herd(hd)$_t$ =
fall additions to breeding herd(hd)$_t$ from eq. 25, if result of eq. 25 is ≥ 0,
or
0, if result of eq. 25 is < 0

25b. cull sow fall sales(hd)$_t$ =
cull sow fall sales(hd)$_t$ from eq. 21, if result of eq. 25 is ≥ 0,
or,
cull sow fall sales(hd)$_t$ from eq. 21 + | fall additions to breeding herd(hd)$_t$ from eq. 25 | if result of eq. 25 is < 0

26. market hog spring sales(hd)$_t$ =
{[1 - spring death rate$_t^5$] * fall pig crop(hd)$_{t-1}$} -
spring additions to breeding herd(hd)$_t^{24a}$

27. market hog fall sales(hd)$_t$ =
{[1 - fall death rate$_t^6$] * spring pig crop(hd)$_t$} -
fall additions to breeding herd(hd)$_t^{25a}$

28. difference in market hog sales$_t$ =
market hog sales(hd)$_t^{23}$ -
[market hog spring sales(hd)$_t^{26}$ + market hog fall sales(hd)$_t^{27}$]

29. market hog spring sales(hd)$_t$ (corrected) =
market hog spring sales(hd)$_t^{26}$ + difference in market hog sales$_t^{28}$ *
{market hog spring sales(hd)$_t^{26}$ / [market hog spring sales(hd)$_t^{26}$ +
market hog fall sales(hd)$_t^{27}$]}

30. market hog fall sales(hd)$_t$ (corrected) =
market hog fall sales(hd)$_t^{27}$ + difference in market hog sales$_t^{28}$ *
{market hog fall sales(hd)$_t^{27}$ / [market hog spring sales(hd)$_t^{26}$ +
market hog fall sales(hd)$_t^{27}$]}

Equations 31-41 estimate fall sales of cull sows, spring sales of cull sows, fall sales of market hogs, and spring sales of market hogs in pounds per sow farrowing. The U.S. average weight of slaughter sows is used to determine pounds of cull sow sold. Then the pounds of market hog sold are obtained as the difference between pounds of state-raised hogs sold and pounds of cull sows sold. Equation 37 determines the average weight of market hogs sold. Equations 32 and 34 give cull sow spring sales and cull sow fall sales, respectively. Market hog spring sales and market hog fall sales are given in equations 39 and 41, respectively.

31. cull sow spring sales(lbs)$_t$ =
cull sow spring sales(hd)$_t^{24b}$ * U.S. average weight slaughter sows(lbs/hd)$_t$

32. cull sow spring sales(lbs/sow)$_t$ =
cull sow spring sales(lbs)$_t^{31}$ / fall sow farrowing(hd)$_{t-1}$

33. cull sow fall sales(lbs)$_t$ =
cull sow fall sales(hd)$_t^{25b}$ * U.S. average weight slaughter sows(lbs/hd)$_t$

34. cull sow fall sales(lbs/sow)$_t$ =
cull sow fall sales(lbs)$_t^{33}$ / spring sow farrowing(hd)$_t$

35. sow farm slaughter(lbs)$_t$ =
[sow spring farm slaughter(hd)$_t^{10}$ + sow fall farm slaughter(hd)$_t^{11}$] *
U.S. average weight slaughter sows(lbs/hd)$_t$

36. market hog sales(lbs)$_t$ =
marketings(lbs)$_t$ + sow farm slaughter(lbs)$_t^{35}$ -
[cull sow spring sales(lbs)$_t^{31}$ + cull sow fall sales(lbs)$_t^{33}$]

37. average weight market hogs(lbs/hd)$_t$ =
market hog sales(lbs)$_t^{36}$ /
[marketings(hd)$_t$ - (sow spring commercial slaughter(hd)$_t^{18}$ +
sow fall commercial slaughter(hd)$_t^{19}$)]

38. market hog spring sales(lbs)$_t$ =
market hog spring sales(hd)$_t^{29}$ * average weight market hogs(lbs/hd)$_t^{37}$

39. market hog spring sales(lbs/sow)$_t$ =
market hog spring sales(lbs)$_t^{38}$ / fall sow farrowing(hd)$_{t-1}$

40. market hog fall sales(lbs)$_t$ =
market hog fall sales(hd)$_t^{30}$ * average weight market hogs(lbs/hd)$_t^{37}$

41. market hog fall sales(lbs/sow)$_t$ =
market hog fall sales(lbs)$_t^{40}$ / spring sow farrowing(hd)$_t$.

A.2.3 REMARKS

Several limitations of the procedures used are noted in closing this discussion. These limitations are due to the lack of data series on several key variables that would both simplify and improve the accuracy of the estimates prepared.

First, it would be preferable to use cull sow sales by state, but the data is not reported. The estimates of cull sow sales prepared apply the U.S. sow culling rate across all states.

A second limitation results from the lack of biannual data on "hogs for breeding purposes" for all states. Biannual data on "hogs for breeding purposes" is only available for ten states: GA, IA, IL, IN, KS, NC, NE, MN, MO, and OH. This study used procedures which could be applied in a consistent manner across all states. Hogs for breeding purposes should be used in equations 16, 17, 24, and 25. The variable "sow farrowings" is used instead in these equations. This reduces the accuracy of the results because the number of sow farrowings does not equal the breeding hog inventory. Furthermore, the number of farrowings per sow has probably been increasing over the period in most states.

A third limitation is the lack of data on the average slaughter weight by state for cull sows. The U.S. annual average weight of slaughter sows was used for both biannual periods and for all states.

APPENDIX B

DESCRIPTIVE STATISTICS OF THE REGIONAL LIVESTOCK PRODUCTION SERIES

Table B1: Descriptive Statistics For Regional Beef Production

MEAN ORIGINAL SERIES[a]

REGION	beef calves sold (LBS/ BEEF COW)	beef steer&heif sold (LBS/ BEEF COW)	beef cull cow sold (LBS/ BEEF COW)
corn belt	42.27*	510.86	152.49*
appalach	85.38	329.20	99.90
delta sta	169.56*	243.30	74.15+
lake sta	39.33	485.76	151.56
pacific	67.01	445.75	137.00
south pln	63.14+	467.61	136.90+
north pln	45.23+	613.13	181.30
southeast	129.86	263.11	80.86
northeast	60.69-	242.89	87.95+
mountain	98.27	369.27	111.05

VARIANCE ORIGINAL SERIES

corn belt	196.42	3170.31	1058.22
appalach	96.77	4192.07	546.44
delta sta	1328.31	2807.39	386.31
lake sta	61.40	8120.07	1387.48
pacific	194.72	7963.03	913.13
south pln	1348.44	12265.06	1068.52
north pln	89.67	7963.24	1474.60
southeast	328.29	3179.29	454.22
northeast	200.09	4000.98	850.61
mountain	588.35	5621.74	836.60

COEFFICIENT OF VARIATION ORIGINAL SERIES

corn belt	33.16	11.02	21.33
appalach	11.52	19.67	23.40
delta sta	21.49	21.78	26.51
lake sta	19.92	18.55	24.58
pacific	20.82	20.02	22.06
south pln	58.16	23.68	23.88
north pln	20.94	14.55	21.18
southeast	13.95	21.43	26.36
northeast	23.31	26.04	33.16
mountain	24.68	20.30	26.04

[a]The *, + and - indicate the original series (x_t), that were found to differ significantly from the normal distribution. More specifically these three superscripts indicate:

+ = Shapiro-Wilk test significant at α = 5% level and positive skewness detected.

- = Shapiro-Wilk test significant at α = 5% level and negative skewness detected.

* = Shapiro-Wilk test significant at α = 5% level. No skewness detected.

Table B2: Descriptive Statistics For Regional Dairy Production

MEAN ORIGINAL SERIES

REGION	milk produced (x1000LBS/ MILK COW)	dairy calves sold (LBS/ MILK COW)	dairy steer&heif sold (LBS/ MILK COW)	dairy cull cow sold (LBS/ MILK COW)
corn belt	10.44	37.20^{+}	538.72^{+}	165.14^{+}
appalach	9.30	91.80	346.79	109.46
delta sta	7.84	183.22	242.59	80.87^{+}
lake sta	11.18	58.83*	403.97^{+}	123.99
pacific	13.63	50.19^{+}	459.47	141.74
south pln	9.94	66.07^{+}	473.75	143.22^{+}
north pln	9.60	53.05	617.60	188.87^{+}
southeast	9.38	139.61	256.49	83.06
northeast	11.27	67.34	230.09	76.36^{+}
mountain	12.51	92.67*	342.10	103.09

VARIANCE ORIGINAL SERIES

corn belt	1532.51	217.36	2906.55	1463.20
appalach	3749.60	164.45	3456.49	556.49
delta sta	3797.32	1612.28	1702.58	514.40
lake sta	2241.81	143.12	3635.99	629.92
pacific	5298.43	264.45	10199.95	1352.62
south pln	3067.56	1713.94	9162.27	1022.11
north pln	2558.35	120.30	5494.46	1376.95
southeast	3637.89	615.87	1360.23	510.42
northeast	1962.82	88.06	925.09	244.25
mountain	4203.04	1962.80	19241.58	1932.77

COEFFICIENT OF VARIATION ORIGINAL SERIES

corn belt	11.86	39.63	10.01	23.16
appalach	20.83	13.97	16.95	21.55
delta sta	24.84	21.91	17.01	28.05
lake sta	13.39	20.34	14.93	20.24
pacific	16.88	32.40	21.98	25.95
south pln	17.62	62.66	20.20	22.32
north pln	16.66	20.68	12.00	19.65
southeast	20.34	17.78	14.38	27.20
northeast	12.44	13.93	13.22	20.47
mountain	16.38	47.81	40.55	42.65

[a]The *, + and - indicate the original series (x_t), that were found to differ significantly from the normal distribution. More specifically these three superscripts indicate:

+ = Shapiro-Wilk test significant at α = 5% level and positive skewness detected.

- = Shapiro-Wilk test significant at α = 5% level and negative skewness detected.

* = Shapiro-Wilk test significant at α = 5% level. No skewness detected.

Table B3: Descriptive Statistics For Regional Hog Production

MEAN ORIGINAL SERIES

REGION	SPRING CULL SOWS SOLD (LBS/SOW)	FALL CULL SOWS SOLD (LBS/SOW)	SPRING HOGS SOLD (LBS/SOW)	FALL HOGS SOLD (LBS/SOW)
corn belt	161.53	191.71	1476.61^{+}	1484.46^{+}
lake stat	163.91^{+}	193.76^{+}	1407.03^{+}	1421.23
mountain	172.19^{+}	200.27^{+}	1391.94	1424.09
south pln	170.12^{+}	200.69^{+}	1456.31	1398.65
appalach	179.03^{+}	207.13^{+}	1242.37	1260.95
delta sta	184.02^{+}	212.98^{+}	1179.45^{+}	1166.79^{+}
northeast	183.23^{+}	211.22^{+}	1304.09^{+}	1310.72^{+}
north pln	162.56^{+}	192.34	1467.08	1532.43
pacific	180.81	210.66^{+}	1391.21^{+}	1332.92
southeast	173.57^{+}	202.43^{+}	1224.49	1235.53

VARIANCE ORIGINAL SERIES

corn belt	579.16	646.64	7449.56	5127.50
lake stat	625.47	677.40	7438.85	6874.52
mountain	1061.16	1053.26	11826.11	8531.67
south pln	852.37	923.74	34194.32	32395.36
appalach	1077.73	996.67	23929.96	21735.88
delta sta	1235.35	1223.43	54417.72	60221.93
northeast	1107.15	1070.24	25786.92	21671.45
north pln	626.81	665.26	8082.54	9455.93
pacific	555.33	616.88	17040.97	12457.43
southeast	943.24	888.81	17701.03	10217.85

COEFFICIENT OF VARIATION ORIGINAL SERIES

corn belt	14.90	13.26	5.85	4.82
lake stat	15.26	13.43	6.13	5.83
mountain	18.92	16.20	7.81	6.49
south pln	17.16	15.14	12.70	12.87
appalach	18.34	15.24	12.45	11.69
delta sta	19.10	16.42	19.78	21.03
northeast	18.16	15.49	12.31	11.23
north pln	15.40	13.41	6.13	6.35
pacific	13.03	11.79	9.38	8.37
southeast	17.69	14.73	10.87	8.18

[a]The *, + and - indicate the original series (x_t), that were found to differ significantly from the normal distribution. More specifically these three superscripts indicate:

+ = Shapiro-Wilk test significant at α = 5% level and positive skewness detected.

- = Shapiro-Wilk test significant at α = 5% level and negative skewness detected.

* = Shapiro-Wilk test significant at α = 5% level. No skewness detected.

Table B4: Descriptive Statistics For Regional Poultry Production

MEAN ORIGINAL SERIES

REGION	BROILERS PRODUCED PER HEAD PLACED (LBS/HD)	CHICKEN SOLD PER LAYER (LBS/LAYER)	EGGS PRODUCED PER LAYER (EGGS/LAYER)	TURKEYS PRODUCED PER HEAD RAISED (LBSxHD)
northeast	3.91	4.28	242.33	19.08^{-}
cornbelt	na	3.40	235.95	19.76
lake sta	na	3.13	235.96	16.74
mountain	na	2.47	226.44*	na
south pln	3.69	3.26	224.75*	na
appala	3.83	4.77	229.62^{-}	17.18
delta	3.54	5.62	230.68^{-}	19.05
north pln	na	2.90	227.04^{+}	19.93
pacific	4.08*	2.47	232.02*	19.79
southeast	3.61	4.07	234.10*	23.07^{+}

VARIANCE ORIGINAL SERIES

northeast	0.01	0.41	277.52	0.47
cornbelt	na	0.09	166.85	0.51
lake sta	na	0.07	76.77	0.36
mountain	na	0.24	316.31	na
south pln	0.09	0.22	195.18	na
appala	0.12	0.85	143.44	1.55
delta	0.07	1.64	87.91	0.65
north pln	na	0.11	122.43	3.69
pacific	0.14	0.10	104.89	0.82
southeast	0.06	0.12	122.85	10.56

COEFFICIENT OF VARIATION ORIGINAL SERIES

northeast	3.06	14.90	6.87	3.61
cornbelt	na	8.88	5.47	3.61
lake sta	na	8.23	3.71	3.57
mountain	na	19.75	7.85	na
south pln	7.94	14.49	6.22	na
appala	9.06	19.33	5.22	7.26
delta	7.55	22.80	4.06	4.24
north pln	na	11.69	4.87	9.64
pacific	9.30	12.84	4.41	4.58
southeast	6.64	8.51	4.73	14.09

[a]The *, + and - indicate the original series (x_t), that were found to differ significantly from the normal distribution. More specifically these three superscripts indicate:

+ = Shapiro-Wilk test significant at α = 5% level and positive skewness detected.

- = Shapiro-Wilk test significant at α = 5% level and negative skewness detected.

* = Shapiro-Wilk test significant at α = 5% level. No skewness detected.

APPENDIX C

1972-1988 SERIES OF DEVIATIONS FROM NONLINEAR SMOOTHING FOR REGIONAL LIVESTOCK PRODUCTION VARIABLES

Table C.1: Deviations From Nonlinear Filter For Livestock Production Variables REGION: CORN BELT (states: IA,IN,IL,MO,OH)

YEAR	beef calves sold (LBS/ BEEF COW)	beef S&H sold (LBS/ BEEF COW)	beef cull sold (LBS/ BEEF COW)	milk produced (1000LBS/ MILK COW)	dairy calves sold (LBS/ MILK COW)	dairy S&H sold (LBS/ MILK COW)	dairy cull sold (LBS/ MILK COW)
1972	-0.04	36.97	-0.65	0.056	-1.30	26.28	-9.11
1973	2.75	-65.07	-15.62	-0.061	1.32	-22.31	-22.03
1974	13.64	0.00	-5.52	0.000	5.08	1.01	-5.82
1975	0.00	-35.88	33.49	-0.092	-2.22	-3.38	53.89
1976	-1.18	6.67	1.78	0.049	-3.05	-1.58	23.51
1977	1.40	0.00	-7.23	0.050	-0.55	1.58	0.57
1978	-0.84	45.11	7.73	-0.060	0.55	19.19	0.43
1979	1.57	-35.89	-23.94	-0.071	3.93	-7.34	-31.52
1980	-3.00	-7.52	0.00	0.000	-8.49	34.83	0.00
1981	3.12	0.00	-2.69	0.004	1.67	-2.89	-6.80
1982	0.00	11.78	6.53	-0.022	0.00	-5.57	7.19
1983	-7.91	-25.69	-8.43	0.087	-6.52	-11.68	-9.91
1984	0.11	0.00	14.52	-0.112	1.02	0.07	0.98
1985	1.24	48.81	-3.41	0.202	0.00	0.07	-0.46
1986	-3.86	66.57	32.28	-0.135	0.00	129.24	25.14
1987	5.49	0.00	0.00	0.000	9.15	0.46	0.00
1988	-0.68	-126.55	-3.41	0.040	0.66	-107.45	-0.94

YEAR	cull sow spring sales (LBS/ SOW)	cull sow fall sales (LBS/ SOW)	market hogs spring sales (LBS/ SOW)	market hogs fall sales (LBS/ SOW)	broiler produced (LBS/ HD)	chiken sold (LBS/ LAYER)	eggs produced (EGGS/ LAYER)	turkey produced (LBS/ HD)
1972	0.00	0.00	0.00	0.93	np	0.02	1.31	0.41
1973	4.91	-28.23	-84.86	-67.39	np	-0.04	-0.86	0.03
1974	-18.77	49.45	19.54	-9.50	np	0.00	-0.22	-0.32
1975	-17.05	2.39	94.06	45.50	np	-0.06	0.00	-0.47
1976	-13.64	-8.21	-8.61	57.40	np	0.01	0.61	0.05
1977	3.18	0.00	0.00	0.00	np	0.13	-1.09	-0.05
1978	0.00	-11.72	-11.50	-45.38	np	-0.04	0.10	0.62
1979	-14.55	5.91	0.02	-32.81	np	0.13	-1.00	0.03
1980	5.14	0.00	-12.64	0.00	np	0.00	0.13	-0.30
1981	1.80	-4.68	2.86	37.24	np	-0.05	0.00	-0.06
1982	-15.00	12.15	29.76	-40.21	np	-0.01	-0.28	0.00
1983	-10.83	18.33	-17.71	31.04	np	0.34	1.83	0.04
1984	-0.20	6.86	-19.93	-39.32	np	0.05	-2.41	-0.08
1985	-0.20	0.76	0.00	11.27	np	-0.01	0.45	0.09
1986	2.82	-0.76	0.80	-3.49	np	-0.01	-1.02	-0.04
1987	0.00	-2.24	-15.65	0.00	np	-0.06	0.19	0.00
1988	-3.27	11.95	0.21	2.44	np	0.05	0.00	0.01

np: not produced

Table C.2: Deviations From Nonlinear Filter For Livestock Production Variables REGION: APPALACHIAN (states: NC,WV,VA,TE,KY)

YEAR	beef calves sold (LBS/ BEEF COW)	beef S&H sold (LBS/ BEEF COW)	beef cull sold (LBS/ BEEF COW)	milk produced (1000LBS/ MILK COW)	dairy calves sold (LBS/ MILK COW)	dairy S&H sold (LBS/ MILK COW)	dairy cull sold (LBS/ MILK COW)
1972	2.18	0.71	-0.18	0.197	3.02	17.52	-4.00
1973	0.00	-42.94	0.00	-0.107	2.57	-2.28	-6.26
1974	-10.01	-117.65	-26.66	0.020	-1.17	-72.46	-26.61
1975	-31.54	5.58	28.42	-0.115	-26.36	7.92	52.60
1976	12.38	-40.59	0.00	0.061	0.00	-51.39	0.00
1977	18.13	0.00	-6.51	0.090	24.05	42.97	-3.25
1978	-6.45	63.55	8.60	-0.159	-18.71	54.49	6.81
1979	0.26	-50.23	-23.12	-0.074	8.32	-4.11	-29.25
1980	-8.21	8.85	0.00	0.040	-15.86	-1.65	0.00
1981	10.94	-19.02	-7.07	-0.009	12.64	0.00	-8.19
1982	0.00	0.00	2.02	0.055	0.00	8.66	3.76
1983	0.20	-21.62	-4.97	0.000	4.86	-12.27	-5.48
1984	-6.36	40.74	29.18	-0.434	-9.43	50.31	33.08
1985	-7.33	-3.27	-0.70	-0.034	-18.12	-44.46	-0.41
1986	-6.88	0.00	10.21	0.037	-0.58	28.74	8.78
1987	0.01	33.40	0.00	0.000	0.00	0.00	0.00
1988	0.00	-28.12	-14.83	-0.003	5.96	-44.89	-19.24

YEAR	cull sow spring sales (LBS/ SOW)	cull sow fall sales (LBS/ SOW)	market hogs spring sales (LBS/ SOW)	market hogs fall sales (LBS/ SOW)	broiler produced (LBS/ HD)	chiken sold (LBS/ LAYER)	eggs produced (EGGS/ LAYER)	turkey produced (LBS/ HD)
1972	0.00	0.00	5.74	16.85	0.00	0.00	1.51	-0.42
1973	11.30	-28.91	0.00	0.00	0.02	-0.15	-0.97	0.00
1974	-3.02	49.06	31.01	7.64	0.12	0.55	1.50	0.17
1975	0.00	3.43	-31.13	-113.26	-0.11	0.00	-0.24	-0.13
1976	-3.03	-6.13	20.81	114.38	0.00	-0.13	0.17	-0.17
1977	6.95	0.00	-91.92	-85.04	-0.01	0.26	0.00	0.04
1978	0.00	-11.31	0.00	-10.52	0.03	-0.53	1.48	0.00
1979	-16.43	6.67	23.35	27.43	0.05	-0.21	-0.51	0.24
1980	3.06	0.00	-25.39	-17.06	-0.07	0.70	-0.08	-0.50
1981	0.00	-4.37	0.00	2.74	0.00	0.12	0.02	-0.06
1982	-18.17	10.75	21.71	6.45	0.00	-1.12	-0.05	0.00
1983	-15.63	14.87	-39.65	3.67	0.03	0.00	1.38	0.04
1984	-2.03	5.41	0.77	-43.98	0.07	-0.73	2.07	0.06
1985	-0.50	0.66	-4.15	0.00	-0.17	0.12	1.87	0.40
1986	2.47	-0.66	47.94	35.17	0.00	0.00	0.00	-0.37
1987	0.00	-2.27	-24.33	-26.23	0.02	-0.01	-0.96	0.00
1988	-2.23	11.69	0.00	-6.76	0.00	0.41	1.74	0.34

Table C.3: Deviations From Nonlinear Filter For Livestock Production Variables REGION: DELTA STATES (states: LA,MS,AR)

YEAR	beef calves sold (LBS/ BEEF COW)	beef S&H sold (LBS/ BEEF COW)	beef cull sold (LBS/ BEEF COW)	milk produced (1000LBS/ MILK COW)	dairy calves sold (LBS/ MILK COW)	dairy S&H sold (LBS/ MILK COW)	dairy cull sold (LBS/ MILK COW)
1972	-4.74	4.19	-3.95	0.062	-8.89	7.07	-3.44
1973	7.65	-5.64	0.02	-0.049	0.27	0.00	1.01
1974	-12.37	-47.44	-9.67	0.031	1.47	-17.35	-10.44
1975	-66.09	12.48	30.43	0.000	-62.35	-5.35	36.41
1976	5.83	-0.67	-0.61	0.173	0.00	-1.32	0.00
1977	-3.81	98.10	27.05	-0.270	-17.49	34.54	23.25
1978	72.07	45.35	0.00	0.103	67.76	0.00	-2.20
1979	47.34	-0.30	-20.33	0.000	64.35	4.93	-10.27
1980	0.00	-12.48	-7.99	-0.057	10.38	-4.61	-7.43
1981	0.00	0.00	0.00	0.214	0.00	-5.09	0.00
1982	-8.40	20.36	19.83	0.204	-49.70	-2.07	7.85
1983	32.28	-15.03	-7.41	0.000	29.84	28.75	-10.42
1984	-5.79	0.00	5.51	-0.107	0.00	-7.71	0.31
1985	17.67	25.62	0.00	0.037	-15.43	0.00	-0.11
1986	0.00	-9.99	1.94	-0.092	18.12	85.78	22.16
1987	-9.21	0.00	-14.16	0.025	-7.27	-11.79	-11.77
1988	12.76	19.66	-11.82	0.000	0.00	7.28	-10.32

YEAR	cull sow spring sales (LBS/ SOW)	cull sow fall sales (LBS/ SOW)	market hogs spring sales (LBS/ SOW)	market hogs fall sales (LBS/ SOW)	broiler produced (LBS/ HD)	chiken sold (LBS/ LAYER)	eggs produced (EGGS/ LAYER)	turkey produced (LBS/ HD)
1972	-0.35	0.00	-0.76	62.02	0.02	-0.11	1.27	-0.01
1973	7.05	-29.28	17.96	67.17	0.00	0.23	-0.12	-0.15
1974	-11.41	51.11	0.00	-23.65	0.07	0.86	-0.13	0.04
1975	-5.90	2.73	4.09	58.55	-0.10	-0.39	1.50	-0.31
1976	-4.19	-5.66	-126.55	0.27	0.04	0.00	0.00	1.33
1977	8.50	0.00	-34.86	-34.75	-0.06	0.24	-0.35	0.04
1978	0.00	-14.86	0.00	0.00	0.00	-0.01	0.27	0.02
1979	-15.78	5.61	5.66	15.31	0.07	0.23	0.56	-0.66
1980	7.37	0.00	-23.60	-6.29	-0.06	-0.22	1.03	-0.18
1981	2.13	-7.72	0.00	3.85	0.01	-0.93	0.00	0.08
1982	-1.92	8.86	8.73	-57.39	0.00	0.00	-0.79	-0.08
1983	-9.23	12.25	-51.85	-88.95	-0.02	1.75	0.94	0.10
1984	2.80	3.83	6.01	0.00	0.01	0.49	-0.82	0.00
1985	-2.20	-0.16	27.43	125.02	0.03	-0.56	0.63	-0.18
1986	0.84	-0.16	-28.50	-115.72	-0.01	-0.41	0.00	-0.33
1987	0.00	-2.79	83.50	60.88	0.06	0.00	-0.02	0.38
1988	-3.00	10.04	0.00	-56.82	0.00	0.42	0.31	0.00

Table C.4: Deviations From Nonlinear Filter For Livestock Production Variables REGION: LAKE STATES (states: MI,WI,MN)

YEAR	beef calves sold (LBS/ BEEF COW)	beef S&H sold (LBS/ BEEF COW)	beef cull sold (LBS/ BEEF COW)	milk produced (1000LBS/ MILK COW)	dairy calves sold (LBS/ MILK COW)	dairy S&H sold (LBS/ MILK COW)	dairy cull sold (LBS/ MILK COW)
1972	2.08	20.39	-11.31	0.179	0.00	4.02	-5.88
1973	0.27	-34.10	0.86	-0.147	4.68	0.00	0.00
1974	-3.65	-101.62	-34.85	0.000	1.16	-82.68	-6.19
1975	-8.13	0.00	14.24	-0.222	-10.14	-33.31	70.82
1976	0.00	69.02	-8.15	0.041	-5.65	9.42	53.03
1977	5.21	102.22	35.23	0.109	-0.78	9.12	31.41
1978	2.03	5.68	2.84	-0.045	3.81	0.00	1.39
1979	-2.27	-129.33	-41.23	-0.028	0.21	-50.14	-26.81
1980	-1.24	0.12	0.00	0.000	-0.20	-0.21	-0.65
1981	-0.46	-59.10	-24.04	0.044	-1.75	5.77	0.00
1982	0.46	104.25	14.56	-0.019	-0.14	7.95	12.00
1983	2.83	0.00	-15.95	0.176	0.14	-12.35	-9.20
1984	-7.61	-13.45	0.00	-0.164	2.90	-30.32	0.54
1985	8.22	57.16	18.46	0.007	-0.61	-35.69	-3.02
1986	-3.24	-27.24	22.98	-0.133	8.15	0.00	12.73
1987	0.00	86.60	-14.91	0.042	-4.52	11.95	0.00
1988	5.14	0.00	-1.47	0.000	-0.25	-48.54	-14.47

YEAR	cull sow spring sales (LBS/ SOW)	cull sow fall sales (LBS/ SOW)	market hogs spring sales (LBS/ SOW)	market hogs fall sales (LBS/ SOW)	broiler produced (LBS/ HD)	chiken sold (LBS/ LAYER)	eggs produced (EGGS/ LAYER)	turkey produced (LBS/ HD)
1972	0.00	0.00	0.00	-3.45	np	-0.02	-0.55	0.10
1973	5.30	-28.42	-59.03	4.49	np	-0.14	0.00	0.00
1974	-17.62	49.46	43.05	0.00	np	0.50	0.04	0.00
1975	-15.92	2.56	7.07	-71.97	np	-0.03	-0.35	-0.37
1976	-12.39	-7.89	-1.29	57.18	np	0.12	0.01	-0.22
1977	3.84	0.00	3.28	0.00	np	-0.15	-0.29	0.00
1978	0.00	-12.12	-34.38	-61.82	np	0.14	1.21	0.66
1979	-14.43	5.93	0.00	-94.20	np	0.00	-0.51	0.14
1980	5.68	0.00	-13.46	2.20	np	-0.16	0.00	-0.33
1981	1.62	-5.19	22.60	0.00	np	-0.19	-0.54	-0.38
1982	-14.68	11.36	55.28	-2.78	np	0.15	0.77	0.00
1983	-10.68	17.13	-57.80	4.81	np	0.11	1.86	0.03
1984	0.00	6.08	0.00	-26.91	np	0.00	-0.86	0.21
1985	3.60	0.68	56.95	81.69	np	-0.07	0.00	-0.13
1986	3.23	-0.68	-52.21	-76.14	np	0.00	0.70	0.00
1987	0.00	-2.45	13.76	26.86	np	-0.27	-2.08	0.00
1988	-3.34	11.66	0.00	0.00	np	0.04	0.34	0.52

np: not produced

Table C.5: Deviations From Nonlinear Filter For Livestock Production Variables REGION: PACIFIC (states: WA,OR,CA)

YEAR	beef calves sold (LBS/ BEEF COW)	beef S&H sold (LBS/ BEEF COW)	beef cull sold (LBS/ BEEF COW)	milk produced (1000LBS/ MILK COW)	dairy calves sold (LBS/ MILK COW)	dairy S&H sold (LBS/ MILK COW)	dairy cull sold (LBS/ MILK COW)
1972	-5.94	-12.97	-19.67	0.260	-2.97	-116.74	-24.87
1973	-0.10	0.00	0.00	-0.095	5.42	13.18	-1.72
1974	-0.61	-27.47	0.00	0.000	-3.96	0.00	-1.72
1975	0.26	5.39	65.82	-0.072	0.00	-55.69	47.34
1976	24.99	23.19	44.91	0.209	43.10	60.26	26.07
1977	34.10	-41.53	-0.06	0.297	49.50	-3.86	-12.33
1978	-7.54	51.84	1.26	-0.289	0.00	101.24	4.12
1979	0.81	0.00	-43.37	-0.138	-1.54	-37.18	-50.38
1980	0.20	-93.89	-49.77	0.120	2.21	-79.15	-54.15
1981	-1.33	74.52	0.00	0.050	0.00	102.72	0.00
1982	0.00	161.85	18.94	-0.003	-4.36	50.94	39.30
1983	8.70	-42.32	-17.17	0.000	5.47	-35.73	-6.80
1984	-5.62	-96.04	8.40	-0.118	0.00	0.00	10.31
1985	7.15	0.00	-7.07	0.091	-1.72	-11.23	-16.43
1986	-0.41	52.48	34.42	0.000	0.23	128.62	14.22
1987	9.10	-79.70	-27.88	0.540	0.54	-155.71	-40.61
1988	-8.09	0.00	0.00	-0.021	-7.65	0.00	0.00

YEAR	cull sow spring sales (LBS/ SOW)	cull sow fall sales (LBS/ SOW)	market hogs spring sales (LBS/ SOW)	market hogs fall sales (LBS/ SOW)	broiler produced (LBS/ HD)	chiken sold (LBS/ LAYER)	eggs produced (EGGS/ LAYER)	turkey produced (LBS/ HD)
1972	-0.04	0.00	-1.46	64.63	0.12	-0.07	2.73	0.10
1973	6.27	-28.65	0.00	-25.87	-0.09	0.00	-1.72	-0.45
1974	-8.47	57.44	91.34	0.00	0.00	0.27	0.36	-0.64
1975	-14.41	0.10	36.81	41.66	0.02	-0.10	-0.53	0.09
1976	-10.78	-0.74	-7.87	-26.73	-0.06	-0.21	2.09	-0.30
1977	8.26	0.00	-44.68	0.00	0.01	0.00	-1.74	0.16
1978	0.00	-9.70	-3.79	-102.96	0.22	-0.06	1.03	0.01
1979	-19.78	6.65	118.31	79.95	-0.23	0.01	-0.99	-0.01
1980	4.47	0.00	-1.07	71.08	-0.05	0.11	0.92	-0.06
1981	2.52	-4.48	6.80	-75.25	0.00	-0.05	-0.25	0.14
1982	-20.83	12.50	-78.23	-85.65	0.00	0.19	0.00	-0.21
1983	-17.59	16.19	0.00	0.00	-0.10	-0.21	0.81	0.00
1984	0.00	1.60	290.09	157.16	0.04	0.04	-0.69	0.61
1985	6.03	2.06	-27.48	-22.22	0.01	-0.18	0.12	-0.31
1986	2.35	-2.59	38.85	41.88	-0.01	0.00	0.00	-0.04
1987	0.00	0.00	0.00	0.00	-0.07	-0.12	-1.67	0.00
1988	-1.13	13.23	-45.50	-3.38	0.01	0.31	3.18	0.01

Table C.6: Deviations From Nonlinear Filter For Livestock Production Variables REGION: SOUTHERN PLAINS (states: OK,TX)

YEAR	beef calves sold (LBS/ BEEF COW)	beef S&H sold (LBS/ BEEF COW)	beef cull sold (LBS/ BEEF COW)	milk produced (1000LBS/ MILK COW)	dairy calves sold (LBS/ MILK COW)	dairy S&H sold (LBS/ MILK COW)	dairy cull sold (LBS/ MILK COW)
1972	14.73	20.67	0.00	0.019	22.58	98.74	-7.68
1973	0.00	-41.85	-4.78	-0.244	0.00	0.00	-6.99
1974	-1.69	-62.17	-15.06	0.101	-0.24	-7.59	-4.49
1975	-22.01	11.97	50.26	-0.272	-27.78	0.50	90.76
1976	10.17	-12.47	-1.94	-0.002	1.05	-28.31	14.01
1977	4.67	19.27	13.08	0.002	1.61	25.44	9.67
1978	-2.13	0.00	0.00	0.031	-2.51	-3.12	-2.05
1979	0.03	14.85	-17.23	-0.159	0.00	4.63	-19.38
1980	0.46	-81.22	-22.27	0.097	4.06	-42.43	-27.55
1981	-0.46	0.00	0.00	0.000	-0.67	0.00	0.00
1982	-0.48	41.52	23.36	-0.023	-0.13	46.20	26.51
1983	0.47	-123.96	-24.92	0.115	0.45	-148.88	-19.13
1984	-2.60	19.86	42.17	-0.060	0.00	12.67	43.68
1985	-0.05	-45.08	-1.12	0.034	-0.76	-103.83	-1.28
1986	1.37	26.03	34.77	-0.026	7.68	105.96	21.48
1987	0.00	0.00	0.00	0.059	0.00	0.00	0.00
1988	-0.19	-27.24	-3.27	0.000	-3.53	-47.52	-2.26

YEAR	cull sow spring sales (LBS/ SOW)	cull sow fall sales (LBS/ SOW)	market hogs spring sales (LBS/ SOW)	market hogs fall sales (LBS/ SOW)	broiler produced (LBS/ HD)	chiken sold (LBS/ LAYER)	eggs produced (EGGS/ LAYER)	turkey produced (LBS/ HD)
1972	-0.29	0.00	59.28	34.72	-0.02	0.10	3.37	np
1973	7.11	-27.65	-1.17	-67.34	0.01	-0.77	0.00	np
1974	-12.27	51.23	-0.75	2.73	0.13	0.14	-5.30	np
1975	-13.88	2.91	-1.76	-2.73	-0.16	0.00	1.85	np
1976	-12.75	-7.21	-86.43	33.18	-0.02	-0.51	0.00	np
1977	2.05	0.00	-111.90	-113.16	0.04	0.40	-2.51	np
1978	0.00	-9.51	0.00	-33.03	0.00	-0.42	0.29	np
1979	-16.48	6.12	7.26	-3.62	0.17	0.19	-0.21	np
1980	3.96	0.00	-64.14	-23.91	-0.06	-0.23	0.00	np
1981	0.00	-4.18	0.85	12.76	-0.02	0.00	0.67	np
1982	-13.91	14.71	161.54	27.99	0.00	0.16	-5.37	np
1983	-11.79	16.95	-185.82	-96.86	-0.01	0.00	1.80	np
1984	0.18	7.86	297.48	217.55	0.00	-0.13	2.12	np
1985	-0.77	0.69	-26.55	0.00	0.05	0.17	-3.81	np
1986	1.94	-0.69	-4.15	-82.23	0.01	0.00	0.00	np
1987	0.00	-2.08	3.58	0.38	-0.04	0.10	-2.91	np
1988	-2.60	10.30	0.00	0.00	-0.02	-0.17	0.17	np

np: not produced

Table C.7: Deviations From Nonlinear Filter For Livestock Production Variables REGION: NORTHERN PLAINS (states: ND,SD,NB,KS)

YEAR	beef calves sold (LBS/ BEEF COW)	beef S&H sold (LBS/ BEEF COW)	beef cull sold (LBS/ BEEF COW)	milk produced (1000LBS/ MILK COW)	dairy calves sold (LBS/ MILK COW)	dairy S&H sold (LBS/ MILK COW)	dairy cull sold (LBS/ MILK COW)
1972	-0.23	95.48	8.40	0.000	-0.02	129.10	10.07
1973	0.58	-94.05	-22.02	0.133	4.70	-1.62	-28.15
1974	-15.46	-94.05	-29.63	-0.034	-11.54	-6.49	-16.96
1975	0.01	1.26	48.61	-0.293	-7.90	-53.66	97.27
1976	10.29	114.25	21.94	0.107	0.55	48.73	50.73
1977	-1.18	68.74	0.00	0.074	2.90	68.50	0.00
1978	1.83	0.00	-13.05	-0.326	0.93	1.06	-28.74
1979	-0.20	-54.60	-27.14	-0.184	0.00	-29.09	-42.16
1980	-6.84	-33.05	-2.16	0.000	-12.56	0.00	-3.50
1981	4.21	10.65	0.00	0.231	8.73	3.14	3.50
1982	0.20	40.74	12.91	-0.142	0.00	-42.85	12.50
1983	-4.22	-25.03	-6.83	0.057	-7.94	21.86	-17.52
1984	-9.20	0.00	24.82	-0.446	-8.84	0.00	15.67
1985	0.00	28.68	0.00	0.022	-0.62	-85.57	0.41
1986	10.00	-17.05	15.01	-0.082	23.26	16.60	-0.27
1987	-1.34	14.54	-2.30	0.027	-0.90	-4.03	-1.24
1988	3.79	0.00	0.00	0.000	14.75	0.00	0.00

YEAR	cull sow spring sales (LBS/ SOW)	cull sow fall sales (LBS/ SOW)	market hogs spring sales (LBS/ SOW)	market hogs fall sales (LBS/ SOW)	broiler produced (LBS/ HD)	chiken sold (LBS/ LAYER)	eggs produced (EGGS/ LAYER)	turkey produced (LBS/ HD)
1972	0.00	0.00	0.00	0.00	np	0.00	3.00	0.44
1973	4.71	-28.34	-90.34	-82.77	np	-0.05	0.58	-0.11
1974	-18.57	49.58	108.60	167.71	np	0.06	-0.07	0.01
1975	-17.09	2.48	0.00	9.43	np	-0.11	0.00	-0.02
1976	-13.66	-8.05	-78.48	2.47	np	0.18	1.21	0.00
1977	2.90	0.00	-67.91	-0.53	np	0.00	-0.20	0.23
1978	0.00	-11.50	-14.91	-100.46	np	-0.40	0.83	-1.10
1979	-14.56	5.87	-1.57	-17.88	np	-0.13	-0.83	-1.53
1980	5.22	0.00	3.19	0.00	np	0.35	0.19	0.06
1981	1.62	-5.04	-2.66	28.33	np	0.21	-1.99	0.86
1982	-14.89	11.94	4.38	-36.28	np	-0.01	0.67	-0.83
1983	-10.81	17.97	0.00	24.83	np	0.00	0.15	-0.12
1984	-0.18	6.66	25.66	0.00	np	0.20	-3.57	0.00
1985	-0.25	0.74	-45.59	-19.17	np	-0.08	0.15	0.03
1986	2.78	-0.74	0.80	2.86	np	0.00	-0.20	-0.09
1987	0.00	-2.35	-10.41	0.00	np	0.12	0.00	0.72
1988	-2.87	11.86	46.29	-5.99	np	0.02	0.03	0.00

np: not produced

Table C.8: Deviations From Nonlinear Filter For Livestock Production Variables REGION: SOUTHEAST (states: FL,GA,SC,AL)

YEAR	beef calves sold (LBS/ BEEF COW)	beef S&H sold (LBS/ BEEF COW)	beef cull sold (LBS/ BEEF COW)	milk produced (1000LBS/ MILK COW)	dairy calves sold (LBS/ MILK COW)	dairy S&H sold (LBS/ MILK COW)	dairy cull sold (LBS/ MILK COW)
1972	1.37	23.53	0.00	0.041	0.01	12.63	-2.68
1973	-0.45	-9.48	-9.89	-0.072	12.84	0.20	0.00
1974	-1.46	-64.08	-37.79	0.000	24.72	-41.02	-24.14
1975	-55.39	-9.79	0.00	-0.034	-49.58	0.00	18.20
1976	-24.49	9.79	0.00	0.032	-17.86	0.00	-3.33
1977	0.65	37.27	10.15	0.029	0.00	56.30	4.21
1978	0.00	46.25	11.10	-0.073	20.18	50.99	0.00
1979	17.39	-18.53	-16.11	-0.038	54.52	9.19	-13.53
1980	-2.88	-94.49	-21.13	-0.002	37.72	-23.83	-10.11
1981	-12.63	-32.66	-0.37	0.036	-12.46	-6.42	0.00
1982	1.22	0.00	0.73	0.000	0.00	-0.28	2.20
1983	-2.49	8.29	0.00	0.061	-15.00	0.14	-2.06
1984	15.61	-10.38	6.64	-0.251	28.43	21.14	25.08
1985	0.06	29.20	-1.09	0.031	-25.69	-0.55	-1.34
1986	-1.92	-0.01	0.00	-0.015	0.70	52.76	7.63
1987	0.00	0.24	0.87	0.012	-25.20	0.00	0.00
1988	27.05	-21.02	-25.31	0.000	21.27	-0.73	-1.34

YEAR	cull sow spring sales (LBS/ SOW)	cull sow fall sales (LBS/ SOW)	market hogs spring sales (LBS/ SOW)	market hogs fall sales (LBS/ SOW)	broiler produced (LBS/ HD)	chiken sold (LBS/ LAYER)	eggs produced (EGGS/ LAYER)	turkey produced (LBS/ HD)
1972	-0.02	0.00	17.77	48.05	0.04	-0.18	0.27	0.13
1973	10.36	-28.89	-16.08	-11.67	-0.01	0.00	-1.57	0.00
1974	-1.95	50.75	129.94	102.70	0.04	0.49	2.04	0.11
1975	0.00	2.47	123.00	2.18	-0.01	-0.08	-0.92	-0.96
1976	-2.45	-7.32	-62.58	-1.36	0.02	0.06	3.30	-1.91
1977	6.57	0.00	0.00	-33.23	-0.01	0.00	-1.47	-1.85
1978	0.00	-10.02	32.14	-2.45	0.00	-0.02	-0.10	0.00
1979	-15.64	6.74	-60.31	0.00	0.05	0.15	0.96	1.46
1980	3.35	0.00	-29.49	13.11	-0.03	-0.04	0.00	-0.52
1981	0.00	-3.61	96.88	121.32	0.00	0.13	0.51	0.04
1982	-17.91	11.93	-2.80	-72.76	0.02	0.00	-0.70	-1.57
1983	-14.90	16.70	-0.44	-6.36	-0.03	-0.04	1.32	0.13
1984	-2.34	4.77	0.44	8.07	0.01	0.31	-2.14	0.00
1985	-0.46	0.59	17.72	0.00	0.00	0.08	2.07	0.06
1986	3.28	-0.59	-53.18	-59.00	-0.03	0.00	2.32	-0.06
1987	0.00	-3.75	43.39	10.86	0.00	-0.10	-2.30	-0.55
1988	-2.26	10.20	-0.88	-16.22	-0.01	0.56	-2.24	1.25

Table C.9: Deviations From Nonlinear Filter For Livestock Production Variables REGION: NORTHEAST STATES (states: NY,ME,PA)

YEAR	beef calves sold (LBS/ BEEF COW)	beef S&H sold (LBS/ BEEF COW)	beef cull sold (LBS/ BEEF COW)	milk produced (1000LBS/ MILK COW)	dairy calves sold (LBS/ MILK COW)	dairy S&H sold (LBS/ MILK COW)	dairy cull sold (LBS/ MILK COW)
1972	2.79	40.70	11.90	0.283	-6.73	12.51	-3.09
1973	30.12	-20.82	0.00	-0.083	11.45	-4.10	-2.98
1974	16.67	-55.40	-4.86	0.000	12.06	-3.07	-1.35
1975	-19.58	-53.67	3.36	-0.038	-15.84	-1.91	23.74
1976	0.20	16.47	-1.59	0.058	-3.32	2.10	8.04
1977	-0.20	0.00	34.79	0.010	-0.51	0.00	0.12
1978	15.86	59.55	10.97	-0.007	5.27	14.42	0.11
1979	-1.04	-64.80	-17.42	-0.037	5.07	-16.03	-18.15
1980	-5.67	0.00	-1.26	0.000	-2.23	7.63	0.00
1981	-4.80	-56.09	-0.13	0.026	0.00	-7.08	-4.92
1982	0.00	89.07	22.95	-0.044	-7.53	1.70	7.69
1983	4.65	28.64	-1.44	0.113	0.34	0.00	0.00
1984	6.05	-19.32	42.27	-0.083	0.00	-16.67	6.71
1985	-2.76	-38.24	-0.08	0.000	2.16	2.17	-6.41
1986	-5.58	0.00	0.00	-0.061	-2.42	-0.57	0.00
1987	0.00	0.00	-12.43	0.075	0.00	0.00	-11.85
1988	10.77	4.68	78.02	0.018	0.11	6.98	2.44

YEAR	cull sow spring sales (LBS/ SOW)	cull sow fall sales (LBS/ SOW)	market hogs spring sales (LBS/ SOW)	market hogs fall sales (LBS/ SOW)	broiler produced (LBS/ HD)	chiken sold (LBS/ LAYER)	eggs produced (EGGS/ LAYER)	turkey produced (LBS/ HD)
1972	0.00	0.00	183.09	146.41	0.14	0.24	1.91	0.31
1973	3.10	-28.26	72.57	38.88	-0.06	0.00	-0.81	-0.09
1974	-16.45	50.74	-83.55	-79.56	0.05	0.70	0.99	0.00
1975	-14.53	1.41	0.00	0.00	0.00	-0.10	0.00	0.10
1976	-9.64	-5.89	143.62	128.55	-0.03	0.04	-0.44	0.47
1977	5.54	0.00	-58.96	-11.26	-0.03	0.00	-0.24	0.72
1978	0.00	-7.40	44.59	-46.73	0.01	-0.83	0.40	-0.02
1979	-16.58	6.27	0.00	0.40	0.19	-0.49	0.00	-0.04
1980	11.00	0.00	-126.06	-0.08	-0.06	0.00	2.07	-1.15
1981	0.00	-10.82	105.17	313.71	-0.05	0.06	-1.26	0.28
1982	-14.39	13.64	-21.26	-210.61	0.00	0.16	0.00	0.01
1983	-15.73	10.58	-3.51	-0.02	0.01	-0.06	1.82	0.00
1984	-4.77	0.30	60.64	102.64	-0.04	-0.75	1.48	-1.31
1985	-0.10	0.79	0.00	0.00	0.05	-0.13	-1.42	-0.67
1986	3.94	-0.79	-25.59	-132.12	0.00	0.26	-5.52	0.00
1987	0.00	-3.51	66.39	159.07	0.00	0.00	0.29	0.14
1988	-3.77	11.98	44.70	65.60	0.06	-0.37	0.00	-0.01

Table C.10: Deviations From Nonlinear Filter For Livestock Production Variables REGION: MOUNTAIN (states: WY,NV,AZ)

YEAR	beef calves sold (LBS/ BEEF COW)	beef S&H sold (LBS/ BEEF COW)	beef cull sold (LBS/ BEEF COW)	milk produced (1000LBS/ MILK COW)	dairy calves sold (LBS/ MILK COW)	dairy S&H sold (LBS/ MILK COW)	dairy cull sold (LBS/ MILK COW)
1972	4.25	13.34	0.00	0.066	10.89	0.00	0.00
1973	-4.25	-66.23	-13.74	0.000	-3.38	-113.43	-21.15
1974	10.84	-98.77	-31.50	0.300	36.63	-211.84	-69.59
1975	-10.30	0.00	25.99	-0.310	-25.31	-3.32	21.89
1976	8.78	0.00	2.06	-0.011	5.34	-3.28	-67.18
1977	1.91	139.73	64.37	0.327	1.66	211.23	14.30
1978	-2.26	140.29	54.49	0.000	-8.87	235.04	16.00
1979	2.79	-52.68	-24.94	-0.181	0.00	-257.95	-95.37
1980	-2.45	15.75	0.00	0.004	11.40	133.53	0.00
1981	-7.32	-46.07	-18.21	0.155	-2.75	-166.23	-49.22
1982	-17.33	0.00	0.26	-0.008	-9.53	0.00	0.24
1983	3.42	127.14	33.61	0.028	6.91	153.00	46.37
1984	0.51	-46.50	0.00	-0.374	-0.52	-277.25	-71.91
1985	0.00	-11.31	-3.22	0.044	6.16	-156.05	-56.51
1986	-12.96	0.00	9.63	0.000	-7.98	0.00	15.36
1987	0.53	30.77	0.00	-0.067	0.10	21.22	0.00
1988	0.00	-4.35	-9.78	0.593	0.00	-7.18	-18.96

YEAR	cull sow spring sales (LBS/ SOW)	cull sow fall sales (LBS/ SOW)	market hogs spring sales (LBS/ SOW)	market hogs fall sales (LBS/ SOW)	broiler produced (LBS/ HD)	chiken sold (LBS/ LAYER)	eggs produced (EGGS/ LAYER)	turkey produced (LBS/ HD)
1972	-0.11	0.00	-1.28	12.64	np	-1.02	4.50	np
1973	7.21	-27.75	89.39	184.83	np	0.08	-0.75	np
1974	-18.57	48.96	0.00	-32.82	np	0.02	-0.49	np
1975	-16.11	2.15	-2.69	-14.03	np	-0.02	17.34	np
1976	-15.14	-8.92	32.19	21.90	np	-0.10	0.00	np
1977	3.32	0.00	-6.20	0.00	np	0.23	-5.63	np
1978	0.00	-11.03	0.00	-17.51	np	-0.43	0.09	np
1979	-17.48	5.77	25.81	64.39	np	0.02	3.57	np
1980	3.98	0.00	-57.89	-98.67	np	0.00	0.58	np
1981	0.00	-4.74	-89.58	0.00	np	-0.54	-7.15	np
1982	-18.76	10.96	73.74	63.01	np	-0.46	-3.75	np
1983	-10.10	22.08	118.67	165.94	np	0.00	0.00	np
1984	-1.35	6.05	-70.31	0.00	np	0.42	9.34	np
1985	1.12	1.09	-120.08	-52.03	np	-0.66	-21.50	np
1986	0.00	-1.09	5.76	-5.62	np	-0.87	0.40	np
1987	17.10	-1.47	0.00	60.34	np	1.43	-8.01	np
1988	-31.67	12.82	-6.13	5.62	np	0.51	3.39	np

np: not produced

APPENDIX D

PEARSON CORRELATION ESTIMATES

FOR REGIONAL LIVESTOCK PRODUCTION VARIABLES

The following abbreviations are used in Table D.1.

Livestock Production Variables:

bcv: beef calf sales
bsh: beef steer & heifer sales
bcc: beef cull cow sales
mlk: milk production
dcv: dairy calf sales
dsh: dairy steer & heifer sales
dcc: dairy cull cow sales
scs: spring cull sow sales
fcs: fall cull sow sales
smh: spring market hog sales
fmh: fall market hog sales
brl: broiler produced
chk: chiken sold
egg: eggs produced
trk: turkeys produced

Producing Regions

1: Corn Belt Region
2: Appalachian Region
3: Delta States Region
4: Lake States Region
5: Pacific Region
6: Southern Plains Region
7: Northern Plains Region
8: Southeast Region
9: Northeast Region
10: Mountain Region

Table D.1: Correlation Estimates For Livestock Production Variables

	bcv1	bsh1	bcc1	mlk1	dcv1	dsh1	dcc1
bcv1	1.000						
bsh1	-0.034	1.000					
bcc1	-0.246	0.357	1.000				
mlk1	-0.020	0.041	-0.453	1.000			
dcv1	0.735	-0.013	-0.160	-0.202	1.000		
dsh1	-0.175	0.807	0.488	-0.341	-0.126	1.000	
dcc1	-0.200	0.193	0.875	-0.210	-0.251	0.270	1.000
scs1	-0.208	0.166	-0.021	0.033	-0.065	0.234	-0.236
fcs1	0.365	-0.056	-0.029	0.136	0.111	-0.124	-0.017
smh1	0.068	0.095	0.546	-0.074	-0.061	0.047	0.673
fmh1	-0.191	0.032	0.236	0.412	-0.336	-0.007	0.521
chk1	-0.451	-0.209	-0.386	0.277	-0.368	-0.168	-0.343
egg1	-0.248	0.057	-0.156	0.634	-0.358	-0.117	0.029
trk1	-0.237	0.322	-0.224	0.185	0.085	0.034	-0.373
bcv2	-0.030	0.010	-0.564	0.347	0.069	-0.140	-0.474
bsh2	-0.479	0.337	0.450	-0.167	-0.125	0.231	0.260
bcc2	-0.403	0.265	0.773	-0.399	-0.253	0.310	0.634
mlk2	-0.004	0.139	-0.201	0.471	-0.163	0.137	-0.009
dcv2	0.107	-0.224	-0.534	0.134	0.222	-0.174	-0.484
dsh2	-0.365	0.324	0.352	-0.516	-0.063	0.406	0.069
dcc2	-0.313	0.205	0.809	-0.367	-0.254	0.249	0.752
scs2	0.194	0.043	0.167	-0.070	0.031	0.170	0.151
fcs2	0.392	-0.048	-0.018	0.129	0.126	-0.117	0.009
smh2	0.180	0.201	0.141	-0.318	0.265	0.253	-0.036
fmh2	-0.082	0.192	-0.271	0.172	-0.028	0.144	-0.238
br12	0.342	-0.132	-0.268	-0.416	0.408	-0.053	-0.432
chk2	0.195	-0.231	-0.199	0.351	-0.157	-0.050	-0.039
egg2	-0.071	0.122	0.059	0.361	-0.169	-0.188	-0.067
trk2	0.335	-0.375	-0.425	0.320	0.459	-0.648	-0.330
bcv3	-0.241	0.095	-0.507	0.152	0.006	-0.050	-0.619
bsh3	-0.202	0.070	-0.001	0.189	-0.052	-0.139	0.098
bcc3	-0.126	0.162	0.532	-0.145	-0.246	0.119	0.624
mlk3	0.092	0.127	-0.025	0.155	0.081	-0.147	0.040
dcv3	-0.161	0.076	-0.388	-0.140	0.050	0.144	-0.555
dsh3	-0.514	0.275	0.311	-0.164	-0.228	0.569	0.175
dcc3	-0.180	0.206	0.676	-0.331	-0.188	0.365	0.727
scs3	-0.155	0.135	0.161	-0.047	-0.201	0.185	0.064
fcs3	0.418	-0.038	-0.014	0.126	0.131	-0.088	0.023
smh3	0.435	-0.060	-0.052	-0.112	0.641	-0.131	-0.256
fmh3	0.348	0.057	-0.188	0.285	0.249	-0.183	-0.092
br13	0.505	0.122	-0.476	0.149	0.653	-0.094	-0.532
chk3	-0.080	-0.357	-0.346	0.089	-0.102	-0.319	-0.329
egg3	-0.318	-0.075	0.055	0.243	-0.448	0.031	0.159
trk3	0.022	0.072	-0.021	0.313	-0.056	-0.148	0.225

Table D.1. (continued)

	bcv1	bsh1	bcc1	mlk1	dcv1	dsh1	dcc1
bcv4	-0.159	0.000	-0.503	0.800	-0.096	-0.302	-0.371
bsh4	-0.258	0.226	0.197	0.401	-0.161	-0.039	0.358
bcc4	-0.376	0.240	0.513	0.027	-0.318	0.241	0.523
mlk4	-0.091	0.115	-0.530	0.710	-0.153	-0.135	-0.410
dcv4	-0.098	0.236	-0.087	-0.270	0.055	0.377	-0.454
dsh4	-0.441	0.341	0.131	-0.004	-0.240	0.337	0.118
dcc4	-0.112	0.117	0.595	-0.138	-0.265	0.155	0.856
scs4	-0.194	0.200	-0.016	0.096	-0.077	0.242	-0.211
fcs4	0.374	-0.054	-0.026	0.135	0.114	-0.118	-0.010
smh4	0.551	0.135	-0.053	0.374	0.335	-0.249	0.083
fmh4	0.139	0.033	-0.330	0.807	-0.077	-0.304	-0.105
chk4	0.265	0.064	0.035	-0.029	0.010	-0.050	0.051
egg4	-0.516	0.045	0.059	0.093	-0.569	0.069	0.038
trk4	-0.059	-0.143	-0.137	-0.130	0.266	-0.263	-0.335
bcv5	-0.037	0.117	-0.193	0.387	-0.117	0.035	0.140
bsh5	-0.062	0.188	0.174	-0.101	0.052	0.075	0.175
bcc5	-0.065	0.086	0.704	-0.278	-0.074	0.111	0.814
mlk5	0.159	0.153	-0.113	0.439	0.159	0.065	0.058
dcv5	-0.111	0.083	-0.125	0.209	-0.227	0.041	0.169
dsh5	-0.124	0.233	0.246	-0.261	-0.066	0.235	0.159
dcc5	-0.095	0.026	0.618	-0.261	-0.112	-0.020	0.678
scs5	0.104	0.172	0.009	0.140	0.053	0.171	-0.113
fcs5	0.444	-0.043	-0.088	0.190	0.154	-0.144	-0.027
smh5	0.171	0.033	0.143	-0.506	0.213	0.138	-0.090
fmh5	-0.113	-0.083	0.143	-0.292	-0.106	0.178	-0.001
br15	0.002	0.401	0.462	0.008	-0.069	0.129	0.307
chk5	0.377	-0.401	-0.069	-0.264	0.185	-0.277	-0.168
egg5	-0.295	-0.074	0.059	0.330	-0.413	-0.190	0.104
trk5	-0.419	0.016	0.312	-0.286	-0.108	0.040	0.112
bcv6	-0.079	0.265	-0.453	0.400	-0.051	0.120	-0.471
bsh6	0.113	0.265	0.379	-0.456	0.413	0.216	0.266
bcc6	-0.090	0.201	0.813	-0.510	0.088	0.266	0.695
mlk6	-0.010	0.343	-0.165	0.523	-0.126	0.109	-0.195
dcv6	-0.073	0.384	-0.328	0.229	-0.026	0.327	-0.522
dsh6	0.188	0.340	0.374	-0.581	0.309	0.495	0.163
dcc6	-0.018	0.040	0.776	-0.423	0.025	0.078	0.806
scs6	-0.061	0.132	0.022	-0.005	-0.004	0.207	-0.190
fcs6	0.391	-0.025	-0.015	0.110	0.128	-0.107	-0.008
smh6	0.213	0.095	0.293	-0.462	0.347	-0.002	0.006
fmh6	0.184	0.032	0.189	-0.187	0.191	-0.168	0.053
br16	0.413	0.090	-0.614	0.096	0.413	0.002	-0.676
chk6	0.183	0.250	0.003	0.243	0.218	0.118	-0.002
egg6	-0.562	-0.153	0.201	-0.258	-0.418	0.054	0.080

Table D.1. (continued)

	bcv1	bsh1	bcc1	mlk1	dcv1	dsh1	dcc1
bcv7	-0.450	0.092	0.228	-0.030	-0.084	0.156	0.309
bsh7	-0.293	0.340	0.201	0.385	-0.200	0.034	0.355
bcc7	-0.390	0.139	0.792	-0.170	-0.325	0.160	0.845
mlk7	0.092	-0.132	-0.484	0.560	-0.065	-0.125	-0.271
dcv7	-0.189	0.000	0.149	-0.144	0.213	0.148	0.045
dsh7	-0.147	0.124	-0.112	0.057	-0.180	0.170	-0.141
dcc7	-0.127	0.006	0.668	-0.063	-0.260	0.002	0.873
scs7	-0.209	0.160	-0.020	0.034	-0.065	0.229	-0.237
fcs7	0.367	-0.053	-0.026	0.135	0.111	-0.122	-0.014
smh7	0.347	-0.112	0.155	-0.188	0.209	-0.077	-0.016
fmh7	0.505	0.000	0.003	0.137	0.132	0.028	0.081
chk7	0.044	-0.102	-0.024	0.090	-0.197	0.026	0.023
egg7	-0.109	0.142	-0.098	0.355	-0.221	0.066	0.057
trk7	0.175	0.025	0.140	0.308	0.027	0.008	0.189
bcv8	0.033	-0.181	-0.507	0.083	0.271	-0.234	-0.734
bsh8	-0.275	0.340	0.086	0.217	0.103	0.046	0.092
bcc8	-0.450	0.484	0.350	-0.041	-0.100	0.298	0.278
mlk8	-0.050	0.067	-0.257	0.639	-0.177	-0.009	0.009
dcv8	0.110	-0.195	-0.428	-0.313	0.057	-0.050	-0.625
dsh8	-0.409	0.361	0.301	-0.275	0.007	0.386	0.138
dcc8	-0.407	0.059	0.653	-0.357	-0.114	0.097	0.521
scs8	0.202	0.061	0.177	-0.071	0.028	0.198	0.162
fcs8	0.385	-0.026	-0.030	0.130	0.113	-0.099	-0.013
smh8	0.576	-0.018	0.209	0.025	0.297	-0.173	0.235
fmh8	0.559	0.005	-0.242	0.155	0.217	-0.119	-0.243
br18	0.557	0.087	-0.348	0.011	0.475	-0.164	-0.320
chk8	0.416	-0.468	-0.181	-0.012	0.290	-0.499	-0.187
egg8	-0.067	0.495	0.001	0.266	-0.250	0.451	0.096
trk8	0.053	-0.329	-0.319	-0.077	0.248	-0.221	-0.547
bcv9	0.300	-0.261	-0.495	-0.016	0.262	-0.315	-0.597
bsh9	-0.453	0.236	0.127	0.088	-0.290	0.075	0.061
bcc9	-0.161	-0.428	0.117	0.031	-0.090	-0.505	0.076
mlk9	-0.111	0.156	-0.204	0.525	-0.145	-0.035	-0.144
dcv9	0.462	-0.113	-0.633	0.053	0.395	-0.140	-0.720
dsh9	-0.234	0.194	0.128	0.372	-0.342	0.047	0.188
dcc9	-0.239	-0.090	0.698	-0.221	-0.453	-0.043	0.814
scs9	-0.152	0.219	0.056	0.055	-0.140	0.307	-0.075
fcs9	0.415	-0.023	-0.028	0.131	0.139	-0.106	0.009
smh9	-0.060	0.006	-0.046	0.074	0.193	-0.182	-0.061
fmh9	0.102	-0.177	-0.220	0.193	0.145	-0.274	-0.172
br19	0.121	-0.026	-0.313	0.144	0.271	-0.111	-0.345
chk9	0.375	0.176	0.006	0.210	0.022	0.273	0.121
egg9	0.066	-0.282	-0.369	0.232	-0.212	-0.466	-0.298
trk9	0.138	-0.029	-0.119	0.121	0.223	-0.071	0.102

Table D.1. (continued)

	bcv1	bsh1	bcc1	mlk1	dcv1	dsh1	dcc1
bcv10	0.308	-0.110	-0.535	0.428	0.089	-0.277	-0.376
bsh10	-0.539	0.203	0.069	0.231	-0.364	0.088	0.119
bcc10	-0.475	0.242	0.296	0.032	-0.362	0.175	0.339
mlk10	0.206	-0.305	-0.360	0.465	0.045	-0.379	-0.238
dcv10	0.463	0.071	-0.506	0.433	0.066	-0.045	-0.472
dsh10	-0.490	0.120	0.155	0.156	-0.467	0.133	0.251
dcc10	-0.507	0.072	0.374	-0.021	-0.395	0.211	0.338
scs10	0.015	0.471	0.003	-0.001	0.126	0.471	-0.156
fcs10	0.335	-0.073	-0.049	0.160	0.093	-0.139	-0.036
smh10	-0.222	-0.289	-0.186	-0.184	-0.094	-0.102	-0.109
fmh10	-0.163	-0.360	-0.382	-0.073	0.120	-0.254	-0.374
chk10	0.259	-0.542	-0.206	-0.090	0.391	-0.477	-0.090
egg10	-0.178	-0.348	0.402	-0.662	-0.206	-0.033	0.345

	scs1	fcs1	smh1	fmh1	chk1	egg1	trk1
scs1	1.000						
fcs1	-0.601	1.000					
smh1	-0.586	0.437	1.000				
fmh1	-0.250	0.144	0.478	1.000			
chk1	-0.196	0.326	-0.144	0.124	1.000		
egg1	-0.189	0.091	0.114	0.541	0.226	1.000	
trk1	0.313	-0.387	-0.413	-0.316	0.056	0.257	1.000
bcv2	0.290	-0.213	-0.504	0.027	0.286	0.035	0.381
bsh2	0.502	-0.503	0.006	-0.131	-0.175	-0.092	0.388
bcc2	0.198	-0.401	0.200	0.021	-0.281	-0.239	-0.046
mlk2	-0.043	0.106	0.124	0.377	0.064	0.601	0.076
dcv2	0.109	0.058	-0.320	-0.010	0.416	-0.082	0.097
dsh2	0.462	-0.443	-0.061	-0.385	-0.016	-0.403	0.320
dcc2	0.026	-0.262	0.414	0.161	-0.273	-0.197	-0.225
scs2	0.685	-0.491	-0.305	-0.041	-0.492	-0.228	-0.042
fcs2	-0.618	0.997	0.468	0.168	0.288	0.085	-0.397
smh2	-0.264	0.144	-0.029	-0.217	-0.345	-0.114	0.131
fmh2	-0.141	-0.040	-0.369	0.083	0.043	0.275	0.354
br12	-0.201	0.354	-0.316	-0.395	0.234	-0.268	0.135
chk2	0.180	0.225	0.011	0.439	0.057	0.276	-0.383
egg2	-0.036	0.440	0.057	0.032	0.259	0.163	0.305
trk2	-0.271	0.289	-0.029	-0.174	0.205	-0.156	0.036
bcv3	0.187	-0.167	-0.534	-0.370	0.349	0.111	0.725
bsh3	0.308	-0.368	0.085	-0.071	0.050	-0.161	0.331
bcc3	-0.066	-0.147	0.480	0.113	-0.159	-0.229	-0.242
mlk3	-0.375	0.008	0.177	0.213	-0.320	0.466	0.253
dcv3	0.163	-0.080	-0.483	-0.296	0.333	-0.007	0.508
dsh3	0.272	-0.107	-0.060	0.064	0.326	-0.090	0.101
dcc3	-0.018	-0.222	0.520	0.192	-0.221	-0.293	-0.313

Table D.1. (continued)

	scs1	fcs1	smh1	fmh1	chk1	egg1	trk1
scs3	0.833	-0.590	-0.395	-0.199	-0.336	-0.267	0.082
fcs3	-0.612	0.991	0.458	0.170	0.265	0.072	-0.423
smh3	0.223	-0.003	-0.008	-0.458	-0.380	-0.202	0.010
fmh3	0.134	-0.373	-0.052	-0.020	-0.453	0.094	0.094
brl3	-0.195	0.229	-0.330	-0.210	-0.056	0.007	0.321
chk3	-0.348	0.500	-0.237	-0.144	0.765	0.143	-0.006
egg3	-0.089	-0.037	0.318	0.448	0.134	0.630	-0.030
trk3	-0.105	-0.097	-0.157	0.455	-0.051	0.322	0.142
bcv4	0.323	-0.153	-0.323	0.042	0.242	0.452	0.517
bsh4	0.182	-0.262	0.061	0.176	-0.074	0.216	0.186
bcc4	0.376	-0.346	0.132	-0.029	-0.153	-0.210	-0.005
mlk4	0.044	0.206	-0.157	0.324	0.502	0.655	0.371
dcv4	0.455	-0.055	-0.586	-0.670	0.105	-0.361	0.378
dsh4	0.503	-0.687	-0.286	0.059	-0.128	0.166	0.362
dcc4	-0.248	-0.212	0.510	0.497	-0.271	-0.005	-0.345
scs4	0.994	-0.596	-0.569	-0.223	-0.214	-0.177	0.295
fcs4	-0.604	1.000	0.444	0.150	0.316	0.089	-0.393
smh4	-0.349	0.429	0.497	0.155	-0.325	-0.018	-0.234
fmh4	0.147	-0.016	-0.292	0.304	-0.031	0.401	0.033
chk4	-0.682	0.703	0.253	-0.067	0.166	0.106	0.000
egg4	-0.180	0.148	-0.016	-0.034	0.439	0.317	0.237
trk4	0.104	0.045	-0.275	-0.560	0.170	-0.138	0.648
bcv5	-0.040	-0.103	-0.036	0.400	0.294	0.064	-0.133
bsh5	-0.264	-0.107	0.265	-0.058	-0.269	0.077	0.248
bcc5	-0.335	-0.068	0.473	0.319	-0.302	-0.132	-0.219
mlk5	0.206	-0.033	-0.034	0.406	-0.056	0.292	-0.090
dcv5	0.052	-0.251	-0.121	0.317	0.225	-0.048	-0.010
dsh5	0.031	-0.132	-0.051	-0.083	-0.140	-0.281	0.175
dcc5	-0.395	0.030	0.430	0.168	-0.208	-0.101	-0.143
scs5	0.896	-0.437	-0.459	-0.137	-0.353	-0.221	0.162
fcs5	-0.631	0.983	0.410	0.172	0.262	0.143	-0.350
smh5	-0.094	0.220	-0.048	-0.236	0.076	-0.592	-0.213
fmh5	0.056	0.161	0.026	-0.039	0.224	-0.374	-0.343
brl5	0.263	-0.065	0.191	-0.074	-0.370	0.088	0.452
chk5	-0.099	0.479	0.087	-0.430	-0.150	-0.388	-0.279
egg5	-0.123	0.193	0.115	0.325	0.084	0.554	0.321
trk5	0.319	-0.181	0.119	0.045	0.192	-0.305	0.095
bcv6	0.309	-0.118	-0.540	-0.043	0.208	0.235	0.551
bsh6	0.030	-0.264	0.304	-0.205	-0.441	-0.496	0.183
bcc6	-0.017	-0.135	0.468	-0.007	-0.360	-0.510	-0.222
mlk6	0.132	0.437	-0.122	0.217	0.264	0.436	0.213
dcv6	0.422	-0.043	-0.524	-0.219	0.159	0.149	0.519
dsh6	0.158	-0.166	0.131	-0.306	-0.458	-0.420	0.120
dcc6	-0.303	-0.020	0.639	0.200	-0.324	-0.331	-0.386

Table D.1. (continued)

	scs1	fcs1	smh1	fmh1	chk1	egg1	trk1
scs6	0.972	-0.543	-0.582	-0.300	-0.304	-0.225	0.243
fcs6	-0.617	0.998	0.446	0.117	0.291	0.070	-0.378
smh6	0.011	0.044	0.064	-0.508	-0.386	-0.589	0.030
fmh6	-0.128	0.133	0.099	-0.107	-0.257	-0.345	-0.043
br16	-0.168	0.359	-0.296	-0.417	0.288	-0.270	0.177
chk6	-0.211	0.550	0.531	0.197	0.266	-0.003	-0.203
egg6	0.238	-0.383	-0.096	0.196	0.202	0.117	0.198
bcv7	0.178	-0.616	-0.023	0.278	-0.193	0.128	0.342
bsh7	0.058	-0.237	0.232	0.457	-0.037	0.285	0.343
bcc7	-0.095	-0.161	0.554	0.470	-0.213	-0.041	-0.262
mlk7	0.240	-0.144	-0.352	0.378	0.074	0.445	-0.037
dcv7	0.369	-0.359	-0.167	-0.037	-0.173	-0.156	0.294
dsh7	0.274	-0.114	-0.264	0.124	0.241	0.213	0.372
dcc7	-0.312	-0.046	0.665	0.614	-0.298	0.089	-0.427
scs7	1.000	-0.594	-0.585	-0.252	-0.197	-0.187	0.313
fcs7	-0.603	1.000	0.440	0.144	0.322	0.090	-0.386
smh7	-0.374	0.832	0.399	-0.031	0.033	-0.030	-0.290
fmh7	-0.439	0.828	0.361	0.421	0.142	0.098	-0.573
chk7	0.168	0.133	-0.124	0.341	-0.022	-0.065	-0.527
egg7	-0.084	-0.139	0.013	0.094	-0.070	0.673	0.407
trk7	0.394	-0.040	-0.043	0.507	-0.202	0.205	-0.265
bcv8	0.317	0.153	-0.544	-0.589	0.300	-0.276	0.379
bsh8	0.114	-0.374	-0.051	-0.037	0.135	0.125	0.679
bcc8	0.297	-0.545	-0.001	0.059	0.019	-0.035	0.440
mlk8	-0.130	0.126	0.178	0.574	0.174	0.756	0.028
dcv8	0.114	0.161	-0.395	-0.640	0.165	-0.438	0.129
dsh8	0.410	-0.438	-0.095	-0.219	0.102	-0.325	0.502
dcc8	0.238	-0.380	0.167	0.020	-0.113	-0.383	-0.050
scs8	0.671	-0.466	-0.293	-0.021	-0.491	-0.219	-0.056
fcs8	-0.615	0.998	0.454	0.149	0.302	0.096	-0.376
smh8	-0.247	0.388	0.502	0.228	-0.325	0.145	-0.306
fmh8	-0.049	0.280	0.043	0.279	-0.178	0.201	-0.125
br18	-0.494	0.303	0.140	-0.188	-0.109	-0.068	0.197
chk8	-0.237	0.555	0.006	-0.103	0.049	-0.346	-0.254
egg8	-0.329	0.216	0.104	0.414	0.132	0.366	0.046
trk8	0.077	0.169	-0.220	-0.282	0.175	-0.030	0.184
bcv9	0.169	-0.047	-0.717	-0.638	0.041	-0.110	0.399
bsh9	0.089	-0.139	-0.125	-0.203	0.108	0.315	0.568
bcc9	0.177	0.092	0.034	-0.137	0.095	-0.260	0.080
mlk9	0.027	0.085	0.012	0.408	0.239	0.753	0.405
dcv9	0.168	0.093	-0.678	-0.514	0.091	-0.209	0.204
dsh9	0.221	-0.138	0.042	0.129	-0.170	0.627	0.460
dcc9	-0.307	0.049	0.541	0.310	-0.157	-0.012	-0.361

Table D.1. (continued)

	scs1	fcs1	smh1	fmh1	chk1	egg1	trk1
scs9	0.947	-0.578	-0.455	-0.146	-0.330	-0.146	0.202
fcs9	-0.628	0.980	0.459	0.093	0.236	0.093	-0.335
smh9	0.116	-0.452	-0.229	0.139	-0.180	0.227	0.540
fmh9	0.314	-0.318	-0.223	0.392	-0.119	0.159	0.093
br19	-0.363	0.323	0.210	-0.087	0.235	0.198	0.301
chk9	-0.201	0.376	0.162	0.302	-0.116	0.301	-0.392
egg9	-0.201	0.279	-0.015	-0.046	0.304	0.290	0.026
trk9	-0.234	-0.063	0.179	0.317	0.060	0.317	0.202
bcv10	-0.151	0.308	-0.268	0.179	0.355	0.234	0.128
bsh10	0.216	-0.188	0.004	0.136	0.421	0.347	0.433
bcc10	0.194	-0.243	0.130	0.099	0.277	0.104	0.282
mlk10	0.138	0.272	-0.113	0.110	0.111	0.245	0.095
dcv10	-0.088	0.582	-0.267	0.018	0.225	0.209	-0.055
dsh10	0.232	-0.223	0.026	0.159	0.193	0.427	0.286
dcc10	0.222	-0.160	0.130	0.102	0.165	0.385	0.112
scs10	0.735	-0.539	-0.472	-0.180	-0.241	-0.084	0.210
fcs10	-0.592	0.998	0.416	0.155	0.369	0.129	-0.370
smh10	-0.384	0.014	-0.184	-0.192	0.424	0.229	0.115
fmh10	-0.121	-0.214	-0.462	-0.249	0.415	0.114	0.186
chk10	-0.028	0.080	-0.161	-0.063	0.077	-0.220	-0.312
egg10	-0.327	0.086	0.333	-0.004	0.058	-0.196	-0.252

	bcv2	bsh2	bcc2	mlk2	dcv2	dsh2	dcc2
bcv2	1.000						
bsh2	-0.108	1.000					
bcc2	-0.452	0.711	1.000				
mlk2	0.373	-0.323	-0.516	1.000			
dcv2	0.829	-0.363	-0.578	0.405	1.000		
dsh2	0.013	0.763	0.591	-0.330	-0.017	1.000	
dcc2	-0.550	0.610	0.962	-0.464	-0.605	0.494	1.000
scs2	0.010	0.155	0.242	-0.026	-0.070	0.174	0.199
fcs2	-0.217	-0.518	-0.410	0.121	0.049	-0.461	-0.264
smh2	-0.169	-0.313	-0.122	-0.047	-0.165	-0.284	-0.209
fmh2	0.415	-0.372	-0.392	0.316	0.196	-0.440	-0.515
br12	0.282	-0.313	-0.332	-0.170	0.453	0.057	-0.391
chk2	-0.014	-0.417	-0.449	0.417	0.108	-0.476	-0.353
egg2	-0.113	0.050	0.027	-0.213	-0.216	-0.119	-0.008
trk2	0.050	-0.263	-0.367	-0.323	0.122	-0.367	-0.318
bcv3	0.363	0.101	-0.372	-0.092	0.142	0.093	-0.523
bsh3	0.339	0.487	0.157	0.051	0.201	0.488	0.167
bcc3	-0.150	0.289	0.572	-0.062	-0.121	0.415	0.676
mlk3	0.038	-0.095	-0.118	0.170	-0.163	-0.340	-0.122
dcv3	0.205	0.005	-0.346	-0.171	0.116	0.126	-0.475
dsh3	0.151	0.094	0.078	0.258	0.299	0.318	0.015
dcc3	-0.279	0.231	0.573	-0.017	-0.147	0.413	0.675

Table D.1. (continued)

	bcv2	bsh2	bcc2	mlk2	dcv2	dsh2	dcc2
scs3	0.266	0.501	0.392	-0.019	0.058	0.492	0.280
fcs3	-0.219	-0.548	-0.416	0.150	0.051	-0.482	-0.268
smh3	-0.326	0.246	0.032	-0.238	-0.171	0.157	0.024
fmh3	-0.198	0.114	0.141	-0.135	-0.374	-0.118	0.154
brl3	0.302	-0.375	-0.531	0.020	0.237	-0.420	-0.612
chk3	0.065	-0.309	-0.272	-0.114	0.235	-0.171	-0.263
egg3	-0.438	0.013	0.024	0.288	-0.380	-0.147	0.109
trk3	0.456	-0.040	0.009	0.187	0.131	-0.303	-0.011
bcv4	0.530	0.025	-0.445	0.479	0.320	-0.212	-0.501
bsh4	0.267	0.501	0.326	0.274	-0.010	0.171	0.315
bcc4	-0.073	0.495	0.546	0.018	-0.177	0.417	0.536
mlk4	0.636	-0.130	-0.547	0.661	0.530	-0.203	-0.556
dcv4	0.148	0.015	-0.108	-0.153	0.173	0.296	-0.299
dsh4	0.461	0.559	0.338	0.282	0.186	0.510	0.221
dcc4	-0.194	0.138	0.542	0.045	-0.256	0.091	0.672
scs4	0.265	0.487	0.203	-0.039	0.063	0.415	0.038
fcs4	-0.216	-0.512	-0.405	0.115	0.055	-0.450	-0.264
smh4	-0.022	-0.166	-0.195	0.133	-0.067	-0.368	-0.072
fmh4	0.391	-0.143	-0.196	0.297	0.087	-0.533	-0.215
chk4	-0.208	-0.507	-0.276	0.007	-0.118	-0.392	-0.212
egg4	-0.059	-0.090	-0.067	0.101	-0.084	-0.030	-0.091
trk4	0.074	0.232	-0.107	-0.265	0.059	0.244	-0.226
bcv5	0.534	-0.107	-0.133	0.339	0.414	-0.089	-0.061
bsh5	0.094	-0.060	-0.044	0.238	0.072	0.010	-0.046
bcc5	-0.274	0.013	0.526	-0.135	-0.241	0.018	0.606
mlk5	0.410	0.046	-0.145	0.569	0.339	-0.153	-0.118
dcv5	0.585	-0.044	-0.019	0.234	0.406	0.063	0.012
dsh5	0.181	-0.051	0.059	-0.152	0.084	0.115	-0.003
dcc5	-0.245	0.020	0.488	-0.193	-0.213	0.044	0.551
scs5	0.213	0.292	0.117	-0.017	0.047	0.230	0.009
fcs5	-0.153	-0.573	-0.488	0.181	0.073	-0.541	-0.346
smh5	-0.278	0.007	0.286	-0.739	-0.171	0.213	0.252
fmh5	-0.275	0.040	0.256	-0.316	-0.105	0.173	0.243
brl5	-0.158	0.496	0.405	-0.070	-0.347	0.380	0.368
chk5	-0.093	-0.329	-0.344	0.001	0.147	-0.160	-0.317
egg5	0.027	-0.084	-0.147	0.344	-0.123	-0.344	-0.181
trk5	0.039	0.671	0.533	-0.424	0.040	0.706	0.484
bcv6	0.769	-0.113	-0.407	0.512	0.543	-0.077	-0.562
bsh6	0.091	0.355	0.332	-0.077	0.116	0.518	0.310
bcc6	-0.371	0.428	0.779	-0.382	-0.275	0.495	0.810
mlk6	0.327	0.022	-0.358	0.369	0.137	-0.213	-0.393
dcv6	0.558	-0.025	-0.315	0.438	0.430	0.089	-0.493
dsh6	0.047	0.144	0.202	0.155	0.178	0.485	0.150
dcc6	-0.505	0.262	0.733	-0.376	-0.389	0.264	0.844

Table D.1. (continued)

	bcv2	bsh2	bcc2	mlk2	dcv2	dsh2	dcc2
scs6	0.197	0.423	0.211	-0.074	0.044	0.395	0.053
fcs6	-0.220	-0.497	-0.387	0.091	0.039	-0.428	-0.249
smh6	-0.218	0.284	0.424	-0.549	-0.213	0.340	0.343
fmh6	-0.156	0.186	0.369	-0.556	-0.287	0.050	0.322
brl6	0.335	-0.525	-0.692	0.025	0.423	-0.236	-0.727
chk6	0.042	-0.044	-0.231	0.299	0.277	0.042	-0.103
egg6	-0.095	0.308	0.422	-0.229	-0.096	0.378	0.346
bcv7	0.297	0.207	0.141	0.272	0.147	0.096	0.068
bsh7	0.418	0.383	0.247	0.363	0.125	0.154	0.235
bcc7	-0.310	0.443	0.788	-0.132	-0.365	0.258	0.844
mlk7	0.598	-0.438	-0.550	0.668	0.560	-0.475	-0.552
dcv7	0.328	0.049	-0.087	0.229	0.395	0.118	-0.188
dsh7	0.543	0.014	-0.098	0.438	0.513	0.240	-0.176
dcc7	-0.361	0.162	0.601	-0.011	-0.379	-0.033	0.737
scs7	0.287	0.502	0.195	-0.043	0.105	0.457	0.022
fcs7	-0.216	-0.504	-0.401	0.107	0.054	-0.444	-0.261
smh7	-0.408	-0.268	-0.224	-0.089	-0.123	-0.231	-0.145
fmh7	-0.097	-0.634	-0.382	0.222	0.162	-0.533	-0.230
chk7	0.243	-0.157	-0.024	0.111	0.192	-0.240	-0.029
egg7	0.053	-0.090	-0.199	0.720	-0.047	-0.199	-0.202
trk7	0.182	0.018	0.107	0.247	0.178	-0.142	0.129
bcv8	0.390	-0.020	-0.437	-0.102	0.404	0.041	-0.592
bsh8	0.257	0.437	0.263	0.011	0.091	0.384	0.199
bcc8	0.204	0.747	0.638	-0.178	-0.031	0.706	0.563
mlk8	0.318	-0.330	-0.538	0.899	0.329	-0.463	-0.447
dcv8	0.139	-0.187	-0.395	-0.211	0.183	0.093	-0.496
dsh8	0.228	0.579	0.367	-0.124	0.165	0.760	0.268
dcc8	-0.224	0.662	0.890	-0.539	-0.246	0.619	0.855
scs8	0.003	0.131	0.225	-0.008	-0.074	0.153	0.186
fcs8	-0.210	-0.520	-0.419	0.125	0.053	-0.447	-0.277
smh8	-0.414	-0.122	0.041	-0.078	-0.231	-0.144	0.208
fmh8	0.021	-0.363	-0.313	0.022	0.053	-0.324	-0.253
brl8	0.132	-0.379	-0.369	0.062	0.155	-0.226	-0.344
chk8	-0.004	-0.493	-0.393	-0.296	0.145	-0.474	-0.360
egg8	0.050	-0.438	-0.275	0.353	-0.068	-0.442	-0.258
trk8	-0.191	-0.196	-0.354	-0.239	0.010	-0.153	-0.420
bcv9	0.238	-0.268	-0.328	-0.179	0.208	-0.115	-0.457
bsh9	0.241	0.444	0.175	0.269	0.013	0.318	0.064
bcc9	0.138	0.198	0.124	-0.172	0.169	0.141	0.096
mlk9	0.293	0.011	-0.219	0.606	0.221	-0.122	-0.230
dcv9	0.256	-0.424	-0.568	-0.186	0.253	-0.253	-0.656
dsh9	-0.002	0.272	-0.013	0.538	-0.225	-0.018	-0.040
dcc9	-0.445	0.159	0.639	-0.178	-0.433	0.095	0.746

Table D.1. (continued)

	bcv2	bsh2	bcc2	mlk2	dcv2	dsh2	dcc2
scs9	0.245	0.452	0.175	0.116	0.031	0.374	0.041
fcs9	-0.226	-0.521	-0.442	0.172	0.018	-0.470	-0.301
smh9	0.320	0.160	0.171	-0.007	0.143	0.056	0.060
fmh9	0.351	0.076	-0.002	-0.056	0.225	-0.060	-0.039
brl9	-0.070	-0.264	-0.450	0.235	0.108	-0.195	-0.427
chk9	0.070	-0.596	-0.359	0.698	0.258	-0.468	-0.266
egg9	-0.036	0.029	-0.083	-0.093	-0.104	-0.050	-0.043
trk9	0.440	-0.258	-0.337	0.596	0.565	-0.077	-0.256
bcv10	0.286	-0.406	-0.469	0.080	0.201	-0.440	-0.455
bsh10	0.222	0.552	0.160	0.181	0.066	0.461	0.150
bcc10	0.059	0.582	0.402	-0.002	-0.054	0.591	0.421
mlk10	0.440	-0.399	-0.666	0.545	0.513	-0.417	-0.640
dcv10	0.245	-0.591	-0.644	0.301	0.236	-0.553	-0.641
dsh10	0.134	0.440	0.126	0.389	-0.008	0.330	0.129
dcc10	-0.155	0.453	0.325	0.291	-0.083	0.416	0.339
scs10	0.160	0.493	0.288	-0.051	-0.029	0.470	0.173
fcs10	-0.208	-0.498	-0.411	0.110	0.065	-0.446	-0.274
smh10	0.109	-0.255	-0.158	0.205	0.284	-0.022	-0.166
fmh10	0.255	-0.177	-0.111	-0.044	0.401	0.019	-0.177
chk10	0.035	0.048	-0.058	-0.300	0.118	-0.094	-0.015
egg10	-0.452	0.031	0.391	-0.312	-0.210	0.266	0.445

	scs2	fcs2	smh2	fmh2	brl2	chk2	egg2
scs2	1.000						
fcs2	-0.476	1.000					
smh2	-0.260	0.162	1.000				
fmh2	-0.268	-0.027	0.676	1.000			
brl2	-0.218	0.343	0.292	0.249	1.000		
chk2	0.425	0.245	-0.261	-0.075	-0.185	1.000	
egg2	-0.139	0.426	0.098	0.036	0.065	0.012	1.000
trk2	-0.278	0.281	-0.034	-0.097	0.070	-0.087	0.307
bcv3	-0.245	-0.180	0.149	0.432	0.260	-0.161	0.249
bsh3	0.210	-0.364	-0.605	-0.422	-0.326	-0.176	-0.009
bcc3	0.187	-0.146	-0.397	-0.551	-0.364	-0.305	-0.124
mlk3	-0.424	0.021	0.508	0.514	-0.003	-0.319	0.024
dcv3	-0.145	-0.083	0.222	0.395	0.437	0.040	0.141
dsh3	0.082	-0.119	0.027	0.106	-0.041	0.061	-0.071
dcc3	0.291	-0.208	-0.230	-0.474	-0.412	-0.141	-0.273
scs3	0.726	-0.603	-0.389	-0.280	-0.245	0.036	-0.178
fcs3	-0.433	0.996	0.171	-0.013	0.337	0.279	0.398
smh3	0.092	-0.016	-0.024	-0.471	-0.046	-0.098	-0.102
fmh3	0.329	-0.354	-0.116	-0.169	-0.444	0.037	-0.075
brl3	-0.294	0.240	0.582	0.631	0.490	-0.120	0.126
chk3	-0.389	0.461	-0.171	0.026	0.562	0.002	0.317
egg3	0.003	-0.026	-0.189	-0.134	-0.493	0.461	0.058
trk3	0.080	-0.082	-0.027	0.463	0.132	-0.013	0.040

Table D.1. (continued)

	scs2	fcs2	smh2	fmh2	brl2	chk2	egg2
bcv4	0.042	-0.166	-0.293	0.185	-0.309	0.194	0.231
bsh4	0.092	-0.270	-0.443	-0.127	-0.415	-0.242	-0.051
bcc4	0.395	-0.354	-0.361	-0.391	-0.558	-0.146	-0.013
mlk4	-0.239	0.194	-0.303	0.283	0.092	0.271	0.209
dcv4	0.128	-0.084	0.376	0.250	0.392	-0.142	0.217
dsh4	0.235	-0.699	-0.264	0.104	-0.182	-0.279	-0.435
dcc4	0.249	-0.182	-0.249	-0.229	-0.376	-0.075	-0.285
scs4	0.703	-0.611	-0.267	-0.139	-0.274	0.202	-0.011
fcs4	-0.481	0.999	0.148	-0.037	0.349	0.238	0.434
smh4	-0.251	0.454	0.081	-0.087	-0.216	-0.043	0.155
fmh4	0.154	-0.023	-0.184	0.269	-0.288	0.219	0.180
chk4	-0.424	0.708	0.464	0.306	0.464	-0.098	0.488
egg4	-0.316	0.121	0.109	0.225	0.012	-0.118	0.335
trk4	-0.119	0.031	0.136	0.039	0.436	-0.290	0.469
bcv5	0.114	-0.091	-0.529	0.033	-0.147	0.163	-0.301
bsh5	-0.318	-0.098	0.451	0.304	-0.073	-0.488	-0.140
bcc5	0.119	-0.048	0.166	-0.058	-0.165	-0.285	-0.017
mlk5	0.209	-0.023	-0.357	0.026	-0.159	0.330	-0.279
dcv5	0.258	-0.234	-0.469	0.083	-0.031	0.099	-0.234
dsh5	0.019	-0.126	0.409	0.330	0.133	-0.290	0.086
dcc5	-0.071	0.033	0.193	-0.058	-0.050	-0.461	0.096
scs5	0.869	-0.436	-0.258	-0.189	-0.228	0.387	0.075
fcs5	-0.461	0.989	0.188	0.063	0.369	0.266	0.408
smh5	-0.062	0.218	0.239	-0.106	0.435	-0.190	0.244
fmh5	0.037	0.160	-0.018	-0.200	0.083	0.145	0.121
brl5	0.326	-0.061	-0.035	-0.233	-0.089	-0.162	0.537
chk5	-0.053	0.481	0.253	-0.113	0.363	0.127	0.128
egg5	-0.165	0.204	0.292	0.450	-0.046	0.191	0.575
trk5	-0.015	-0.195	-0.347	-0.436	0.004	-0.259	0.167
bcv6	0.025	-0.120	0.142	0.649	0.249	0.054	0.144
bsh6	0.029	-0.237	0.199	-0.115	0.036	-0.538	-0.228
bcc6	0.160	-0.128	0.033	-0.435	-0.190	-0.458	-0.040
mlk6	-0.158	0.424	-0.068	0.276	0.150	0.300	0.447
dcv6	0.041	-0.056	0.232	0.519	0.284	0.044	0.187
dsh6	0.228	-0.145	0.333	-0.004	0.241	-0.271	-0.278
dcc6	0.067	-0.005	-0.036	-0.466	-0.237	-0.365	-0.057
scs6	0.793	-0.558	-0.229	-0.186	-0.152	0.223	-0.009
fcs6	-0.495	0.996	0.168	-0.034	0.370	0.186	0.432
smh6	-0.104	0.038	0.399	-0.129	0.232	-0.618	0.202
fmh6	-0.166	0.139	0.325	0.033	0.170	-0.410	0.372
brl6	-0.287	0.362	0.328	0.366	0.475	0.007	0.135
chk6	-0.358	0.552	-0.236	-0.333	-0.086	0.100	0.100
egg6	0.148	-0.390	-0.087	-0.042	-0.013	0.005	0.132

Table D.1. (continued)

	scs2	fcs2	smh2	fmh2	brl2	chk2	egg2
bcv7	0.097	-0.595	0.202	0.402	-0.318	-0.172	-0.308
bsh7	-0.019	-0.219	-0.202	0.147	-0.325	-0.209	0.125
bcc7	0.055	-0.150	-0.103	-0.257	-0.451	-0.257	0.015
mlk7	0.240	-0.144	-0.158	0.352	-0.120	0.520	-0.291
dcv7	0.214	-0.351	0.298	0.275	-0.031	-0.029	-0.159
dsh7	0.244	-0.113	-0.162	0.212	0.355	0.159	0.083
dcc7	0.097	-0.019	-0.129	-0.254	-0.456	-0.056	-0.068
scs7	0.682	-0.611	-0.259	-0.139	-0.199	0.183	-0.028
fcs7	-0.488	0.998	0.146	-0.039	0.353	0.227	0.441
smh7	-0.345	0.831	0.329	-0.111	0.410	0.182	0.439
fmh7	-0.133	0.841	0.103	0.024	0.299	0.507	0.215
chk7	0.118	0.132	-0.048	0.141	0.032	0.339	-0.130
egg7	0.046	-0.128	0.042	0.301	-0.205	0.122	-0.053
trk7	0.526	-0.041	-0.311	-0.160	-0.176	0.471	-0.004
bcv8	-0.171	0.127	0.163	0.201	0.421	-0.062	0.331
bsh8	0.005	-0.382	-0.203	-0.016	-0.152	-0.473	0.175
bcc8	0.075	-0.559	-0.333	-0.187	-0.234	-0.574	-0.050
mlk8	-0.124	0.137	-0.168	0.263	-0.302	0.469	-0.172
dcv8	-0.119	0.158	0.281	0.189	0.530	0.022	0.126
dsh8	0.209	-0.441	-0.190	-0.158	-0.003	-0.351	0.007
dcc8	0.192	-0.396	-0.234	-0.472	-0.256	-0.478	0.040
scs8	0.999	-0.449	-0.240	-0.247	-0.210	0.453	-0.136
fcs8	-0.487	0.998	0.165	-0.020	0.355	0.231	0.430
smh8	0.132	0.397	-0.150	-0.507	-0.002	0.201	0.154
fmh8	0.147	0.298	0.082	0.042	0.231	0.428	0.192
brl8	-0.370	0.331	0.430	0.314	0.396	-0.258	0.118
chk8	-0.105	0.563	0.301	0.089	0.392	0.208	0.454
egg8	-0.233	0.238	0.460	0.672	-0.072	0.178	0.141
trk8	-0.162	0.159	0.347	0.099	0.228	0.192	0.319
bcv9	0.195	-0.070	0.180	0.237	0.567	-0.082	0.201
bsh9	-0.227	-0.164	-0.014	0.203	0.073	-0.475	0.145
bcc9	0.086	0.080	-0.187	-0.273	0.045	-0.084	0.467
mlk9	-0.084	0.083	-0.158	0.216	-0.003	0.238	0.251
dcv9	0.154	0.082	0.195	0.272	0.514	0.178	0.106
dsh9	0.216	-0.133	-0.118	0.088	-0.305	0.206	0.223
dcc9	0.080	0.054	-0.124	-0.328	-0.253	-0.176	0.123
scs9	0.766	-0.580	-0.270	-0.125	-0.308	0.312	-0.125
fcs9	-0.463	0.986	0.199	0.006	0.337	0.226	0.414
smh9	0.088	-0.445	0.207	0.358	0.097	-0.311	0.083
fmh9	0.289	-0.307	-0.172	0.066	0.007	0.231	-0.021
brl9	-0.464	0.338	0.305	0.197	0.116	0.019	0.235
chk9	0.088	0.384	0.151	0.205	0.030	0.406	-0.228
egg9	-0.236	0.263	-0.371	-0.216	0.202	0.037	0.293
trk9	-0.003	-0.042	-0.132	0.131	0.147	0.052	-0.321

Table D.1. (continued)

	scs2	fcs2	smh2	fmh2	br12	chk2	egg2
bcv10	0.031	0.321	-0.111	0.274	0.346	0.421	0.370
bsh10	-0.015	-0.207	-0.633	-0.245	-0.147	-0.059	0.101
bcc10	0.155	-0.256	-0.651	-0.431	-0.200	-0.138	0.070
mlk10	0.166	0.276	-0.112	0.124	0.099	0.532	0.229
dcv10	-0.019	0.583	0.128	0.353	0.385	0.502	0.369
dsh10	0.143	-0.233	-0.540	-0.181	-0.201	0.109	-0.077
dcc10	0.123	-0.189	-0.472	-0.394	-0.232	0.022	-0.113
scs10	0.561	-0.553	-0.315	-0.179	-0.142	0.033	-0.294
fcs10	-0.499	0.992	0.116	-0.044	0.353	0.241	0.451
smh10	-0.353	-0.012	0.031	0.212	0.408	-0.285	-0.306
fmh10	-0.246	-0.255	-0.038	0.158	0.350	-0.359	-0.309
chk10	0.054	0.075	-0.388	-0.315	0.261	0.120	-0.247
egg10	-0.066	0.093	0.061	-0.256	0.274	-0.120	-0.016

	trk2	bcv3	bsh3	bcc3	mlk3	dcv3	dsh3
trk2	1.000						
bcv3	0.288	1.000					
bsh3	0.179	0.138	1.000				
bcc3	-0.149	-0.538	0.557	1.000			
mlk3	0.006	0.115	-0.312	-0.178	1.000		
dcv3	0.082	0.872	-0.123	-0.668	-0.040	1.000	
dsh3	-0.273	0.112	0.182	0.139	-0.435	0.183	1.000
dcc3	-0.267	-0.557	0.431	0.878	-0.298	-0.530	0.420
scs3	-0.407	-0.154	0.421	0.361	-0.331	-0.239	0.134
fcs3	0.252	-0.215	-0.379	-0.145	-0.011	-0.104	-0.106
smh3	0.302	-0.100	-0.013	-0.134	-0.042	-0.128	-0.315
fmh3	0.154	-0.141	0.057	-0.024	0.130	-0.216	-0.593
br13	0.386	0.394	-0.397	-0.695	0.381	0.387	-0.264
chk3	0.285	0.244	-0.212	-0.248	-0.265	0.270	0.023
egg3	-0.270	-0.070	-0.141	-0.136	0.019	0.046	-0.007
trk3	-0.118	-0.035	-0.019	-0.034	0.348	-0.110	-0.207
bcv4	0.341	0.474	0.483	-0.152	0.036	0.111	0.121
bsh4	-0.104	-0.190	0.576	0.475	0.002	-0.505	0.039
bcc4	-0.148	-0.251	0.650	0.737	-0.405	-0.453	0.450
mlk4	-0.028	0.298	0.132	-0.298	0.144	0.157	0.031
dcv4	-0.032	0.513	-0.094	-0.267	-0.267	0.523	0.489
dsh4	-0.583	0.034	0.360	0.271	0.112	-0.092	0.251
dcc4	-0.317	-0.603	0.274	0.754	-0.009	-0.581	0.053
scs4	-0.236	0.174	0.318	-0.047	-0.380	0.130	0.263
fcs4	0.284	-0.174	-0.368	-0.147	0.004	-0.082	-0.106
smh4	0.371	-0.327	0.082	0.158	0.356	-0.505	-0.517
fmh4	0.185	-0.068	0.009	-0.098	0.212	-0.333	-0.317
chk4	0.218	0.123	-0.342	-0.077	0.254	0.130	-0.090
egg4	0.016	0.427	0.017	0.089	0.115	0.277	0.398
trk4	0.373	0.622	0.254	-0.278	-0.108	0.517	0.080

Table D.1. (continued)

	trk2	bcv3	bsh3	bcc3	mlk3	dcv3	dsh3
bcv5	0.025	-0.096	0.446	0.310	-0.285	-0.178	0.195
bsh5	0.038	0.093	0.138	0.303	0.625	-0.140	0.150
bcc5	-0.078	-0.488	0.100	0.667	0.146	-0.501	0.184
mlk5	-0.234	-0.351	0.110	-0.047	-0.090	-0.363	-0.005
dcv5	-0.121	-0.034	0.501	0.365	-0.293	-0.080	0.202
dsh5	0.053	0.285	0.112	0.222	0.242	0.209	0.369
dcc5	0.010	-0.389	0.080	0.671	0.276	-0.493	0.086
scs5	-0.143	0.020	0.298	0.004	-0.414	0.018	0.146
fcs5	0.299	-0.131	-0.378	-0.198	0.085	-0.055	-0.161
smh5	0.072	-0.053	-0.365	-0.156	-0.268	0.236	-0.133
fmh5	-0.207	-0.273	-0.260	-0.134	-0.566	0.026	0.099
brl5	-0.178	0.009	0.352	0.352	0.123	-0.109	-0.046
chk5	0.166	-0.111	-0.123	-0.080	-0.101	-0.087	-0.121
egg5	-0.160	0.178	-0.159	-0.282	0.383	0.108	-0.013
trk5	-0.159	-0.052	0.345	0.214	-0.289	0.036	0.141
bcv6	-0.210	0.392	0.046	-0.385	0.074	0.285	0.191
bsh6	-0.112	-0.211	0.416	0.421	0.057	-0.235	0.124
bcc6	-0.146	-0.568	0.259	0.727	-0.168	-0.538	0.219
mlk6	-0.056	0.301	-0.088	-0.374	0.119	0.233	0.041
dcv6	-0.336	0.349	-0.096	-0.424	-0.016	0.318	0.275
dsh6	-0.485	-0.277	0.095	0.259	-0.067	-0.148	0.285
dcc6	-0.065	-0.674	0.159	0.748	-0.042	-0.627	0.000
scs6	-0.259	0.086	0.240	-0.032	-0.394	0.079	0.196
fcs6	0.282	-0.167	-0.367	-0.125	0.035	-0.085	-0.130
smh6	0.052	-0.200	-0.093	0.139	0.112	-0.218	-0.287
fmh6	0.083	-0.196	-0.234	-0.044	0.244	-0.170	-0.520
brl6	0.490	0.521	-0.091	-0.445	-0.101	0.514	0.057
chk6	0.197	-0.220	0.233	0.169	-0.192	-0.236	0.173
egg6	-0.420	0.042	-0.078	-0.059	-0.099	0.237	0.165
bcv7	-0.182	0.137	0.286	0.110	0.271	0.033	0.463
bsh7	-0.231	-0.126	0.506	0.353	0.214	-0.331	0.070
bcc7	-0.357	-0.631	0.165	0.637	0.035	-0.624	0.114
mlk7	-0.063	-0.012	-0.068	-0.222	0.143	-0.094	0.091
dcv7	0.008	0.167	0.226	-0.029	0.004	0.114	0.638
dsh7	-0.521	0.044	0.121	-0.058	-0.173	0.139	0.279
dcc7	-0.280	-0.760	0.068	0.620	0.135	-0.725	-0.116
scs7	-0.269	0.189	0.303	-0.074	-0.374	0.164	0.270
fcs7	0.287	-0.166	-0.366	-0.146	0.007	-0.078	-0.107
smh7	0.127	-0.142	-0.487	-0.284	0.093	0.043	-0.166
fmh7	0.048	-0.415	-0.500	-0.148	-0.023	-0.187	-0.096
chk7	-0.349	-0.426	-0.381	-0.146	-0.031	-0.283	-0.142
egg7	-0.322	0.068	0.069	-0.034	0.235	-0.075	0.063
trk7	-0.260	-0.546	-0.096	0.070	-0.071	-0.470	-0.041

Table D.1. (continued)

	trk2	bcv3	bsh3	bcc3	mlk3	dcv3	dsh3
bcv8	0.384	0.573	0.048	-0.547	-0.221	0.476	0.094
bsh8	0.196	0.292	0.644	0.328	-0.020	0.033	0.294
bcc8	-0.187	0.067	0.584	0.523	-0.017	-0.090	0.262
mlk8	-0.096	-0.012	0.047	-0.098	0.274	-0.127	0.178
dcv8	0.073	0.503	-0.145	-0.480	-0.223	0.614	-0.047
dsh8	-0.113	0.300	0.679	0.357	-0.402	0.253	0.648
dcc8	-0.120	-0.360	0.344	0.615	-0.238	-0.384	0.195
scs8	-0.292	-0.246	0.185	0.169	-0.424	-0.130	0.100
fcs8	0.276	-0.153	-0.365	-0.143	0.033	-0.062	-0.110
smh8	0.155	-0.454	-0.125	0.238	0.209	-0.382	-0.449
fmh8	0.004	-0.101	-0.422	-0.335	0.310	0.088	-0.500
br18	0.235	0.075	-0.156	-0.222	0.365	0.069	-0.456
chk8	0.597	0.063	-0.225	-0.294	-0.030	0.105	-0.208
egg8	-0.132	0.210	-0.362	-0.215	0.328	0.261	0.260
trk8	0.365	0.437	-0.363	-0.694	-0.022	0.561	-0.006
bcv9	0.302	0.462	-0.124	-0.355	-0.036	0.376	-0.176
bsh9	-0.293	0.263	0.285	0.155	0.228	-0.004	0.166
bcc9	0.263	-0.055	0.433	0.246	-0.239	-0.222	0.053
mlk9	-0.292	0.036	-0.038	-0.257	0.224	0.006	-0.041
dcv9	0.440	0.566	-0.216	-0.560	-0.123	0.589	-0.123
dsh9	-0.327	0.153	0.248	0.025	0.194	-0.023	0.066
dcc9	-0.247	-0.587	0.095	0.725	0.032	-0.600	-0.031
scs9	-0.401	0.069	0.328	0.009	-0.365	0.063	0.250
fcs9	0.282	-0.134	-0.322	-0.141	0.033	-0.067	-0.118
smh9	-0.078	0.072	-0.010	-0.136	0.442	0.007	-0.173
fmh9	-0.060	-0.068	-0.077	-0.274	0.202	0.027	-0.341
br19	0.282	0.283	-0.084	-0.421	0.093	0.301	0.001
chk9	-0.303	-0.498	-0.384	0.051	0.106	-0.430	0.133
egg9	0.013	0.032	-0.079	-0.153	0.044	0.014	-0.655
trk9	-0.011	-0.048	0.312	0.197	0.176	-0.097	0.230
bcv10	0.234	0.258	-0.161	-0.501	-0.132	0.354	-0.288
bsh10	-0.129	0.339	0.636	0.259	-0.226	0.194	0.344
bcc10	-0.159	0.128	0.716	0.554	-0.362	0.025	0.371
mlk10	0.259	0.150	0.197	-0.176	-0.034	0.016	0.131
dcv10	0.093	0.143	-0.418	-0.530	-0.039	0.215	-0.207
dsh10	-0.376	0.162	0.494	0.268	-0.155	0.056	0.320
dcc10	-0.415	-0.117	0.293	0.376	-0.202	-0.171	0.427
scs10	-0.357	0.036	0.144	-0.004	-0.269	0.079	0.086
fcs10	0.299	-0.139	-0.369	-0.169	0.000	-0.055	-0.094
smh10	-0.067	0.133	-0.131	-0.003	0.040	0.101	0.207
fmh10	0.176	0.190	-0.127	-0.114	0.041	0.111	0.094
chk10	0.317	-0.130	0.002	-0.195	-0.299	-0.040	-0.346
egg10	-0.333	-0.324	-0.200	0.190	-0.155	-0.043	-0.017

Table D.1. (continued)

	dcc3	scs3	fcs3	smh3	fmh3	brl3	chk3
dcc3	1.000						
scs3	0.268	1.000					
fcs3	-0.190	-0.587	1.000				
smh3	-0.147	0.068	-0.029	1.000			
fmh3	-0.069	0.084	-0.336	0.449	1.000		
brl3	-0.682	-0.454	0.245	0.193	0.167	1.000	
chk3	-0.389	-0.378	0.449	-0.196	-0.411	0.122	1.000
egg3	0.027	-0.263	-0.023	-0.050	0.297	-0.326	-0.067
trk3	-0.182	0.089	-0.069	-0.514	-0.012	0.226	0.088
bcv4	-0.286	0.169	-0.178	-0.024	0.090	0.109	0.034
bsh4	0.256	0.455	-0.265	-0.061	0.080	-0.267	-0.130
bcc4	0.716	0.609	-0.340	-0.078	-0.075	-0.652	-0.292
mlk4	-0.457	-0.078	0.183	-0.221	-0.104	0.230	0.286
dcv4	-0.182	0.231	-0.084	0.055	-0.385	0.195	0.160
dsh4	0.210	0.644	-0.699	-0.161	-0.037	-0.273	-0.330
dcc4	0.772	0.163	-0.157	-0.409	0.062	-0.540	-0.287
scs4	0.001	0.828	-0.602	0.220	0.188	-0.192	-0.376
fcs4	-0.216	-0.592	0.994	-0.006	-0.366	0.230	0.490
smh4	-0.034	-0.199	0.451	0.289	0.330	0.284	-0.314
fmh4	-0.335	0.234	-0.007	-0.092	0.329	0.228	0.008
chk4	-0.160	-0.597	0.706	-0.312	-0.369	0.294	0.487
egg4	0.041	-0.171	0.090	-0.481	-0.569	-0.268	0.386
trk4	-0.331	-0.103	0.001	0.173	-0.224	0.258	0.378
bcv5	0.255	0.147	-0.061	-0.460	-0.033	-0.105	0.090
bsh5	0.279	-0.130	-0.124	-0.103	-0.219	0.037	-0.360
bcc5	0.724	-0.016	-0.039	-0.341	-0.132	-0.326	-0.210
mlk5	-0.069	0.258	0.014	0.074	0.196	0.123	-0.132
dcv5	0.306	0.285	-0.203	-0.640	-0.097	-0.192	0.056
dsh5	0.271	0.088	-0.147	-0.398	-0.458	-0.019	-0.212
dcc5	0.600	-0.040	0.021	-0.294	-0.238	-0.310	-0.064
scs5	0.050	0.788	-0.412	0.203	0.264	-0.138	-0.388
fcs5	-0.274	-0.610	0.988	-0.048	-0.331	0.315	0.470
smh5	-0.085	-0.196	0.219	0.089	0.027	0.224	0.201
fmh5	0.022	-0.054	0.188	0.022	0.040	-0.068	0.166
brl5	0.216	0.352	-0.080	0.069	0.059	-0.234	-0.239
chk5	-0.148	0.000	0.483	0.203	-0.377	0.044	0.132
egg5	-0.312	-0.192	0.195	-0.427	-0.199	0.057	0.085
trk5	0.201	0.261	-0.231	0.077	-0.112	-0.335	-0.076
bcv6	-0.442	0.181	-0.099	-0.331	-0.093	0.451	0.082
bsh6	0.485	0.148	-0.233	0.185	0.055	0.032	-0.532
bcc6	0.789	0.229	-0.125	0.105	-0.035	-0.407	-0.355
mlk6	-0.516	0.018	0.412	-0.141	-0.316	0.252	0.254
dcv6	-0.428	0.220	-0.037	-0.106	-0.122	0.408	0.053
dsh6	0.405	0.254	-0.115	0.129	-0.100	0.018	-0.423
dcc6	0.775	0.015	-0.003	0.015	0.059	-0.443	-0.253

Table D.1. (continued)

	dcc3	scs3	fcs3	smh3	fmh3	br13	chk3
scs6	0.002	0.857	-0.543	0.270	0.174	-0.191	-0.319
fcs6	-0.211	-0.586	0.990	0.002	-0.365	0.240	0.483
smh6	0.027	0.107	0.026	0.408	0.120	0.192	-0.183
fmh6	-0.190	-0.059	0.127	0.149	0.251	0.295	-0.100
br16	-0.416	-0.408	0.369	0.035	-0.097	0.676	0.283
chk6	0.165	-0.268	0.544	0.255	-0.105	0.036	-0.005
egg6	0.074	0.092	-0.405	-0.260	0.008	-0.328	0.016
bcv7	0.316	0.133	-0.594	-0.323	-0.096	-0.071	-0.490
bsh7	0.235	0.213	-0.218	-0.352	0.093	-0.092	-0.310
bcc7	0.658	0.182	-0.148	-0.217	0.009	-0.528	-0.341
mlk7	-0.221	0.201	-0.124	-0.194	0.032	0.128	-0.081
dcv7	0.218	0.200	-0.351	-0.029	-0.310	0.061	-0.362
dsh7	-0.064	0.269	-0.091	-0.407	-0.216	-0.009	0.174
dcc7	0.624	0.033	-0.005	-0.245	0.160	-0.471	-0.324
scs7	-0.027	0.831	-0.605	0.226	0.130	-0.192	-0.344
fcs7	-0.220	-0.591	0.992	-0.005	-0.371	0.229	0.498
smh7	-0.281	-0.456	0.813	0.246	-0.337	0.200	0.281
fmh7	-0.122	-0.409	0.861	-0.113	-0.213	0.220	0.273
chk7	-0.196	0.295	0.155	-0.192	-0.109	-0.001	-0.061
egg7	-0.035	-0.042	-0.099	-0.175	0.150	-0.006	-0.013
trk7	0.053	0.447	-0.021	0.080	0.182	-0.118	-0.211
bcv8	-0.608	0.027	0.112	0.253	-0.233	0.464	0.325
bsh8	0.280	0.069	-0.397	-0.043	0.140	0.006	-0.019
bcc8	0.450	0.378	-0.582	-0.065	0.087	-0.284	-0.240
mlk8	-0.067	-0.167	0.145	-0.220	-0.066	0.010	-0.067
dcv8	-0.475	-0.051	0.157	0.011	-0.262	0.283	0.255
dsh8	0.470	0.338	-0.449	-0.109	-0.242	-0.253	-0.136
dcc8	0.606	0.394	-0.413	0.071	0.024	-0.507	-0.204
scs8	0.289	0.705	-0.404	0.072	0.311	-0.283	-0.387
fcs8	-0.212	-0.602	0.993	-0.021	-0.368	0.237	0.471
smh8	0.140	-0.140	0.380	0.400	0.262	-0.094	-0.091
fmh8	-0.371	-0.164	0.292	0.116	0.303	0.318	-0.093
br18	-0.300	-0.514	0.340	0.093	0.295	0.673	0.013
chk8	-0.330	-0.301	0.554	0.004	-0.249	0.343	0.280
egg8	-0.056	-0.439	0.256	-0.570	-0.129	0.297	-0.048
trk8	-0.520	-0.398	0.134	0.369	0.032	0.376	0.175
bcv9	-0.493	0.097	-0.068	0.101	-0.008	0.391	0.458
bsh9	-0.058	0.244	-0.183	-0.186	-0.343	-0.120	0.172
bcc9	0.081	0.285	0.058	-0.031	-0.298	-0.267	0.148
mlk9	-0.318	-0.102	0.085	-0.118	0.138	0.156	0.122
dcv9	-0.574	-0.067	0.088	0.154	0.030	0.564	0.344
dsh9	-0.045	0.253	-0.131	-0.116	-0.002	-0.234	-0.115
dcc9	0.633	0.116	0.054	-0.350	-0.154	-0.659	-0.028

Table D.1. (continued)

	dcc3	scs3	fcs3	smh3	fmh3	br13	chk3
scs9	0.075	0.869	-0.558	0.125	0.144	-0.274	-0.465
fcs9	-0.206	-0.597	0.986	-0.013	-0.347	0.256	0.448
smh9	-0.156	0.033	-0.454	-0.050	0.348	0.329	-0.190
fmh9	-0.284	0.177	-0.317	0.045	0.403	0.185	-0.242
br19	-0.292	-0.681	0.336	0.181	0.140	0.465	0.126
chk9	0.100	-0.049	0.430	-0.110	-0.118	0.085	-0.025
egg9	-0.471	-0.111	0.244	0.043	0.200	-0.017	0.481
trk9	0.246	-0.155	-0.035	-0.232	-0.141	0.053	-0.018
bcv10	-0.557	-0.307	0.343	-0.261	0.182	0.474	0.484
bsh10	0.159	0.225	-0.234	-0.222	-0.261	-0.433	0.223
bcc10	0.478	0.319	-0.273	-0.244	-0.209	-0.611	0.120
mlk10	-0.236	0.088	0.277	-0.109	-0.307	0.077	0.137
dcv10	-0.619	-0.198	0.610	-0.125	-0.033	0.510	0.407
dsh10	0.201	0.349	-0.241	-0.273	-0.306	-0.549	0.111
dcc10	0.367	0.323	-0.202	0.004	-0.306	-0.666	0.123
scs10	0.024	0.643	-0.535	0.340	0.376	-0.041	-0.298
fcs10	-0.244	-0.598	0.984	-0.004	-0.382	0.221	0.537
smh10	-0.033	-0.269	-0.010	-0.245	-0.392	-0.009	0.608
fmh10	-0.164	-0.149	-0.267	0.026	-0.090	0.157	0.506
chk10	-0.267	0.015	0.078	0.311	0.060	0.105	0.359
egg10	0.282	-0.188	0.095	-0.190	-0.215	-0.368	0.215

	egg3	trk3	bcv4	bsh4	bcc4	mlk4	dcv4
egg3	1.000						
trk3	-0.234	1.000					
bcv4	0.054	0.146	1.000				
bsh4	-0.172	0.465	0.439	1.000			
bcc4	-0.127	-0.068	0.225	0.651	1.000		
mlk4	0.173	0.341	0.642	0.273	-0.246	1.000	
dcv4	-0.376	-0.352	0.104	-0.308	0.085	-0.104	1.000
dsh4	-0.119	0.356	0.208	0.608	0.389	0.241	0.004
dcc4	0.074	0.387	-0.301	0.431	0.500	-0.302	-0.576
scs4	-0.073	-0.101	0.357	0.207	0.414	0.035	0.436
fcs4	-0.030	-0.096	-0.156	-0.265	-0.345	0.202	-0.061
smh4	-0.189	0.054	0.092	0.217	-0.055	0.104	-0.432
fmh4	-0.123	0.603	0.573	0.526	0.074	0.468	-0.240
chk4	-0.128	0.112	-0.153	-0.285	-0.275	0.008	0.156
egg4	0.104	-0.081	0.260	-0.049	0.192	0.100	0.379
trk4	-0.215	-0.112	0.259	-0.056	-0.027	0.026	0.485
bcv5	-0.166	0.501	0.308	0.517	0.293	0.370	-0.339
bsh5	-0.225	-0.034	0.117	0.084	0.155	-0.100	0.089
bcc5	-0.146	0.277	-0.341	0.205	0.443	-0.490	-0.250

Table D.1. (continued)

	egg3	trk3	bcv4	bsh4	bcc4	mlk4	dcv4
mlk5	0.013	0.453	0.282	0.564	0.065	0.540	-0.394
dcv5	-0.212	0.575	0.210	0.445	0.323	0.272	-0.232
dsh5	-0.461	0.077	-0.010	-0.147	0.223	-0.285	0.445
dcc5	-0.257	0.230	-0.294	0.209	0.392	-0.434	-0.156
scs5	-0.112	0.000	0.314	0.155	0.390	-0.010	0.341
fcs5	-0.052	0.013	-0.100	-0.244	-0.392	0.248	-0.090
smh5	-0.202	-0.185	-0.692	-0.527	-0.329	-0.433	0.194
fmh5	0.191	-0.286	-0.497	-0.291	-0.100	-0.212	0.045
brl5	-0.002	0.093	0.110	0.283	0.385	-0.012	0.128
chk5	-0.338	-0.318	-0.122	-0.267	-0.076	-0.194	0.295
egg5	0.360	0.314	0.273	0.030	-0.131	0.363	-0.034
trk5	-0.007	-0.143	-0.239	0.098	0.169	-0.053	-0.048
bcv6	-0.175	0.417	0.504	0.208	-0.133	0.688	0.328
bsh6	-0.356	-0.090	-0.250	0.199	0.281	-0.300	-0.026
bcc6	-0.241	-0.128	-0.495	0.245	0.583	-0.628	-0.094
mlk6	-0.060	0.346	0.430	0.231	-0.137	0.693	0.150
dcv6	-0.117	0.110	0.353	0.048	-0.140	0.580	0.538
dsh6	-0.256	-0.168	-0.364	-0.015	0.174	-0.233	0.259
dcc6	-0.070	-0.011	-0.565	0.202	0.442	-0.626	-0.399
scs6	-0.129	-0.085	0.259	0.156	0.384	-0.046	0.466
fcs6	-0.068	-0.090	-0.176	-0.258	-0.344	0.183	-0.050
smh6	-0.469	-0.199	-0.458	-0.050	0.017	-0.472	0.200
fmh6	-0.279	0.154	-0.443	-0.056	-0.222	-0.272	-0.125
brl6	-0.344	-0.220	0.192	-0.439	-0.405	0.192	0.472
chk6	0.030	-0.333	0.107	0.111	0.046	0.351	-0.180
egg6	0.479	-0.029	-0.259	-0.250	-0.098	-0.051	-0.013
bcv7	0.030	0.255	0.246	0.259	0.306	-0.038	-0.033
bsh7	0.010	0.553	0.324	0.720	0.360	0.426	-0.400
bcc7	0.120	0.206	-0.362	0.441	0.510	-0.319	-0.464
mlk7	0.049	0.348	0.536	0.124	-0.122	0.565	-0.087
dcv7	-0.225	-0.060	0.280	0.019	0.280	-0.079	0.393
dsh7	0.056	0.368	0.133	0.134	-0.051	0.559	0.132
dcc7	0.227	0.313	-0.380	0.363	0.347	-0.288	-0.708
scs7	-0.088	-0.106	0.325	0.180	0.373	0.045	0.458
fcs7	-0.034	-0.096	-0.154	-0.262	-0.344	0.204	-0.056
smh7	0.022	-0.278	-0.356	-0.463	-0.428	-0.037	0.087
fmh7	0.018	0.110	-0.274	-0.324	-0.409	0.211	-0.192
chk7	-0.158	0.342	-0.215	0.060	-0.157	0.152	-0.173
egg7	0.446	0.209	0.428	0.331	0.095	0.416	-0.109
trk7	0.044	0.369	0.068	0.260	0.081	0.263	-0.272
bcv8	-0.385	-0.232	0.372	-0.148	-0.185	0.238	0.630
bsh8	-0.077	0.175	0.440	0.507	0.431	0.187	0.036
bcc8	-0.137	0.186	0.092	0.562	0.512	0.028	-0.054

Table D.1. (continued)

	egg3	trk3	bcv4	bsh4	bcc4	mlk4	dcv4
mlk8	0.393	0.219	0.569	0.245	-0.055	0.691	-0.317
dcv8	-0.230	-0.346	-0.094	-0.528	-0.355	-0.058	0.584
dsh8	-0.199	-0.112	0.141	0.268	0.566	-0.081	0.376
dcc8	-0.151	-0.038	-0.317	0.341	0.582	-0.479	-0.086
scs8	0.014	0.086	0.031	0.073	0.381	-0.234	0.133
fcs8	-0.029	-0.096	-0.157	-0.282	-0.358	0.206	-0.055
smh8	0.145	-0.081	-0.237	-0.157	-0.172	-0.085	-0.387
fmh8	0.176	0.117	-0.165	-0.496	-0.659	0.230	-0.195
br18	-0.137	0.059	-0.130	-0.252	-0.549	0.146	-0.124
chk8	-0.361	-0.015	-0.059	-0.428	-0.305	-0.164	0.163
egg8	0.204	0.220	0.064	-0.229	-0.209	0.219	0.076
trk8	0.255	-0.532	0.032	-0.724	-0.529	-0.051	0.386
bcv9	-0.379	0.092	0.229	-0.212	-0.228	0.026	0.558
bsh9	-0.158	0.290	0.336	0.618	0.337	0.330	0.193
bcc9	-0.285	0.015	0.218	0.262	0.383	-0.036	0.107
mlk9	0.475	0.329	0.370	0.222	-0.263	0.805	-0.250
dcv9	-0.352	-0.057	0.212	-0.462	-0.407	0.049	0.566
dsh9	0.375	0.228	0.519	0.455	0.307	0.381	-0.017
dcc9	0.077	0.194	-0.388	0.285	0.476	-0.409	-0.373
scs9	-0.026	-0.028	0.307	0.262	0.453	0.034	0.338
fcs9	-0.037	-0.083	-0.114	-0.229	-0.309	0.184	-0.047
smh9	0.015	0.459	0.081	0.110	-0.219	0.170	-0.150
fmh9	0.126	0.382	0.025	-0.075	-0.390	0.261	-0.345
br19	0.370	-0.358	0.146	-0.343	-0.430	0.267	0.007
chk9	0.031	0.143	-0.003	0.025	-0.068	0.276	-0.078
egg9	0.240	0.126	-0.018	0.035	-0.382	0.368	-0.325
trk9	0.008	0.314	0.261	0.186	-0.019	0.391	-0.269
bcv10	0.119	0.423	0.193	-0.170	-0.503	0.484	-0.117
bsh10	0.172	0.151	0.444	0.535	0.422	0.430	-0.034
bcc10	0.097	0.085	0.225	0.517	0.616	0.135	-0.052
mlk10	-0.092	0.137	0.636	0.066	0.021	0.485	0.142
dcv10	-0.049	0.209	0.193	-0.242	-0.479	0.511	0.186
dsh10	0.243	0.203	0.383	0.552	0.463	0.355	-0.063
dcc10	0.312	-0.091	0.170	0.438	0.504	0.154	-0.001
scs10	-0.064	0.016	0.083	0.251	0.211	0.062	0.203
fcs10	-0.009	-0.098	-0.125	-0.262	-0.355	0.235	-0.052
smh10	-0.037	0.105	-0.016	0.033	-0.113	0.115	0.090
fmh10	-0.145	0.050	0.077	-0.032	-0.206	0.098	0.128
chk10	-0.234	0.214	-0.124	0.132	-0.181	-0.074	-0.313
egg10	0.249	-0.142	-0.717	-0.334	-0.117	-0.419	-0.157

Table D.1. (continued)

	dsh4	dcc4	scs4	fcs4	smh4	fmh4	chk4
dsh4	1.000						
dcc4	0.275	1.000					
scs4	0.474	-0.223	1.000				
fcs4	-0.692	-0.203	-0.598	1.000			
smh4	-0.297	0.051	-0.301	0.434	1.000		
fmh4	0.173	0.010	0.205	-0.016	0.374	1.000	
chk4	-0.567	-0.043	-0.676	0.704	0.163	-0.101	1.000
egg4	-0.025	-0.052	-0.179	0.139	-0.377	-0.126	0.505
trk4	-0.185	-0.463	0.067	0.039	-0.244	-0.270	0.296
bcv5	0.331	0.471	-0.008	-0.097	0.062	0.414	-0.175
bsh5	0.203	0.152	-0.269	-0.109	0.203	-0.145	0.244
bcc5	0.038	0.801	-0.315	-0.063	0.030	-0.113	0.251
mlk5	0.410	0.149	0.216	-0.027	0.260	0.559	-0.422
dcv5	0.400	0.544	0.066	-0.244	-0.111	0.286	-0.129
dsh5	0.096	0.130	0.030	-0.135	-0.139	-0.189	0.294
dcc5	0.028	0.650	-0.389	0.027	0.072	-0.099	0.376
scs5	0.271	-0.103	0.917	-0.432	-0.143	0.286	-0.508
fcs5	-0.677	-0.187	-0.622	0.985	0.465	0.061	0.746
smh5	-0.435	-0.154	-0.108	0.219	-0.068	-0.379	0.153
fmh5	-0.302	-0.089	0.049	0.166	-0.145	-0.287	-0.136
brl5	0.159	0.168	0.264	-0.067	0.082	-0.018	0.176
chk5	-0.450	-0.322	-0.131	0.480	0.247	-0.203	0.370
egg5	-0.100	-0.090	-0.129	0.195	-0.010	0.180	0.382
trk5	0.227	0.032	0.274	-0.190	-0.152	-0.355	-0.438
bcv6	0.370	-0.340	0.299	-0.117	-0.072	0.419	-0.013
bsh6	0.253	0.283	0.006	-0.259	0.256	-0.389	-0.178
bcc6	0.105	0.587	-0.013	-0.135	0.102	-0.347	-0.104
mlk6	0.076	-0.357	0.136	0.432	0.166	0.456	0.230
dcv6	0.312	-0.517	0.403	-0.044	-0.127	0.223	-0.030
dsh6	0.269	0.149	0.117	-0.159	0.003	-0.460	-0.060
dcc6	-0.045	0.750	-0.291	-0.017	0.178	-0.285	0.028
scs6	0.418	-0.205	0.970	-0.544	-0.324	0.177	-0.585
fcs6	-0.679	-0.196	-0.612	0.997	0.450	-0.025	0.727
smh6	-0.121	-0.127	-0.007	0.038	0.323	-0.214	0.066
fmh6	-0.218	-0.043	-0.131	0.130	0.408	0.056	0.104
brl6	-0.452	-0.588	-0.156	0.361	0.168	-0.055	0.389
chk6	-0.212	-0.098	-0.197	0.551	0.547	-0.070	0.015
egg6	0.182	0.068	0.193	-0.386	-0.618	-0.353	-0.279
bcv7	0.515	0.320	0.174	-0.612	-0.251	-0.035	-0.323
bsh7	0.527	0.444	0.071	-0.234	0.272	0.360	-0.196
bcc7	0.260	0.743	-0.083	-0.160	0.103	-0.047	-0.187
mlk7	0.305	-0.084	0.251	-0.141	-0.009	0.605	-0.272
dcv7	0.257	-0.068	0.350	-0.357	-0.247	-0.156	-0.233
dsh7	0.413	0.016	0.224	-0.111	-0.359	0.038	-0.043
dcc7	0.097	0.859	-0.288	-0.039	0.246	0.062	-0.061

Table D.1. (continued)

	dsh4	dcc4	scs4	fcs4	smh4	fmh4	chk4
scs7	0.496	-0.256	0.993	-0.597	-0.348	0.148	-0.677
fcs7	-0.689	-0.208	-0.598	1.000	0.429	-0.017	0.706
smh7	-0.658	-0.361	-0.400	0.830	0.290	-0.284	0.560
fmh7	-0.542	-0.010	-0.429	0.834	0.372	0.128	0.477
chk7	0.142	0.024	0.161	0.133	0.161	0.411	-0.249
egg7	0.271	0.124	-0.074	-0.131	-0.089	0.212	0.148
trk7	0.256	0.183	0.402	-0.038	0.119	0.524	-0.404
bcv8	-0.192	-0.837	0.290	0.145	-0.036	0.022	0.037
bsh8	0.363	0.201	0.131	-0.378	-0.108	0.060	-0.094
bcc8	0.682	0.384	0.295	-0.553	-0.163	-0.029	-0.402
mlk8	0.202	0.056	-0.110	0.131	0.158	0.392	-0.026
dcv8	-0.318	-0.636	0.074	0.160	-0.164	-0.354	0.224
dsh8	0.422	0.160	0.391	-0.439	-0.405	-0.399	-0.238
dcc8	0.299	0.460	0.232	-0.387	-0.160	-0.202	-0.379
scs8	0.219	0.251	0.690	-0.455	-0.253	0.148	-0.400
fcs8	-0.688	-0.199	-0.609	0.998	0.440	-0.031	0.724
smh8	-0.335	0.170	-0.240	0.389	0.414	-0.001	0.199
fmh8	-0.297	-0.208	-0.054	0.283	0.269	0.153	0.116
br18	-0.353	-0.192	-0.497	0.309	0.512	-0.045	0.416
chk8	-0.745	-0.323	-0.236	0.556	0.277	0.031	0.480
egg8	-0.124	0.072	-0.281	0.224	0.032	0.135	0.444
trk8	-0.563	-0.772	0.057	0.166	-0.186	-0.323	0.071
bcv9	-0.138	-0.472	0.148	-0.053	-0.299	0.142	0.312
bsh9	0.567	0.019	0.057	-0.149	-0.159	0.115	0.135
bcc9	-0.109	-0.028	0.156	0.086	0.068	0.034	0.046
mlk9	0.239	-0.124	0.011	0.085	0.018	0.317	-0.030
dcv9	-0.329	-0.616	0.171	0.091	-0.162	0.119	0.242
dsh9	0.336	0.086	0.226	-0.135	-0.090	0.243	0.069
dcc9	0.024	0.774	-0.299	0.050	0.011	-0.090	0.231
scs9	0.524	-0.077	0.952	-0.575	-0.261	0.188	-0.644
fcs9	-0.692	-0.178	-0.619	0.983	0.461	-0.026	0.762
smh9	0.332	0.047	0.092	-0.454	-0.091	0.186	-0.193
fmh9	0.204	-0.049	0.294	-0.318	0.010	0.298	-0.494
br19	-0.471	-0.434	-0.364	0.329	0.195	-0.273	0.267
chk9	0.005	0.146	-0.183	0.384	0.236	0.305	0.227
egg9	-0.145	-0.184	-0.224	0.273	0.127	0.169	0.148
trk9	0.264	0.320	-0.259	-0.057	-0.023	-0.018	0.062
bcv10	-0.357	-0.216	-0.136	0.314	0.022	0.355	0.296
bsh10	0.483	0.166	0.201	-0.195	-0.343	-0.018	-0.150
bcc10	0.434	0.424	0.189	-0.248	-0.340	-0.149	-0.129
mlk10	-0.134	-0.257	0.135	0.275	0.119	0.334	0.181
dcv10	-0.388	-0.448	-0.069	0.586	0.217	0.433	0.445
dsh10	0.556	0.278	0.211	-0.225	-0.382	0.013	-0.128
dcc10	0.486	0.246	0.194	-0.166	-0.440	-0.144	-0.191

Table D.1. (continued)

	dsh4	dcc4	scs4	fcs4	smh4	fmh4	chk4
scs10	0.585	-0.058	0.741	-0.540	-0.232	0.184	-0.644
fcs10	-0.682	-0.232	-0.588	0.997	0.393	-0.008	0.694
smh10	0.158	0.043	-0.432	0.008	-0.479	-0.182	0.293
fmh10	0.197	-0.167	-0.160	-0.226	-0.453	-0.007	-0.057
chk10	-0.112	-0.031	-0.054	0.078	0.001	0.122	-0.226
egg10	-0.200	0.307	-0.385	0.088	-0.354	-0.660	0.201

	egg4	trk4	bcv5	bsh5	bcc5	mlk5	dcv5
egg4	1.000						
trk4	0.273	1.000					
bcv5	-0.098	-0.350	1.000				
bsh5	0.409	0.026	-0.151	1.000			
bcc5	0.169	-0.176	0.125	0.442	1.000		
mlk5	-0.560	-0.371	0.559	-0.322	-0.197	1.000	
dcv5	-0.032	-0.218	0.914	-0.119	0.231	0.385	1.000
dsh5	0.520	0.133	-0.046	0.658	0.485	-0.537	0.125
dcc5	0.339	-0.057	-0.016	0.570	0.933	-0.343	0.094
scs5	-0.279	0.034	0.058	-0.330	-0.181	0.259	0.147
fcs5	0.132	0.039	-0.044	-0.073	-0.061	0.015	-0.187
smh5	-0.304	0.096	-0.289	-0.441	-0.017	-0.332	-0.196
fmh5	-0.378	-0.076	-0.127	-0.673	-0.183	0.041	-0.094
br15	0.169	0.376	-0.285	0.183	0.283	-0.142	-0.102
chk5	0.050	0.307	-0.408	0.102	-0.117	-0.247	-0.345
egg5	0.381	0.278	-0.276	0.126	0.041	-0.063	-0.135
trk5	-0.243	0.162	-0.105	-0.266	-0.028	-0.012	0.007
bcv6	-0.004	0.166	0.269	-0.024	-0.381	0.432	0.340
bsh6	-0.392	0.126	-0.032	0.420	0.368	0.040	0.071
bcc6	-0.176	-0.079	-0.074	0.218	0.729	-0.127	0.002
mlk6	0.199	0.122	0.134	-0.188	-0.418	0.379	0.036
dcv6	-0.007	0.189	-0.013	-0.070	-0.497	0.334	0.039
dsh6	-0.305	0.061	-0.170	0.298	0.230	0.086	-0.022
dcc6	-0.153	-0.213	-0.008	0.185	0.827	-0.150	0.040
scs6	-0.200	0.110	-0.087	-0.290	-0.258	0.185	0.019
fcs6	0.147	0.047	-0.110	-0.075	-0.048	-0.051	-0.251
smh6	-0.333	0.229	-0.527	0.119	0.129	-0.252	-0.429
fmh6	-0.426	0.068	-0.362	-0.137	0.092	-0.106	-0.264
br16	0.050	0.297	0.069	0.028	-0.420	-0.171	0.001
chk6	-0.201	-0.137	0.210	-0.016	-0.173	0.346	-0.038
egg6	0.041	0.069	-0.272	-0.248	0.053	-0.214	-0.042
bcv7	0.127	-0.016	0.178	0.538	0.408	0.063	0.264
bsh7	-0.138	-0.087	0.447	0.182	0.273	0.504	0.500
bcc7	-0.120	-0.332	0.082	0.099	0.694	0.114	0.144

Table D.1. (continued)

	egg4	trk4	bcv5	bsh5	bcc5	mlk5	dcv5
mlk7	-0.036	-0.416	0.421	0.048	-0.211	0.535	0.322
dcv7	0.108	0.240	-0.050	0.476	0.235	-0.011	0.014
dsh7	-0.043	0.132	0.239	-0.197	-0.113	0.392	0.431
dcc7	-0.197	-0.486	0.175	0.077	0.738	0.178	0.211
scs7	-0.178	0.112	-0.049	-0.266	-0.338	0.204	0.043
fcs7	0.148	0.047	-0.102	-0.107	-0.065	-0.034	-0.249
smh7	0.038	0.213	-0.567	-0.089	-0.119	-0.212	-0.615
fmh7	-0.138	-0.340	0.088	-0.253	0.020	0.235	-0.035
chk7	-0.387	-0.563	0.173	-0.382	-0.164	0.484	0.153
egg7	0.245	0.068	0.098	0.222	-0.008	0.272	0.104
trk7	-0.452	-0.463	0.203	-0.338	0.056	0.668	0.148
bcv8	0.025	0.659	-0.246	-0.158	-0.627	-0.080	-0.242
bsh8	0.154	0.387	0.308	0.260	0.274	0.061	0.325
bcc8	0.003	0.029	0.301	0.180	0.302	0.111	0.352
mlk8	0.182	-0.340	0.395	0.234	-0.120	0.509	0.210
dcv8	0.082	0.467	-0.342	-0.175	-0.557	-0.405	-0.191
dsh8	0.156	0.429	0.203	0.147	0.209	-0.101	0.339
dcc8	-0.124	-0.003	-0.038	-0.006	0.532	-0.111	0.059
scs8	-0.308	-0.130	0.119	-0.323	0.122	0.214	0.260
fcs8	0.158	0.035	-0.099	-0.075	-0.059	-0.049	-0.240
smh8	-0.196	-0.196	-0.229	0.011	0.211	-0.011	-0.306
fmh8	-0.331	-0.260	-0.212	-0.210	-0.224	0.080	-0.194
brl8	-0.327	0.143	-0.105	0.161	-0.113	-0.009	-0.086
chk8	0.019	0.332	-0.248	-0.077	0.013	-0.321	-0.202
egg8	0.380	-0.303	0.194	0.250	0.141	-0.066	0.151
trk8	0.040	0.450	-0.666	-0.158	-0.472	-0.421	-0.676
bcv9	0.208	0.573	-0.204	-0.052	-0.233	-0.279	-0.075
bsh9	0.447	0.403	0.005	0.337	0.031	0.079	0.086
bcc9	0.115	0.507	-0.132	0.006	0.165	-0.131	0.022
mlk9	-0.073	0.005	0.087	-0.157	-0.283	0.538	0.059
dcv9	0.073	0.360	-0.070	-0.184	-0.449	-0.227	-0.063
dsh9	0.351	0.240	-0.048	0.153	-0.022	0.191	0.014
dcc9	0.247	-0.199	0.006	0.169	0.792	-0.219	0.144
scs9	-0.202	-0.023	0.063	-0.247	-0.266	0.303	0.161
fcs9	0.165	0.098	-0.092	-0.042	-0.044	-0.040	-0.226
smh9	-0.269	0.137	-0.099	0.153	0.172	0.156	0.047
fmh9	-0.560	-0.212	0.036	-0.305	-0.167	0.362	0.103
brl9	-0.050	0.350	-0.254	0.051	-0.322	-0.074	-0.335
chk9	-0.031	-0.548	0.221	0.135	0.109	0.462	0.078
egg9	-0.087	0.116	-0.087	-0.469	-0.442	0.067	-0.056
trk9	0.035	-0.014	0.450	0.409	0.290	0.315	0.448
bcv10	-0.165	0.164	0.300	-0.591	-0.348	0.250	0.318
bsh10	0.394	0.293	0.391	-0.057	-0.062	0.147	0.401
bcc10	0.349	0.212	0.413	-0.034	0.220	0.016	0.482

Table D.1. (continued)

	egg4	trk4	bcv5	bsh5	bcc5	mlk5	dcv5
mlk10	0.224	0.252	0.129	0.111	-0.159	0.196	0.126
dcv10	-0.027	-0.005	0.094	-0.393	-0.478	0.255	0.033
dsh10	0.419	0.159	0.325	0.013	0.003	0.208	0.370
dcc10	0.397	0.060	0.051	0.056	0.119	0.132	0.027
scs10	-0.389	-0.190	0.174	-0.348	-0.312	0.420	0.132
fcs10	0.175	0.059	-0.100	-0.126	-0.090	-0.033	-0.255
smh10	0.442	0.191	0.124	0.217	0.100	-0.110	0.130
fmh10	0.179	0.132	0.082	0.111	-0.043	-0.065	0.036
chk10	-0.479	0.120	0.213	-0.566	-0.209	0.328	0.116
egg10	0.020	0.104	-0.332	-0.138	0.333	-0.377	-0.114

	dsh5	dcc5	scs5	fcs5	smh5	fmh5	br15
dsh5	1.000						
dcc5	0.546	1.000					
scs5	0.043	-0.305	1.000				
fcs5	-0.109	0.018	-0.428	1.000			
smh5	-0.039	-0.041	-0.072	0.148	1.000		
fmh5	-0.462	-0.302	0.025	0.067	0.719	1.000	
br15	0.236	0.338	0.363	-0.067	-0.102	-0.253	1.000
chk5	0.099	0.018	-0.016	0.469	0.062	0.056	0.055
egg5	0.056	0.087	-0.105	0.234	-0.245	-0.068	0.365
trk5	-0.103	-0.027	0.122	-0.305	0.428	0.475	0.221
bcv6	-0.007	-0.382	0.245	-0.051	-0.202	-0.036	0.011
bsh6	0.209	0.309	-0.004	-0.278	0.120	0.044	0.264
bcc6	0.229	0.671	0.014	-0.217	0.282	0.216	0.341
mlk6	-0.059	-0.345	0.149	0.472	-0.204	-0.171	0.217
dcv6	-0.061	-0.472	0.308	-0.023	-0.057	0.126	0.085
dsh6	0.155	0.158	0.136	-0.175	0.120	0.160	0.276
dcc6	0.126	0.764	-0.202	-0.078	0.246	0.156	0.254
scs6	0.026	-0.319	0.942	-0.563	-0.069	0.040	0.333
fcs6	-0.106	0.056	-0.448	0.985	0.229	0.138	-0.042
smh6	0.058	0.248	-0.030	-0.022	0.564	0.318	0.270
fmh6	-0.093	0.157	-0.100	0.100	0.659	0.424	0.180
br16	0.157	-0.383	-0.102	0.400	0.240	0.028	-0.332
chk6	-0.271	-0.184	-0.172	0.494	-0.007	0.168	-0.070
egg6	-0.079	-0.004	0.061	-0.454	0.298	0.428	0.128
bcv7	0.451	0.286	0.060	-0.571	-0.444	-0.353	0.009
bsh7	-0.025	0.208	0.047	-0.206	-0.325	-0.119	0.351
bcc7	0.019	0.609	-0.101	-0.222	0.072	0.233	0.270
mlk7	-0.020	-0.261	0.285	-0.064	-0.591	-0.394	-0.320
dcv7	0.527	0.159	0.296	-0.349	-0.311	-0.269	0.051
dsh7	-0.119	-0.166	0.231	-0.094	-0.073	0.159	0.232
dcc7	-0.079	0.621	-0.186	-0.058	-0.019	0.125	0.189

Table D.1. (continued)

	dsh5	dcc5	scs5	fcs5	smh5	fmh5	brl5
scs7	0.029	-0.398	0.896	-0.625	-0.094	0.058	0.266
fcs7	-0.131	0.031	-0.436	0.984	0.220	0.161	-0.062
smh7	-0.095	-0.013	-0.283	0.791	0.357	0.237	0.134
fmh7	-0.152	-0.020	-0.185	0.842	0.250	0.227	-0.161
chk7	-0.210	-0.199	0.176	0.126	0.176	0.362	-0.319
egg7	-0.224	-0.038	-0.071	-0.053	-0.674	-0.332	0.214
trk7	-0.259	-0.052	0.527	-0.038	-0.112	0.060	0.131
bcv8	-0.021	-0.496	0.194	0.128	0.165	0.162	-0.093
bsh8	0.157	0.256	0.065	-0.371	-0.235	-0.297	0.377
bcc8	0.182	0.289	0.133	-0.590	-0.056	-0.146	0.364
mlk8	-0.125	-0.169	-0.096	0.201	-0.787	-0.469	-0.157
dcv8	0.079	-0.464	0.031	0.154	0.386	0.312	-0.153
dsh8	0.364	0.137	0.284	-0.482	0.000	-0.008	0.359
dcc8	0.116	0.513	0.138	-0.491	0.288	0.260	0.298
scs8	0.027	-0.077	0.865	-0.433	-0.058	0.043	0.320
fcs8	-0.101	0.034	-0.441	0.988	0.209	0.133	-0.051
smh8	-0.121	0.244	-0.008	0.386	0.038	-0.216	0.369
fmh8	-0.121	-0.237	0.137	0.323	0.245	0.000	0.096
brl8	-0.138	-0.082	-0.385	0.366	0.275	0.080	-0.045
chk8	0.231	0.081	-0.032	0.568	0.347	0.100	-0.065
egg8	0.358	0.055	-0.234	0.290	-0.065	-0.135	-0.138
trk8	-0.084	-0.431	0.004	0.128	0.323	0.259	-0.158
bcv9	0.150	-0.092	0.213	0.004	0.046	-0.237	0.097
bsh9	0.103	0.205	-0.118	-0.134	-0.447	-0.355	0.427
bcc9	0.124	0.275	0.197	0.039	-0.022	0.068	0.383
mlk9	-0.472	-0.300	-0.008	0.114	-0.305	-0.004	0.207
dcv9	0.172	-0.397	0.264	0.154	0.183	-0.156	-0.184
dsh9	-0.056	-0.010	0.235	-0.078	-0.695	-0.433	0.601
dcc9	0.179	0.810	-0.210	0.012	-0.007	0.009	0.376
scs9	0.016	-0.378	0.911	-0.578	-0.217	0.020	0.292
fcs9	-0.107	0.038	-0.434	0.987	0.142	0.094	-0.016
smh9	0.001	0.148	0.058	-0.415	0.016	-0.095	0.210
fmh9	-0.220	-0.255	0.321	-0.295	0.136	0.090	-0.022
brl9	-0.308	-0.342	-0.376	0.328	0.078	0.222	-0.133
chk9	-0.082	0.060	-0.032	0.429	-0.334	-0.144	-0.160
egg9	-0.611	-0.294	-0.226	0.267	0.152	0.214	0.075
trk9	0.134	0.221	-0.171	0.015	-0.527	-0.501	0.008
bcv10	-0.352	-0.428	0.043	0.386	0.230	0.226	-0.118
bsh10	-0.020	-0.040	0.075	-0.207	-0.414	-0.268	0.338
bcc10	0.098	0.203	0.128	-0.279	-0.263	-0.183	0.438
mlk10	0.142	-0.120	0.288	0.335	-0.547	-0.414	0.133
dcv10	-0.223	-0.458	0.105	0.648	0.114	0.124	-0.107
dsh10	-0.024	0.007	0.123	-0.211	-0.616	-0.352	0.350
dcc10	-0.106	0.157	0.063	-0.217	-0.508	-0.220	0.321

Table D.1. (continued)

	dsh5	dcc5	scs5	fcs5	smh5	fmh5	brl5
scs10	-0.204	-0.412	0.657	-0.547	0.013	0.043	0.118
fcs10	-0.147	0.012	-0.439	0.979	0.204	0.152	-0.074
smh10	-0.007	0.213	-0.548	0.024	-0.240	-0.204	-0.314
fmh10	-0.055	0.077	-0.326	-0.232	-0.081	-0.163	-0.442
chk10	-0.479	-0.241	-0.003	0.085	0.184	0.184	-0.353
egg10	-0.106	0.320	-0.375	0.022	0.445	0.496	0.059

	chk5	egg5	trk5	bcv6	bsh6	bcc6	mlk6
chk5	1.000						
egg5	0.152	1.000					
trk5	-0.148	-0.067	1.000				
bcv6	-0.087	0.374	-0.101	1.000			
bsh6	0.072	-0.197	0.391	0.004	1.000		
bcc6	-0.009	-0.253	0.455	-0.452	0.686	1.000	
mlk6	0.056	0.398	-0.079	0.489	-0.414	-0.489	1.000
dcv6	0.021	0.301	-0.012	0.910	0.020	-0.373	0.495
dsh6	0.242	-0.109	0.184	0.184	0.801	0.512	-0.281
dcc6	-0.073	-0.202	0.317	-0.631	0.514	0.916	-0.547
scs6	-0.004	-0.133	0.207	0.247	-0.002	0.020	0.102
fcs6	0.487	0.178	-0.196	-0.125	-0.235	-0.116	0.428
smh6	0.361	-0.106	0.378	-0.120	0.578	0.560	-0.259
fmh6	0.136	0.125	0.406	-0.035	0.324	0.353	-0.073
brl6	0.255	-0.167	-0.331	0.357	-0.035	-0.429	0.159
chk6	0.092	-0.195	0.210	-0.026	0.236	0.122	0.266
egg6	-0.348	0.302	0.590	0.016	-0.003	0.123	-0.272
bcv7	-0.360	0.204	0.033	0.204	0.391	0.202	-0.246
bsh7	-0.390	0.354	0.312	0.442	0.432	0.251	0.196
bcc7	-0.260	0.123	0.470	-0.308	0.410	0.785	-0.274
mlk7	-0.147	0.070	-0.438	0.475	-0.373	-0.545	0.279
dcv7	0.080	0.102	0.028	0.232	0.402	0.197	-0.141
dsh7	-0.108	0.347	0.226	0.706	0.103	-0.145	0.266
dcc7	-0.229	0.131	0.200	-0.391	0.281	0.640	-0.318
scs7	-0.089	-0.113	0.318	0.310	0.026	-0.020	0.139
fcs7	0.480	0.195	-0.185	-0.118	-0.262	-0.135	0.436
smh7	0.631	0.279	0.028	-0.243	-0.115	-0.021	0.325
fmh7	0.279	0.089	-0.224	-0.036	-0.284	-0.134	0.376
chk7	0.132	0.042	0.126	0.232	-0.202	-0.093	0.302
egg7	-0.146	0.474	-0.488	0.404	-0.083	-0.301	0.128
trk7	-0.166	0.017	0.127	0.149	-0.129	0.068	0.266
bcv8	0.467	0.110	0.121	0.464	-0.030	-0.352	0.322
bsh8	-0.538	-0.026	0.195	0.212	0.376	0.267	-0.084
bcc8	-0.655	-0.245	0.539	0.050	0.452	0.488	-0.108

Table D.1. (continued)

	chk5	egg5	trk5	bcv6	bsh6	bcc6	mlk6
mlk8	-0.200	0.285	-0.444	0.317	-0.287	-0.478	0.399
dcv8	0.593	0.070	0.028	0.248	-0.049	-0.364	0.080
dsh8	-0.256	-0.167	0.485	0.135	0.531	0.434	-0.135
dcc8	-0.261	-0.229	0.697	-0.372	0.455	0.844	-0.427
scs8	-0.050	-0.152	-0.035	0.031	0.015	0.148	-0.136
fcs8	0.475	0.197	-0.209	-0.114	-0.252	-0.146	0.436
smh8	0.113	-0.115	-0.071	-0.528	-0.054	0.159	0.008
fmh8	0.016	0.104	-0.076	0.034	-0.242	-0.340	0.225
brl8	0.161	0.095	-0.172	0.279	0.367	-0.118	-0.086
chk8	0.668	0.220	-0.110	-0.096	-0.138	-0.096	0.108
egg8	-0.319	0.298	-0.473	0.284	-0.252	-0.282	0.284
trk8	0.253	0.189	0.062	-0.041	-0.219	-0.347	-0.041
bcv9	0.301	0.037	-0.377	0.296	-0.273	-0.396	0.049
bsh9	0.008	0.388	0.054	0.395	0.123	0.013	0.351
bcc9	0.517	0.356	0.399	0.027	0.200	0.296	0.027
mlk9	-0.315	0.533	0.061	0.573	-0.138	-0.373	0.459
dcv9	0.223	-0.203	-0.440	0.235	-0.387	-0.574	0.175
dsh9	-0.018	0.614	-0.220	0.280	-0.150	-0.217	0.422
dcc9	0.041	0.197	0.141	-0.482	0.116	0.634	-0.285
scs9	-0.047	-0.062	0.187	0.305	0.041	-0.017	0.167
fcs9	0.527	0.234	-0.288	-0.091	-0.212	-0.149	0.426
smh9	-0.416	0.297	0.209	0.388	0.318	0.074	-0.179
fmh9	-0.351	0.083	0.351	0.219	-0.008	-0.162	0.019
brl9	0.084	0.284	-0.061	0.199	0.151	-0.251	-0.029
chk9	0.145	0.024	-0.588	0.212	-0.166	-0.137	0.233
egg9	0.090	0.219	0.159	0.055	-0.356	-0.374	0.246
trk9	-0.176	0.032	-0.215	0.223	0.270	-0.047	-0.071
bcv10	-0.116	0.258	-0.171	0.435	-0.420	-0.572	0.379
bsh10	-0.374	0.081	0.304	0.113	-0.087	-0.063	0.346
bcc10	-0.366	-0.077	0.362	-0.095	0.079	0.251	0.089
mlk10	0.473	0.404	-0.334	0.355	-0.242	-0.425	0.445
dcv10	0.262	0.250	-0.433	0.501	-0.517	-0.642	0.637
dsh10	-0.189	0.204	0.073	0.104	-0.148	-0.104	0.330
dcc10	-0.160	0.052	0.152	-0.150	-0.113	0.149	0.122
scs10	-0.462	-0.495	0.174	0.192	0.026	-0.001	0.114
fcs10	0.454	0.200	-0.179	-0.117	-0.309	-0.168	0.455
smh10	-0.014	-0.015	-0.303	0.081	-0.154	-0.172	-0.176
fmh10	-0.228	-0.268	-0.131	0.092	-0.155	-0.178	-0.304
chk10	0.128	-0.344	0.139	-0.228	-0.140	-0.085	-0.004
egg10	0.190	0.156	0.372	-0.380	0.186	0.390	-0.477

Table D.1. (continued)

	dcv6	dsh6	dcc6	scs6	fcs6	smh6	fmh6
dcv6	1.000						
dsh6	0.333	1.000					
dcc6	-0.632	0.289	1.000				
scs6	0.372	0.187	-0.243	1.000			
fcs6	-0.049	-0.139	-0.001	-0.554	1.000		
smh6	0.047	0.476	0.408	0.056	0.076	1.000	
fmh6	0.002	0.138	0.340	-0.105	0.153	0.824	1.000
brl6	0.363	0.007	-0.517	-0.185	0.367	0.012	-0.057
chk6	0.069	0.126	0.073	-0.280	0.540	0.016	-0.050
egg6	0.068	0.062	0.116	0.172	-0.409	0.006	0.156
bcv7	0.037	0.228	0.119	0.079	-0.623	-0.214	-0.261
bsh7	0.242	0.193	0.214	-0.029	-0.236	0.005	0.177
bcc7	-0.341	0.212	0.824	-0.110	-0.160	0.274	0.357
mlk7	0.324	-0.210	-0.521	0.225	-0.169	-0.611	-0.499
dcv7	0.212	0.394	-0.030	0.320	-0.374	-0.051	-0.306
dsh7	0.665	0.392	-0.253	0.255	-0.126	-0.164	-0.100
dcc7	-0.500	0.106	0.819	-0.276	-0.042	0.107	0.284
scs7	0.425	0.156	-0.307	0.972	-0.611	0.015	-0.124
fcs7	-0.044	-0.164	-0.018	-0.544	0.998	0.042	0.132
smh7	-0.040	0.045	0.019	-0.304	0.832	0.305	0.307
fmh7	0.001	-0.074	0.005	-0.358	0.820	-0.110	0.095
chk7	0.220	-0.051	-0.102	0.165	0.118	0.074	0.323
egg7	0.332	0.125	-0.244	-0.060	-0.138	-0.398	-0.431
trk7	0.145	0.004	0.061	0.447	-0.063	-0.119	0.052
bcv8	0.544	-0.002	-0.593	0.273	0.138	0.266	0.135
bsh8	0.092	0.095	0.177	0.055	-0.370	-0.047	-0.143
bcc8	0.006	0.180	0.365	0.201	-0.532	0.113	0.040
mlk8	0.189	-0.201	-0.376	-0.184	0.103	-0.740	-0.637
dcv8	0.358	0.134	-0.504	0.103	0.167	0.253	0.152
dsh8	0.147	0.412	0.189	0.328	-0.435	0.040	-0.211
dcc8	-0.327	0.204	0.751	0.220	-0.379	0.453	0.356
scs8	0.049	0.230	0.058	0.781	-0.470	-0.125	-0.179
fcs8	-0.043	-0.149	-0.026	-0.556	0.998	0.028	0.117
smh8	-0.446	-0.049	0.341	-0.123	0.402	0.069	0.096
fmh8	0.073	-0.097	-0.214	0.009	0.282	-0.028	0.239
brl8	0.231	0.305	-0.064	-0.477	0.332	0.384	0.453
chk8	-0.143	-0.195	-0.056	-0.158	0.549	0.239	0.334
egg8	0.220	-0.132	-0.211	-0.364	0.221	-0.398	-0.193
trk8	0.133	-0.151	-0.403	0.053	0.142	0.100	0.079
bcv9	0.280	-0.080	-0.450	0.282	-0.036	0.075	-0.051
bsh9	0.368	0.152	-0.102	0.053	-0.124	0.071	-0.079
bcc9	-0.028	0.045	0.200	0.199	0.077	0.328	0.256
mlk9	0.541	0.004	-0.340	-0.020	0.062	-0.288	-0.068
dcv9	0.242	-0.224	-0.628	0.236	0.098	-0.106	-0.151
dsh9	0.250	-0.001	-0.224	0.244	-0.140	-0.342	-0.357
dcc9	-0.540	0.045	0.790	-0.224	0.063	0.152	0.186

Table D.1. (continued)

	dcv6	dsh6	dcc6	scs6	fcs6	smh6	fmh6
scs9	0.385	0.213	-0.267	0.938	-0.589	-0.083	-0.197
fcs9	-0.035	-0.105	-0.032	-0.557	0.984	0.027	0.088
smh9	0.265	0.202	0.058	0.090	-0.453	0.207	0.355
fmh9	0.115	-0.098	-0.121	0.274	-0.338	-0.022	0.306
br19	0.253	0.120	-0.244	-0.422	0.310	0.032	0.036
chk9	0.246	0.208	-0.087	-0.111	0.377	-0.277	-0.321
egg9	0.038	-0.341	-0.206	-0.184	0.278	0.071	0.318
trk9	0.023	0.255	0.025	-0.247	-0.063	-0.450	-0.508
bcv10	0.275	-0.350	-0.442	-0.121	0.293	-0.299	0.096
bsh10	0.035	-0.191	-0.095	0.125	-0.199	-0.459	-0.472
bcc10	-0.160	-0.045	0.225	0.146	-0.244	-0.320	-0.394
mlk10	0.244	-0.121	-0.450	0.177	0.249	-0.399	-0.420
dcv10	0.507	-0.210	-0.610	-0.019	0.576	-0.182	0.032
dsh10	0.035	-0.082	-0.109	0.191	-0.230	-0.533	-0.590
dcc10	-0.060	0.029	0.118	0.212	-0.174	-0.350	-0.560
scs10	0.314	0.156	-0.185	0.724	-0.534	-0.032	-0.123
fcs10	-0.043	-0.210	-0.048	-0.538	0.993	0.003	0.100
smh10	0.011	-0.007	-0.088	-0.374	0.016	-0.255	-0.411
fmh10	0.034	-0.142	-0.148	-0.138	-0.223	-0.122	-0.247
chk10	-0.332	-0.282	0.013	0.009	0.066	0.003	0.119
egg10	-0.310	0.289	0.497	-0.286	0.087	0.262	0.266

	br16	chk6	egg6	bcv7	bsh7	bcc7	mlk7
br16	1.000						
chk6	0.275	1.000					
egg6	-0.432	-0.356	1.000				
bcv7	-0.252	-0.259	0.233	1.000			
bsh7	-0.329	0.192	0.123	0.472	1.000		
bcc7	-0.740	0.038	0.339	0.321	0.561	1.000	
mlk7	0.051	-0.045	-0.165	0.259	0.112	-0.317	1.000
dcv7	0.047	-0.072	0.061	0.772	0.137	0.020	0.273
dsh7	-0.045	-0.037	0.434	0.126	0.445	0.000	0.286
dcc7	-0.714	0.014	0.210	0.223	0.491	0.908	-0.170
scs7	-0.169	-0.213	0.237	0.175	0.055	-0.097	0.237
fcs7	0.360	0.549	-0.384	-0.615	-0.236	-0.161	-0.147
smh7	0.173	0.350	-0.126	-0.556	-0.381	-0.121	-0.333
fmh7	0.234	0.447	-0.259	-0.505	-0.180	-0.080	0.178
chk7	-0.190	0.007	0.026	-0.184	0.099	0.187	0.374
egg7	-0.131	-0.128	-0.026	0.263	0.332	-0.074	0.296
trk7	-0.438	0.087	0.107	-0.021	0.266	0.268	0.541
bcv8	0.596	0.101	-0.138	-0.188	-0.199	-0.568	-0.030
bsh8	-0.017	0.081	0.083	0.445	0.550	0.182	-0.113
bcc8	-0.356	0.037	0.264	0.409	0.588	0.481	-0.194

Table D.1. (continued)

	br16	chk6	egg6	bcv7	bsh7	bcc7	mlk7
mlk8	-0.018	0.310	-0.240	0.285	0.296	-0.156	0.739
dcv8	0.600	-0.123	0.003	-0.338	-0.453	-0.585	-0.242
dsh8	-0.005	0.070	0.241	0.459	0.331	0.191	-0.294
dcc8	-0.586	-0.068	0.417	0.232	0.298	0.772	-0.462
scs8	-0.274	-0.350	0.140	0.096	-0.027	0.047	0.247
fcs8	0.378	0.548	-0.395	-0.603	-0.235	-0.177	-0.139
smh8	-0.221	0.247	-0.152	-0.427	-0.181	0.067	-0.051
fmh8	0.115	0.047	0.105	-0.379	-0.170	-0.267	0.271
br18	0.550	0.227	-0.195	-0.203	0.123	-0.233	-0.167
chk8	0.418	0.010	-0.228	-0.296	-0.351	-0.258	-0.093
egg8	0.333	0.027	-0.099	0.214	0.082	-0.098	0.243
trk8	0.396	-0.021	0.271	-0.147	-0.549	-0.490	-0.120
bcv9	0.406	-0.516	-0.115	-0.233	-0.416	-0.657	0.110
bsh9	-0.241	-0.139	-0.021	0.220	0.455	0.131	-0.087
bcc9	-0.168	0.006	0.105	0.024	0.235	0.246	-0.196
mlk9	-0.138	0.206	0.299	0.036	0.515	-0.005	0.365
dcv9	0.717	-0.258	-0.304	-0.323	-0.607	-0.878	0.209
dsh9	-0.368	-0.166	0.015	0.222	0.370	0.028	0.177
dcc9	-0.676	-0.192	0.200	0.056	0.239	0.775	-0.346
scs9	-0.233	-0.208	0.132	0.204	0.130	-0.032	0.282
fcs9	0.396	0.519	-0.465	-0.572	-0.215	-0.196	-0.163
smh9	-0.206	-0.338	0.488	0.463	0.489	0.212	0.148
fmh9	-0.235	-0.162	0.468	0.143	0.266	0.074	0.383
br19	0.508	0.419	0.037	-0.040	0.005	-0.292	-0.172
chk9	0.060	0.258	-0.399	-0.103	-0.021	-0.074	0.574
egg9	-0.084	-0.001	0.162	-0.659	0.019	-0.131	-0.159
trk9	0.031	0.171	-0.085	0.461	0.361	-0.043	0.439
bcv10	0.415	-0.018	0.040	-0.361	0.041	-0.403	0.193
bsh10	-0.259	0.117	0.143	0.170	0.390	0.079	-0.031
bcc10	-0.344	0.078	0.174	0.158	0.368	0.279	-0.207
mlk10	0.218	0.121	-0.308	0.062	0.037	-0.405	0.572
dcv10	0.547	0.146	-0.314	-0.566	-0.183	-0.570	0.347
dsh10	-0.431	-0.065	0.089	0.222	0.326	0.102	0.110
dcc10	-0.589	0.029	0.188	0.144	0.124	0.248	0.028
scs10	-0.148	-0.077	0.056	-0.023	0.040	-0.088	0.185
fcs10	0.351	0.544	-0.363	-0.618	-0.250	-0.181	-0.125
smh10	0.045	-0.240	0.024	0.097	-0.165	-0.180	0.082
fmh10	0.097	-0.265	0.126	0.116	-0.218	-0.252	0.226
chk10	-0.078	-0.036	-0.155	-0.304	-0.202	-0.102	-0.038
egg10	-0.347	-0.214	0.604	-0.104	-0.132	0.405	-0.551

Table D.1. (continued)

	dcv7	dsh7	dcc7	scs7	fcs7	smh7	fmh7
dcv7	1.000						
dsh7	0.139	1.000					
dcc7	-0.138	-0.050	1.000				
scs7	0.370	0.272	-0.314	1.000			
fcs7	-0.360	-0.113	-0.044	-0.596	1.000		
smh7	-0.209	-0.132	-0.083	-0.363	0.831	1.000	
fmh7	-0.301	0.071	0.122	-0.437	0.828	0.659	1.000
chk7	-0.184	0.184	0.199	0.171	0.129	0.117	0.437
egg7	0.053	0.391	0.043	-0.083	-0.134	-0.237	-0.172
trk7	0.052	0.330	0.327	0.393	-0.042	-0.025	0.375
bcv8	0.235	0.107	-0.762	0.326	0.150	0.236	-0.115
bsh8	0.302	0.207	0.046	0.108	-0.373	-0.519	-0.508
bcc8	0.148	0.179	0.255	0.288	-0.546	-0.576	-0.549
mlk8	0.164	0.203	0.009	-0.131	0.126	-0.124	0.240
dcv8	-0.048	0.088	-0.667	0.120	0.162	0.316	-0.030
dsh8	0.506	0.301	-0.081	0.405	-0.436	-0.396	-0.531
dcc8	0.139	-0.064	0.541	0.234	-0.382	-0.244	-0.384
scs8	0.216	0.249	0.095	0.669	-0.462	-0.324	-0.099
fcs8	-0.357	-0.112	-0.049	-0.609	0.998	0.828	0.833
smh8	-0.319	-0.213	0.288	-0.248	0.389	0.465	0.486
fmh8	-0.299	0.134	-0.053	-0.049	0.280	0.387	0.573
br18	-0.217	0.111	-0.093	-0.495	0.305	0.240	0.241
chk8	0.070	-0.229	-0.177	-0.227	0.555	0.589	0.455
egg8	0.031	0.023	-0.013	-0.332	0.219	-0.014	0.339
trk8	0.180	-0.157	-0.545	0.085	0.167	0.442	0.031
bcv9	0.044	0.157	-0.623	0.173	-0.046	-0.004	-0.146
bsh9	0.094	0.346	-0.051	0.093	-0.139	-0.146	-0.432
bcc9	0.261	0.145	0.113	0.185	0.091	0.183	-0.129
mlk9	-0.099	0.675	0.038	0.028	0.084	0.026	0.172
dcv9	0.012	-0.066	-0.807	0.169	0.093	0.067	0.090
dsh9	0.102	0.320	0.045	0.226	-0.134	-0.078	-0.233
dcc9	-0.175	-0.069	0.814	-0.307	0.051	0.038	0.034
scs9	0.326	0.283	-0.182	0.947	-0.578	-0.384	-0.369
fcs9	-0.332	-0.118	-0.054	-0.621	0.982	0.808	0.784
smh9	0.267	0.425	0.184	0.114	-0.454	-0.312	-0.288
fmh9	0.029	0.322	0.130	0.312	-0.321	-0.167	0.047
br19	0.041	0.070	-0.259	-0.359	0.325	0.312	0.113
chk9	0.012	0.208	0.119	-0.202	0.376	0.169	0.630
egg9	-0.800	0.200	-0.029	-0.197	0.278	0.247	0.136
trk9	0.392	0.423	0.110	-0.241	-0.062	-0.245	0.066
bcv10	-0.383	0.386	-0.224	-0.149	0.311	0.097	0.418
bsh10	0.003	0.311	-0.050	0.214	-0.187	-0.313	-0.360
bcc10	-0.011	0.244	0.159	0.188	-0.241	-0.364	-0.365

Table D.1. (continued)

	dcv7	dsh7	dcc7	scs7	fcs7	smh7	fmh7
mlk10	0.383	0.262	-0.300	0.145	0.272	0.185	0.260
dcv10	-0.349	0.277	-0.417	-0.083	0.583	0.393	0.663
dsh10	0.043	0.348	0.045	0.232	-0.221	-0.283	-0.322
dcc10	0.101	0.223	0.140	0.222	-0.160	-0.126	-0.259
scs10	-0.018	0.184	-0.207	0.728	-0.539	-0.453	-0.290
fcs10	-0.362	-0.108	-0.068	-0.585	0.997	0.825	0.819
smh10	0.021	0.207	-0.148	-0.386	0.013	-0.142	-0.143
fmh10	0.104	0.094	-0.273	-0.126	-0.219	-0.325	-0.270
chk10	-0.246	-0.137	-0.024	-0.025	0.079	0.073	0.089
egg10	-0.185	0.194	0.411	-0.326	0.088	0.296	0.054

	chk7	egg7	trk7	bcv8	bsh8	bcc8	mlk8
chk7	1.000						
egg7	-0.309	1.000					
trk7	0.610	-0.053	1.000				
bcv8	0.003	-0.181	-0.234	1.000			
bsh8	-0.631	0.285	-0.137	-0.017	1.000		
bcc8	-0.252	-0.036	0.055	-0.246	0.767	1.000	
mlk8	0.042	0.593	0.271	-0.220	0.055	-0.135	1.000
dcv8	0.035	-0.208	-0.505	0.710	-0.400	-0.468	-0.405
dsh8	-0.470	-0.024	-0.215	0.127	0.714	0.713	-0.216
dcc8	-0.025	-0.385	0.161	-0.241	0.380	0.687	-0.536
scs8	0.127	0.053	0.528	-0.180	-0.014	0.052	-0.106
fcs8	0.112	-0.121	-0.060	0.129	-0.375	-0.549	0.144
smh8	-0.080	-0.121	0.375	-0.428	-0.165	-0.137	0.065
fmh8	0.296	-0.164	0.448	-0.130	-0.408	-0.347	0.114
br18	-0.135	0.131	-0.290	0.169	0.034	-0.217	-0.070
chk8	0.144	-0.455	-0.064	0.457	-0.383	-0.622	-0.269
egg8	-0.004	0.246	-0.132	-0.247	-0.014	-0.134	0.423
trk8	-0.216	-0.196	-0.232	0.560	-0.215	-0.460	-0.175
bcv9	-0.232	0.115	-0.171	0.507	0.050	-0.265	-0.253
bsh9	-0.180	0.510	-0.192	0.164	0.414	0.394	0.122
bcc9	0.020	-0.162	0.062	0.417	0.132	0.015	-0.271
mlk9	0.086	0.600	0.391	-0.015	0.228	0.086	0.565
dcv9	-0.129	-0.157	-0.178	0.536	-0.141	-0.409	-0.152
dsh9	-0.236	0.778	0.096	-0.088	0.242	0.068	0.468
dcc9	0.024	0.021	0.080	-0.621	0.017	0.192	-0.191
scs9	0.231	0.053	0.416	0.171	0.019	0.211	-0.013
fcs9	0.047	-0.019	-0.126	0.147	-0.346	-0.581	0.156
smh9	-0.047	0.211	0.258	-0.048	0.442	0.374	-0.028
fmh9	0.413	-0.196	0.623	-0.069	-0.042	0.125	0.047
br19	-0.414	0.300	-0.410	0.335	0.149	-0.276	0.182
chk9	0.349	0.372	0.443	-0.286	-0.316	-0.376	0.596
egg9	0.166	0.100	-0.008	0.099	-0.209	-0.169	-0.095
trk9	-0.299	0.452	0.107	-0.274	0.426	0.175	0.599

Table D.1. (continued)

	chk7	egg7	trk7	bcv8	bsh8	bcc8	mlk8
bcv10	0.131	0.121	0.120	0.214	-0.026	-0.317	0.108
bsh10	-0.344	0.278	-0.075	-0.048	0.570	0.579	0.262
bcc10	-0.401	0.157	-0.079	-0.239	0.607	0.675	0.048
mlk10	0.035	0.262	0.243	0.364	-0.064	-0.420	0.530
dcv10	0.358	0.122	0.201	0.350	-0.383	-0.597	0.237
dsh10	-0.210	0.493	0.010	-0.180	0.323	0.359	0.386
dcc10	-0.229	0.394	0.136	-0.260	0.272	0.368	0.294
scs10	0.138	-0.033	0.409	-0.034	0.179	0.460	-0.080
fcs10	0.119	-0.130	-0.035	0.160	-0.361	-0.539	0.147
smh10	-0.280	0.400	-0.364	-0.026	0.158	-0.021	0.161
fmh10	-0.202	0.097	-0.147	0.112	0.259	0.135	0.023
chk10	0.252	-0.334	0.168	0.168	-0.196	-0.159	-0.222
egg10	-0.037	-0.076	-0.198	-0.258	-0.213	-0.086	-0.444

	dcv8	dsh8	dcc8	scs8	fcs8	smh8	fmh8
dcv8	1.000						
dsh8	-0.008	1.000					
dcc8	-0.388	0.499	1.000				
scs8	-0.114	0.200	0.165	1.000			
fcs8	0.167	-0.434	-0.411	-0.460	1.000		
smh8	-0.381	-0.361	-0.003	0.133	0.401	1.000	
fmh8	0.028	-0.522	-0.375	0.160	0.303	0.635	1.000
br18	0.285	-0.228	-0.370	-0.369	0.328	0.103	0.342
chk8	0.438	-0.314	-0.213	-0.096	0.547	0.158	0.264
egg8	-0.089	-0.133	-0.447	-0.194	0.256	-0.149	0.175
trk8	0.498	-0.138	-0.262	-0.158	0.160	-0.010	0.270
bcv9	0.454	-0.050	-0.310	0.184	-0.051	-0.082	0.075
bsh9	-0.032	0.323	0.101	-0.240	-0.148	-0.338	-0.512
bcc9	0.166	0.239	0.381	0.063	0.060	-0.066	-0.267
mlk9	-0.245	-0.097	-0.259	-0.080	0.083	0.073	0.321
dcv9	0.547	-0.127	-0.544	0.161	0.103	-0.054	0.276
dsh9	-0.187	0.106	-0.201	0.220	-0.126	0.016	-0.123
dcc9	-0.425	0.009	0.558	0.075	0.044	0.266	-0.213
scs9	0.080	0.347	0.139	0.761	-0.582	-0.231	-0.060
fcs9	0.195	-0.414	-0.457	-0.435	0.985	0.359	0.227
smh9	-0.273	0.119	0.239	0.070	-0.456	-0.051	0.216
fmh9	-0.194	-0.168	0.098	0.278	-0.325	0.182	0.622
br19	0.274	-0.026	-0.394	-0.456	0.333	-0.078	0.074
chk9	-0.277	-0.426	-0.438	0.115	0.390	0.263	0.255
egg9	0.224	-0.421	-0.182	-0.251	0.264	0.199	0.306
trk9	-0.381	0.238	-0.190	0.001	-0.039	0.132	0.021
bcv10	0.223	-0.250	-0.487	0.047	0.311	-0.008	0.442
bsh10	-0.220	0.584	0.172	-0.022	-0.191	-0.151	-0.385
bcc10	-0.294	0.696	0.408	0.146	-0.243	-0.047	-0.431

Table D.1. (continued)

	dcv8	dsh8	dcc8	scs8	fcs8	smh8	fmh8
mlk10	0.121	-0.091	-0.486	0.175	0.276	0.085	0.141
dcv10	0.366	-0.493	-0.724	0.007	0.589	0.081	0.512
dsh10	-0.216	0.405	0.037	0.143	-0.220	-0.131	-0.388
dcc10	-0.391	0.347	0.271	0.118	-0.175	0.066	-0.400
scs10	-0.156	0.284	0.183	0.553	-0.543	-0.039	0.067
fcs10	0.149	-0.436	-0.386	-0.474	0.993	0.386	0.278
smh10	0.010	0.032	-0.146	-0.358	0.006	-0.264	-0.409
fmh10	-0.080	0.020	0.032	-0.268	-0.239	-0.227	-0.239
chk10	0.045	-0.190	0.058	0.043	0.043	0.068	-0.036
egg10	0.159	0.036	0.343	-0.067	0.079	0.082	-0.036

	br18	chk8	egg8	trk8	bcv9	bsh9	bcc9
br18	1.000						
chk8	0.228	1.000					
egg8	0.176	-0.044	1.000				
trk8	0.151	0.443	-0.037	1.000			
bcv9	0.147	0.341	-0.168	0.294	1.000		
bsh9	-0.111	-0.358	-0.108	-0.357	0.166	1.000	
bcc9	-0.143	0.498	-0.540	0.060	0.170	0.284	1.000
mlk9	0.223	-0.327	0.157	0.013	-0.080	0.311	-0.073
dcv9	0.166	0.434	0.097	0.438	0.799	-0.252	-0.151
dsh9	-0.226	-0.312	0.061	-0.186	0.076	0.634	0.155
dcc9	-0.267	-0.027	-0.102	-0.514	-0.286	0.184	0.343
scs9	-0.495	-0.277	-0.241	-0.094	0.061	0.099	0.127
fcs9	0.363	0.547	0.250	0.132	-0.012	-0.086	0.083
smh9	0.320	-0.162	-0.040	0.062	0.150	0.154	0.060
fmh9	0.078	0.000	-0.150	0.139	-0.057	-0.327	-0.022
br19	0.646	0.127	0.202	0.577	-0.033	-0.103	-0.080
chk9	0.083	-0.073	0.390	-0.299	-0.076	-0.074	-0.330
egg9	0.267	0.028	-0.308	0.025	0.167	0.167	0.115
trk9	0.186	-0.203	0.134	-0.284	-0.018	0.137	-0.078
bcv10	0.395	0.310	0.249	0.171	0.335	-0.218	-0.076
bsh10	-0.439	-0.470	-0.112	-0.317	-0.107	0.572	0.143
bcc10	-0.462	-0.461	-0.164	-0.456	-0.158	0.447	0.189
mlk10	-0.081	0.453	0.003	0.128	0.325	0.104	0.449
dcv10	0.345	0.395	0.369	0.172	0.374	-0.142	-0.137
dsh10	-0.535	-0.502	-0.105	-0.426	-0.083	0.640	0.118
dcc10	-0.653	-0.563	-0.252	-0.287	-0.147	0.546	0.101
scs10	-0.306	-0.589	-0.180	-0.199	0.039	0.012	-0.379
fcs10	0.270	0.543	0.214	0.190	-0.033	-0.130	0.088
smh10	-0.003	-0.213	-0.005	-0.111	0.356	0.427	-0.109
fmh10	-0.020	-0.190	-0.167	0.093	0.441	0.168	-0.133
chk10	-0.105	0.246	-0.590	-0.012	0.142	-0.172	0.155
egg10	0.066	0.063	-0.248	0.084	-0.108	-0.043	0.201

Table D.1. (continued)

	mlk9	dcv9	dsh9	dcc9	scs9	fcs9	smh9
mlk9	1.000						
dcv9	-0.229	1.000					
dsh9	0.508	-0.196	1.000				
dcc9	-0.180	-0.621	0.152	1.000			
scs9	0.027	0.077	0.358	-0.207	1.000		
fcs9	0.069	0.112	-0.037	0.050	-0.563	1.000	
smh9	0.482	-0.126	0.077	-0.041	0.001	-0.475	1.000
fmh9	0.410	-0.015	-0.137	-0.209	0.232	-0.410	0.668
br19	0.383	0.053	0.000	-0.430	-0.409	0.370	0.137
chk9	0.275	-0.023	0.126	0.017	-0.060	0.395	-0.173
egg9	0.404	-0.002	0.124	0.053	-0.218	0.247	0.020
trk9	0.371	-0.109	0.215	-0.016	-0.185	-0.013	0.314
bcv10	0.435	0.453	-0.002	-0.322	-0.146	0.313	0.158
bsh10	0.299	-0.222	0.521	0.089	0.216	-0.181	-0.087
bcc10	0.077	-0.303	0.393	0.340	0.213	-0.232	-0.129
mlk10	0.239	0.301	0.424	-0.186	0.194	0.315	-0.110
dcv10	0.344	0.554	0.053	-0.403	-0.042	0.589	-0.180
dsh10	0.290	-0.279	0.732	0.222	0.335	-0.174	-0.169
dcc10	0.241	-0.413	0.576	0.332	0.244	-0.168	-0.164
scs10	0.093	0.145	0.059	-0.352	0.703	-0.569	0.099
fcs10	0.108	0.105	-0.123	0.035	-0.580	0.972	-0.451
smh10	0.076	0.068	0.056	0.086	-0.430	0.032	0.034
fmh10	0.039	0.234	-0.254	-0.172	-0.312	-0.273	0.303
chk10	-0.168	0.169	-0.278	-0.100	-0.056	0.046	-0.107
egg10	-0.067	-0.369	-0.148	0.553	-0.323	0.069	0.075

	fmh9	br19	chk9	egg9	trk9	bcv10	bsh10
fmh9	1.000						
br19	-0.093	1.000					
chk9	-0.127	-0.045	1.000				
egg9	0.190	0.118	-0.172	1.000			
trk9	0.102	0.170	0.360	-0.235	1.000		
bcv10	0.329	0.306	0.036	0.479	0.071	1.000	
bsh10	-0.145	-0.135	-0.287	0.148	0.281	-0.001	1.000
bcc10	-0.223	-0.272	-0.307	0.034	0.253	-0.118	0.917
mlk10	0.011	0.070	0.331	-0.062	0.395	0.239	0.120
dcv10	0.049	0.204	0.468	0.360	-0.102	0.740	-0.234
dsh10	-0.222	-0.271	-0.041	0.112	0.313	-0.110	0.890
dcc10	-0.273	-0.270	0.088	0.002	0.234	-0.406	0.718
scs10	0.289	-0.381	-0.007	-0.091	-0.141	-0.061	0.222
fcs10	-0.309	0.324	0.365	0.294	-0.057	0.322	-0.151
smh10	-0.372	0.064	0.163	0.090	0.421	-0.029	0.219
fmh10	0.020	0.009	-0.011	0.030	0.300	-0.025	0.055
chk10	0.216	-0.196	-0.215	0.320	-0.077	0.273	0.025
egg10	-0.041	0.078	-0.203	0.262	-0.049	-0.066	-0.095

Table D.1. (continued)

	bcc10	mlk10	dcv10	dsh10	dcc10	scs10	fcs10
bcc10	1.000						
mlk10	-0.029	1.000					
dcv10	-0.390	0.425	1.000				
dsh10	0.809	0.244	-0.200	1.000			
dcc10	0.695	0.087	-0.371	0.831	1.000		
scs10	0.226	-0.277	-0.037	0.187	0.220	1.000	
fcs10	-0.221	0.284	0.584	-0.194	-0.126	-0.531	1.000
smh10	0.154	0.000	-0.090	0.298	0.378	-0.247	0.039
fmh10	-0.021	-0.107	-0.163	-0.022	0.166	0.021	-0.180
chk10	-0.024	0.002	0.033	-0.003	-0.051	0.090	0.093
egg10	0.072	-0.351	-0.294	-0.016	0.129	-0.383	0.078

	smh10	fmh10	chk10	egg10
smh10	1.000			
fmh10	0.795	1.000		
chk10	0.105	0.208	1.000	
egg10	0.282	0.049	0.089	1.000