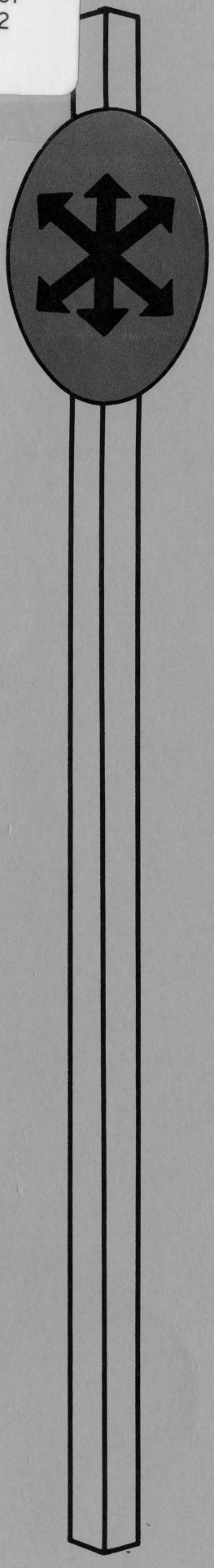

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An Impact Analysis of the Dairy Herd Buyout Program on the U.S. Feeder Cattle Industry

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ABSTRACT

AN IMPACT ANALYSIS OF THE DAIRY HERD BUYOUT PROGRAM
ON THE U.S. FEEDER CATTLE INDUSTRY

Dairy production decisions are considered to be determined outside the beef cattle industry. However, through its effects on nonfed cattle marketings, a dairy herd buyout program affects both feeder and slaughter cattle prices in the U.S. feeder cattle industry. An impact analysis of a year-long buyout program indicates relatively severe first quarter price effects. However, by the second quarter price flexibilities show lessened relative price impacts, even though prices continue to decline in absolute terms. Within two years, reduced beef cattle numbers lead to higher prices that would have occurred without the buyout program.

AN IMPACT ANALYSIS OF THE DAIRY HERD BUYOUT PROGRAM ON THE U.S. FEEDER CATTLE INDUSTRY

Dairy production and beef production are two separate sectors with important areas of interdependence between them. At the farm level, dairy production competes with beef production for some inputs, particularly grazing land. Dairy calves that are not kept for replacement or slaughtered for veal may go into feedlots or be grown on grass. Cull dairy cows are also sold for slaughter and thereby increase the supply of nonfed beef. While the dairy industry influences the beef cattle production, it appears that conditions in the beef cattle industry have limited effect on the dairy industry.

The Dairy Herd Buyout Program,[1] introduced by the 1985 Farm Bill, contains authority for future cuts in the surplus of dairy products (Beck, Wade, and Infanger; 1986). However, because of the linkage between the two sectors, the program raises important questions about the future profitability and economic survival of the beef cattle industry.

This paper examines the extent to which the dairy herd buyout program affects the U.S. feeder cattle industry in order to provide beef cattle producers with useful information pertaining to their future economic survival. In order to fulfill this objective, (1) an econometric model of the U.S. feeder cattle industry is fitted, using quarterly series from 1965 to 1983, (2) an impact analysis is performed to determine supply-price effects on the feeder cattle sector

[1]The dairy herd buyout is authorized for the 18-month period from April 1, 1986 to September 30, 1987; period during which the disposal of dairy cows takes place.

THE ECONOMIC MODEL

The basic explanatory relationships are specified from neoclassical theory. The theory of demand suggests that quantity is the appropriate dependent variable. However, because prices are important coordinators among various segments of the U.S. beef cattle industry, demand equations at each market level are normalized to yield prices as dependent variables. Inverted demand, supply, and inventories are simultaneously determined within the model. Dairy production decisions are considered predetermined outside the beef cattle industry. Through its effects on nonfed cattle marketings, the dairy herd buyout program affects slaughter cattle prices which, in turn, affect feeder cattle prices and beef cow inventories. Due to space limitations, only parts of the model of the U.S. feeder cattle industry which are directly affected by the program are discussed here. Functions not presented include the calf crop, feeder cattle inventories, beef heifer replacements, feeder cattle imports, beef cow inventories, and cattle on feed.

Nonfed Cattle Marketings

Nonfed slaughter cattle are defined to include all cattle coming from cull beef and dairy cows, bulls and stags, and grass-fed steers and heifers Consequently, nonfed cattle marketings function is specified as:

$$NSC_{qt} = f(NCP_{qt}, NCP^{e}_{qt}, PCN_{qt}, RC_{qt}, FCI_{qt}, DCI_{qt}, BCI_{qt}, NSC_{qt-1}) \quad (1)$$

Where NCP and NCP^{e} are current and expected nonfed cattle prices, and PCN, RC, FCI, DCI, BCI, and NSC_{qt-1} are corn price, range conditions,

feeder cattle inventories, dairy cow inventories, beef cow inventories, and lagged nonfed cattle marketings respectively.

Dairy cow inventories are treated exogenous to the model because dairy production decisions are considered determined outside the beef cattle industry. Increased beef and dairy cow inventories should reduce nonfed cattle marketings. Good range conditions encourage the grass fattening of cattle, but may also encourage producers to feed their animals to heavier weights, causing some deferment of slaughterings (Bain, 1977). Thus, no a priori expectation as to the sign of the coefficient of this variable can be made. High feeder cattle inventories and corn prices are expected to be associated with increased nonfed cattle slaughter.

Nonfed Slaughter Cattle Price

Once cattle reach slaughter weight, they are sold to packers for slaughter. The demand for slaughter cattle is derived from the demand for beef packers produce and is governed by input demand theory. However, movements in current nonfed cattle price must enable the market to clear. Consequently, nonfed cattle price function is specified as:

$$NCP_{qt} = f(NSC_{qt}, PFC_{qt}, WR_{qt}, IR_{qt}, NBP_{qt}, NSC_{qt-1}) \qquad (2)$$

Large nonfed cattle slaughter or marketings (NSC) would reduce nonfed cattle prices. Fed cattle price (PFC), nonfed beef price (NBP), wage rates in the meatpacking industry (WR), and interest rates (IR) are also specified as explanatory variables.

Fed Slaughter Cattle Price

Fed slaughter cattle price is specified as an inversion of the demand for fed beef cattle, which is derived from the demand for fed beef. The function is specified as:

$$PFC_{qt} = f(FSC_{qt}, NCP_{qt}, FBP_{qt}, WR_{qt}, IR_{qt}, FSC_{qt-1}) \quad (3)$$

Where variables not previously defined are FSC, fed cattle marketings, FBP, fed beef price, and FSC_{qt-1}, lagged fed cattle marketings. Increased fed beef prices are expected to be associated with increased demand for fed slaughter cattle, causing fed cattle prices to rise.

Fed Cattle Marketings

Neoclassical theory suggests that output supply is a function of all input and output prices. Accordingly, fed cattle marketings are expected to respond to current and expected fed cattle prices, current corn prices, interest rates, and cattle on feed.

$$FSC_{qt} = f(PFC_{qt}, PFC^{e}_{qt}, PCN_{qt}, IR_{qt}, COF_{qt}, FSC_{qt-1}) \quad (4)$$

Where variables not previously defined are PFC^{e}, fed cattle price in the next quarter,and COF, beginning quarter cattle on feed. Fed cattle marketings are expected to be positively influenced by current fed cattle price, and cattle on feed, but negatively related to expected fed cattle price, corn price, and interest rates.

Feeder Cattle Price

Input demand theory suggests that feedlot operators' demand for feeder cattle includes all input prices and price of output produced. However, movements in current feeder cattle prices must enable the

market to clear. As a result, a price dependent function is specified so that placements can be determined by supply-demand equilibrium condition.

$$FCP_{qt} = f(FLP_{qt}, PFC^{e}_{qt}, IR_{qt}, PCN_{qt}, FLP_{qt-1}) \quad (5)$$

Where the previously undefined variables are FLP, feeder cattle placements, and FLP_{qt-1}, lagged placements. Feeder cattle price is expected to be negatively influenced by placements, corn price, and interest rates but positively by expected fed cattle price.

Feeder Cattle Supply

The supply of feeder cattle for feedlot placements from cow-calf and backgrounding operations is specified to reflect opportunity costs of retention on pasture for additional period. This function is specified as:

$$FLP_{qt} = f(FCP_{qt}, FCI_{qt}, NCP^{e}_{qt}, IR_{qt}, FLP_{qt-1}, SD_{qt}) \quad (6)$$

Where variables not previously defined are NCP^{e}, expected nonfed cattle price, and SD, seasonal dummies. Placements are expected to be inversely related to expectations of higher future nonfed cattle prices, but positively related to current feeder cattle price, inventories, and interest rates.

Price Expectations

Price expectations are of the "quasi-rational" form suggested by Nerlove (1983, pp. 1251-1279) and whose general validity for beef cattle analysis has been indicated by the work of Bessler (1982, pp. 16-23). These expectations take the weighted average form for both

nonfed and fed cattle prices:

$$NCP^{e}_{qt} = aNCP_{qt} + (1-a)NCP_{qt-1} \quad (7)$$

$$PFC^{e}_{qt} = bPFC_{qt} + (1-b)PFC_{qt-1} \quad (8)$$

In estimating the model these functions are substituted into equations (1), (4), (5), and (6) to eliminate the unobservable expectations variables.

The Submodel

Equations (1) through (8) specify a submodel within the overall beef cattle industry model which traces the effects of a change in dairy cow inventories through to feeder cattle prices and the supply of feedlot placements. The overall model contains 11 structural equations and 5 identities and is of the general linear form:

$$GY_t + AY_{t-j} + BX_t = U_t \quad (9)$$

Where Y_t = TXN matrix of endogenous variables,

Y_{t-j} = TXN matrix of lagged endogenous variables,

X_t = MXN matrix of exogenous variables,

U_t = TXN matrix of stochastic disturbance terms,

G = TXT matrix of coefficients on endogenous variables,

A = TXT matrix of coefficients on lagged endogenous variables,

B = TXM matrix of coefficients on exogenous variables.

Intercepts can be obtained by setting X_t=1 for all t where desirable. Lagged endogenous variables are included because of the expected price functions and because of distributed lags in the other functions of the model.

Table 1. 3SLS Estimates for Submodel of the U.S. Feeder Cattle Industry with Standard Errors in Parentheses.[a,b]

Nonfed Cattle Marketings

$$NSC_{qt} = \underset{(669.1804)}{1220.3880} - \underset{(23.0386)}{75.1802}\, NCP_{qt} + \underset{(25.6919)}{8.7450}\, NCP_{qt-1} - \underset{(4.3327)}{4.9501}\, RC_{qt}$$
$$+ \underset{(149.4414)}{571.6934}\, PCN_{qt} + \underset{(.0096)}{.0561}\, FCI_{qt} - \underset{(.0137)}{.0276}\, BCI_{qt}$$
$$- \underset{(.0137)}{.0276}\, DCI_{qt} + \underset{(.0575)}{.5040}\, NSC_{qt-1}$$

Nonfed Cattle Price

$$NCP_{qt} = \underset{(1.6019)}{-2.5626} - \underset{(.000163)}{.001066}\, NSC_{qt} + \underset{(.05447)}{.7358}\, PFC_{qt} - \underset{(.0418)}{.0265}\, IR_{qt}$$
$$+ \underset{(.4519)}{.7306}\, WR_{qt} + \underset{(2.3542)}{.997}\, NBP_{qt} + \underset{(.00015)}{.00044}\, NSC_{qt-1}$$

Fed Cattle Price

$$PFC_{qt} = \underset{(1.7212)}{3.1534} - \underset{(.000193)}{.000275}\, FSC_{qt} + \underset{(.0370)}{.9162}\, NCP_{qt} - \underset{(.0376)}{.0742}\, IR_{qt}$$
$$- \underset{(.4956)}{.7939}\, WR_{qt} + \underset{(1.6270)}{11.8530}\, FBP_{qt} + \underset{(.000156)}{.000133}\, FSC_{qt-1}$$

Fed Cattle Marketings

$$FSC_{qt} = \underset{(551.1632)}{2122.4060} - \underset{(22.5550)}{36.9159}\, PFC_{qt} + \underset{(20.8965)}{9.5618}\, PFC_{qt-1}$$
$$- \underset{(148.5497)}{151.1445}\, PCN_{qt} - \underset{(16.8404)}{16.2840}\, IR_{qt} + \underset{(.0349)}{.1650}\, COF_{qt}$$
$$+ \underset{(.0725)}{.5212}\, FSC_{qt-1}$$

Feeder Cattle Price

$$FCP_{qt} = \underset{(2.0210)}{-13.111} + \underset{(.000128)}{.00019}\, FLP_{qt} + \underset{(.0924)}{1.3909}\, PFC_{qt} + \underset{(.0895)}{.4475}\, PFC_{qt-1}$$
$$- \underset{(.6318)}{4.9535}\, PCN_{qt} - \underset{(.0741)}{.1362}\, IR_{qt} + \underset{(.00012)}{.0024}\, FLP_{qt-1}$$

Feeder Cattle Supply to Feedlots

$$
\begin{aligned}
6.\quad FLP_{qt} = {} & 860.4165 + 315.6927\ FCP_{qt} - 334.5920\ NCP_{qt} \\
& (1533.2800)\quad (78.7154)\qquad\quad (153.7453) \\
& - 266.8341\ NCP_{qt-1} + .0937\ FCI_{qt} + 30.2418\ IR_{qt} \\
& \quad (69.9156)\qquad\quad (.0296)\qquad\quad (33.1523) \\
& + .1808\ FLP_{qt-1} + 786.8734\ S_2 + 720.2084\ S_3 \\
& \quad (.1254)\qquad\quad (376.2802)\qquad\quad (476.9016) \\
& + 2947.3520\ S_4 \\
& \quad (435.2654)
\end{aligned}
$$

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[a]Quantities are specified in terms of cattle numbers (1,000) head for feeder and slaughter cattle markets.

[b]Variable definition: FCP =feeder cattle price, FCI = feeder cattle inventories, BCI = beef cow inventories, DCI = dairy cow inventories, RC = range conditions, PFC = fed cattle price, NCP = nonfed cattle price, CS = calf slaughter, FCS = feeder cattle supply, FLP = feedlot placements, FSC = fed cattle marketings, FSD = demand for fed cattle, NSC = nonfed cattle marketings, NSD = demand for nonfed cattle, COF = cattle on feed, IR = interest rates, WR = wage rates in meat packing industry, FBP = fed beef price, NBP = nonfed beef price.

Parameters for the submodel are estimated wthin the overall model by means of Three-Stage Least Squares on quarterly data for 1965-1983. Details of the overall model's specification and estimation are presented in Bedingar (1986). Estimates of equations (1) through (6), transformed to eliminate the unobservable price expectations variables are presented in table 1. The overall estimated model can be found in appendix A, table 2.

Impact Analysis of the Dairy Herd Buyout Program

Impact analysis indicates the net impact of a change in current value of an exogenous variable on current values of endogenous variables. As such, it provides very useful information for policy evaluation and decisionmaking. Consequently, the analysis is done to determine the impact of the dairy herd buyout program on feeder and slaughter cattle prices, supplies, and inventories in the U.S. feeder cattle sector. First, a dynamic simulation of the model is performed over 25 quarters with all exogenous variables held constant at their mean values. Second, an additional simulation is run by increasing dairy cow slaughter at a rate of 250 thousand head per quarter for one year. The results are then compared with the first-run solutions. Differences in the resulting values of the endogenous variables are attributed to the change in dairy cow slaughter and can be interpreted as policy multipliers (Intriligator, 1978, p. 552). Due to space limitations, only the results for first five quarters and years after the initial increase in dairy cow slaughter are reported in table 3. From this table, it is clear that increased dairy cow slaughter in the first quarter for instance causes a reduction of $3.38/cwt in feeder cattle prices, $2.58/cwt in fed cattle prices,

Table 3. Net Impact of a 250 Thousand Head Increase in Dairy Cow Slaughter on the U.S. Feeder Cattle Industry

A. First Five Quarters of the Effective Change

	Prices[a]			Quantities[b]		
	FCP	PFC	NCP	FLP	FSC	NSC
1	-3.38	-2.58	-2.90	-25	21	322
2	-6.44	-3.74	-4.09	28	37	511
3	-7.02	-3.83	-4.16	82	49	607
4	-7.22	-4.00	-4.32	88	61	659
5	-3.83	-1.42	-1.42	99	46	360

B. First Five Years of the Effective Change in the First Year

	FCP	PFC	NCP	FLP	FSC	NSC
1	-4.22	-3.54	-3.87	43	42	525
2	-1.55	-0.58	-0.58	-13	17	166
3	0.42	0.26	0.26	-116	-68	-34
4	1.03	0.68	0.64	-147	-126	-84
5	1.32	0.84	0.81	-164	-154	-110

[a]nominal Prices are in $/cwt.

[b]Quantities are in 1,000 head.

$2.90/cwt in nonfed cattle prices, 25,000 head in feedlot placements, but an increase of 21,000 head in fed cattle marketings, and 322, 000 head in nonfed cattle marketings.

Apparently, the reduction in nonfed slaughter cattle prices induces additional culling from beef cow inventories. This is reflected in the increase of nonfed slaughter cattle marketings after the initial increase in dairy cow slaughter took effect. In the long run, the additional impact is to further reduce feedlot placements, fed and nonfed cattle marketings. Consequently, reduced cattle numbers lead to higher prices in the subsequent years (see table 3.b).

Although the absolute values of price declines shown in table 3 increase through the four quarters that the simulated buyout program operates, the relative effect on prices is at its maximum in the first quarter. For feeder cattle prices, the first quarter price flexibility is 2.02. That is, feeder cattle prices decrease by 2.02 percent for each 1 percent decrease in dairy cow inventory. Feeder cattle price flexibility declines to 1.92 in the second quarter, 1.40 in the third quarter, and 1.08 in the fourth quarter. Similar patterns occur for fed and nonfed slaughter cattle prices. First quarter price flexibilities are estimated to be 1.68 and 2.82 for fed and nonfed slaughter cattle respectively. These results suggest that the period of greatest relative price shock occurs at the beginning of the buyout program. Even though the simulated program extends over four quarters, the process of adjustment in the beef cattle industry is sufficiently rapid (at least,in this model) to begin to blunt its price effects within a very few months.

Conclusions

The impact analysis indicates that the model responds in a logical and stable manner in response to an exogenous change in dairy cow inventories and suggests the magnitude of changes in feeder and slaughter cattle prices in the U.S. feeder cattle industry as a result of the dairy herd buyout program. As such, this analysis provides the evidence that the dairy buyout, at least in the short run, has a negative impact on the feeder cattle sector.

APPENDIX A

Table 2. 3SLS Estimates for the U.S. Feeder Cattle Industry with Standard Errors in Parentheses.[a,b]

Feeder Cattle Market

Annual Calf Crop

1. $CC_t = \underset{(3135.0220)}{7731.9020} + \underset{(.0638)}{.6790}\ BDC_{t-1} + \underset{(43.0281)}{47.5618}\ FCP_{t-1} + \underset{(20.4612)}{65.6422}\ FOT_{t-1}$

$$- \underset{(5.5566)}{32.0054}\ FPI_{t-1} \qquad R^2 = .94$$

Quarterly Calf Crop

2. $CC_{qt} = d_i * CC_t, \quad d_i = (.27, .44, .15, .14)$

Beef Heifer Replacements

3. $BHR_{qt} = \underset{(356.5877)}{-472.0349} + \underset{(2.8385)}{9.3788}\ FCP_{qt-4} + \underset{(.0076)}{0.248}\ BCT_{qt} + \underset{(3.1992)}{7.9858}\ RC_{qt}$

$$+ \underset{(0.996)}{.4302}\ BHR_{qt-1} + \underset{(90.6248)}{670.9696}\ S_2 - \underset{(195.1126)}{1631.99}\ S_3 - \underset{(57.6069)}{772.9023}\ S_4$$

Beef Cow Inventories

4. $BCI_{qt} = \underset{(760.4454)}{164.7681} + \underset{(25.5806)}{61.5500}\ FCP_{qt} + \underset{(5.9186)}{23.0794}\ FCP_{qt-4} - \underset{(1.7737)}{1.4025}\ CLA_{qt}$

$$+ \underset{(5.3182)}{10.1898}\ RC_{qt-1} - \underset{(53.4817)}{110.2242}\ NCP_{qt} + \underset{(.2144)}{1.0517}\ BHR_{qt}$$

$$+ \underset{(.0135)}{.9317}\ BHR_{qt-1} + \underset{(238.0468)}{151.3350}\ S_2 - \underset{(210.8328)}{116.1722}\ S_3 - \underset{(193.06919)}{107.3802}\ S_4$$

Feeder Cattle Imports

5. $FCM_{qt} = \underset{(86.2397)}{99.2158} + \underset{(2.9508)}{3.8621}\ PFC_{qt} - \underset{(38.9994)}{68.4299}\ PCN_{qt} - \underset{(.3606)}{.1579}\ TUV_{qt}$

$$+ \underset{(.1039)}{.3941}\ FCM_{qt-1} + \underset{(32.10486)}{61.0868}\ S_2 - \underset{(32.5293)}{71.0988}\ S_3 + \underset{(37.1185)}{223.6186}\ S_4$$

Feeder Cattle Supply to Feedlots

$$6.\quad FLP_{qt} = \underset{(1533.2800)}{860.4165} + \underset{(78.7154)}{315.6927}\ FCP_{qt} - \underset{(153.7453)}{334.5920}\ NCP_{qt}$$
$$- \underset{(69.9156)}{266.8341}\ NCP_{qt-1} + \underset{(.0296)}{.0937}\ FCI_{qt} + \underset{(33.1523)}{30.2418}\ IR_{qt}$$
$$+ \underset{(.1254)}{.1808}\ FLP_{qt-1} + \underset{(376.2802)}{786.8734}\ S_2 + \underset{(476.9016)}{720.2084}\ S_3$$
$$+ \underset{(435.2654)}{2947.3520}\ S_4$$

Feeder Cattle Price

$$7.\quad FCP_{qt} = \underset{(2.0210)}{-13.111} + \underset{(.000128)}{.00019}\ FLP_{qt} + \underset{(.0924)}{1.3909}\ PFC_{qt} + \underset{(.0895)}{.4475}\ PFC_{qt-1}$$
$$- \underset{(.6318)}{4.9535}\ PCN_{qt} - \underset{(.0741)}{.1362}\ IR_{qt} + \underset{(.00012)}{.0024}\ FLP_{qt-1}$$

Slaughter Cattle Market

Fed Cattle Marketings

$$8.\quad FSC_{qt} = \underset{(551.1632)}{2122.4060} - \underset{(22.5550)}{36.9159}\ PFC_{qt} + \underset{(20.8965)}{9.5618}\ PFC_{qt-1}$$
$$- \underset{(148.5497)}{151.1445}\ PCN_{qt} - \underset{(16.8404)}{16.2840}\ IR_{qt} + \underset{(.0349)}{.1650}\ COF_{qt}$$
$$+ \underset{(.0725)}{.5212}\ FSC_{qt-1}$$

Fed Cattle Price

$$9.\quad PFC_{qt} = \underset{(1.7212)}{3.1534} - \underset{(.000193)}{.000275}\ FSC_{qt} + \underset{(.0370)}{.9162}\ NCP_{qt} - \underset{(.0376)}{.0742}\ IR_{qt}$$
$$- \underset{(.4956)}{.7939}\ WR_{qt} + \underset{(1.6270)}{11.8530}\ FBP_{qt} + \underset{(.000156)}{.000133}\ FSC_{qt-1}$$

Nonfed Cattle Marketings

$$10.\quad NSC_{qt} = \underset{(669.1804)}{1220.3880} - \underset{(23.0386)}{75.1802}\ NCP_{qt} + \underset{(25.6919)}{8.7450}\ NCP_{qt-1} - \underset{(4.3327)}{4.9501}\ RC_{qt}$$
$$+ \underset{(149.4414)}{571.6934}\ PCN_{qt} + \underset{(.0096)}{.0561}\ FCI_{qt} - \underset{(.0137)}{.0276}\ BCI_{qt}$$
$$- \underset{(.0137)}{.0276}\ DCI_{qt} + \underset{(.0575)}{.5040}\ NSC_{qt-1}$$

Nonfed Cattle Price

$$11.\quad NCP_{qt} = \underset{(1.6019)}{-2.5626} - \underset{(.000163)}{.001066}\ NSD_{qt} + \underset{(.05447)}{.7358}\ PFC_{qt} - \underset{(.0418)}{.0265}\ IR_{qt}$$

$$\underset{(.4519)}{.7306}\ WR_{qt} + \underset{(2.3542)}{.997}\ NBP_{qt} + \underset{(.00015)}{.00044}\ NSD_{qt-1}$$

Identities

Feeder Cattle Inventories

$$12.\quad FCI_{qt} = FCI_{qt-1} + CC_{qt} + FCM_{qt} - CS_{qt} - BHR_{qt} - DHR_{qt} - DIS_{qt} - NSH_{qt} - FLP_{qt}$$

Feeder Cattle Market Clearing

$$13.\quad FCS_{qt} = FLP_{qt}$$

Cattle on Feed

$$14.\quad COF_{qt} = COF_{qt-1} + FLP_{qt} - FSC_{qt}$$

Fed Cattle Market Clearing

$$15.\quad FSC_{qt} = FSD_{qt}$$

Nonfed Cattle Market Clearing

$$16.\quad NSC_{qt} = NSD_{qt}$$

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[a]Quantities are specified in terms of cattle numbers (1,000) head for feeder and slaughter cattle markets.

[b]Variable definition: CC = calf crop, FOI = forage output index, FCP =feeder cattle price, FPI = feed price index, BDC = beef and dairy cow inventories, FCM = feeder cattle imports, FCI = feeder cattle inventories, BHR = beef heifer replacements, BCI = beef cow inventories, DHR = dairy heifer replacements, DCI = dairy cow inventories, RC = range conditions, CLA = cropland acreage, PFC = fed cattle price, NCP = nonfed cattle price, CS = calf slaughter, FCS = feeder cattle supply, FLP = feedlot placements, FSC = fed cattle marketings, FSD = demand for fed cattle, NSC = nonfed cattle marketings, NSD = demand for nonfed cattle, COF = cattle on feed, IR = interest rates, WR = wage rates in meat packing industry, FBP = fed beef price, NBP = nonfed beef price.

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