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Market Valuation for Attributes of Female Beef Cattle Replacements

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ABSTRACT

Previous studies have been carried out to estimate the market value for various traits of feeder cattle, but little work has been done to estimate the market value of various traits for replacement females. This study uses a hedonic price model to estimate the market value for various traits of beef replacement females in South Texas. The results of this study indicate that significant premiums exist for replacement beef cattle females that are first cross Brahman-Herford (F1) or straight Brahman. Quality factors also had a positive impact on price. Lot size was found to be statistically insignificant across all classes of replacement females.

KEY WORDS: beef replacement females, hedonic price model

INTRODUCTION

Many studies have been carried out to estimate the market value for various traits of feeder cattle (Buccola, 1980; Faminow and Gumm, 1986; Marsh, 1985; Falconer et al., 1997 and Avent et al., 2004). However, less research has been done to estimate the market value of various traits for replacement females. This study follows the work done in the analysis of feeder cattle prices and uses a hedonic price model to estimate the market value for various traits for replacement females in South Texas.

MATERIALS AND METHODS

The data for this study is taken from three years (2005, 2006 and 2007) of a specialized sale that focuses on replacement females for commercial beef herds. This event is titled the Tri-County Commercial Female Sale and is held at the Beeville Livestock Inc. sales barn in Beeville, TX. This event is part of the educational program provided by Texas AgriLife Extension Service for livestock producers in Bee, Goliad and Refugio counties in Texas. The purpose of this event is to provide area ranchers with an alternative market for both the sale of their raised commercial females, as well as an opportunity to purchase commercial female replacements. In addition, this event also provides area ranchers with an educational opportunity to determine how the market values particular attributes of commercial replacement females.

For each sale, the entries were divided into three categories which included replacement pairs, bred heifers and open heifers. The total number for each category

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included 96 lots of pairs, 138 lots of bred heifers, and 178 lots of open heifers. Within each category, a set of three judges ranked every lot with respect to the quality of the replacement females in the lot, and the lots within each category were sold in the order in which the judges ranked them. The quality criteria the lots were judged on included structural correctness, maternal characteristics and confirmation. In addition to the sales price in dollars per head, the number of replacement females in each lot, as well as the predominant color and breed type of the replacement females in each lot was recorded.

The hypothesized hedonic price model for replacement pairs is shown in Table 1.

Table 1. Hedonic Model Variable Definitions and Expected Signs for Pairs

Independent variable	Variable definition	Expected sign
Order	Order in which the lot was sold from lowest to highest	–
OrderSQ	Quadratic term for sales order	+
LotSize	Number of head in the lot sold	+
LotSizeSQ	Quadratic term for number of head in the lot	-
2006	Zero-one dummy variable for the year 2006	-
2007	Zero-one dummy variable for the year 2007	+
Black	Zero-one dummy variable for black cows, one if the cows in the lot were black, zero otherwise	+
F1	Zero-one dummy variable for F1 cows, one if the cows in the lot were F1, zero otherwise	+
MixedLot	Zero-one dummy variable for lots that were not all pairs, one if the lot contained cows other than pairs, zero otherwise	-
ThreeInOne	Zero-one dummy variable for lots that contained pairs that were re-bred, one if the lot contained cows that were re-bred, zero otherwise	+
BraunBray	0-1 dummy variable for lots that were made up of BraunBray cows, one if the lot contained BraunBray cows, zero otherwise	+

The quality of the replacement pairs is represented by the variable titled Order, as the pairs were judged and placed in descending order of quality and sold in that order. Following previous work related to feeder cattle, it was hypothesized that a quadratic relationship between sales order and price existed. In addition, a quadratic relationship between the size of lot and price was included. Zero-one dummy variables were included in the model to identify annual market influences, with 2006 expected to be negative due to extreme drought conditions in the area. Color influences were hypothesized to exist in the data, and a zero-one dummy variable was included in the model to account for the influence of black cows, with an expected positive sign. Breed effects were tested with zero-one dummy variables for first cross Brahman-Herford (F1) and BraunBray pairs, both of which were expected to have positive signs. Inclusion of the BraunBray dummy variable allows for separate testing for a breed effect for a relatively small number of

Brahman cross entries. In addition, zero-one dummy variables were included to measure the influence on the price if the lot was a mixture of pairs and open cows, in addition to lots that contain pairs that were re-bred. This model represents a base lot that was sold in 2005, had no black cows in the lot, had no F1 cows or BraunBray cows in the lot, had no cows without calves, and had no pairs in the lot that were re-bred. The hypothesized hedonic price model for bred heifers is shown in Table 2. The quality of the bred heifers is represented by the variable titled Order, as the pairs were judged and placed in descending order of quality and sold in that order.

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Following the model hypothesized for replacement pairs a quadratic relationship between sales order and price was specified. In addition, a quadratic relationship between the size of lot and price was included. Zero-one dummy variables where included in the model to identify annual market influences; again with 2006 expected to be negative due to extreme drought conditions in the area. Color influences were hypothesized to exist in the data, and a zero-one dummy variable was included in the model to account for the influence of black heifers, with an expected positive sign. Breed effects were tested with zero-one dummy variables included for F1s, BraunBray, and Brahman heifers, all of which were expected to have positive signs. This model represents a base lot that was sold in 2005, had no black heifers in the lot, and had no F1, BraunBray, or Brahman heifers in the lot.

The hypothesized model for open heifer prices was the same as the model hypothesized for bred heifer prices.

Table 2**.** Hedonic model variable definitions and expected signs for bred heifers

Independent variable	Variable definition	Expected sign
Order	Order in which the lot was sold from lowest to highest	–
OrderSQ	Quadratic term for sales order	+
LotSize	Number of head in the lot sold	+
LotSizeSQ	Quadratic term for number of head in the lot	-
2006	Zero-one dummy variable for the year 2006	-
2007	Zero-one dummy variable for the year 2007	+
Black	Zero-one dummy variable for black heifers, one if the heifers in the lot were black, zero otherwise	+
F1	Zero-one dummy variable for F1 heifers, one if the heifers in the lot were F1, zero otherwise	+
BraunBray	Zero- one dummy variable for lots that were made up of BraunBray heifers, one if the lot contained BraunBray heifers, zero otherwise	+
Brahman	Zero-one dummy variable for lots that were made up of Brahman heifers, one if the heifers in the lot were Brahman, zero otherwise	+

RESULTS

The model for replacement pairs was estimated using least-squares, with results shown in Table 3. The results indicated that the model is highly statistically significant, given the F-statistic of 17.162. The results yielded an R-squared value of 0.692, comparable to results of previous research on feeder cattle prices.

The results indicated that price was significantly affected by sales order. In this case the measure of quality of the cows in each lot, and the linear and quadratic terms both had the expected sign. However, lot size did not have a significant impact on price. Pairs that were sold in the 2006 sale were discounted by approximately $300 per head, which was expected due to severe drought conditions. The parameter estimate for the dummy variable for 2007 was not significantly different than zero.

Parameter estimates for color, breed, and re-bred cows were statistically significant. Cows that were in lots made up of black cows would be expected to sell for $76.54 more per head than lots of other color. Cows in lots that consisted of F1 cows would be expected to sell for $129.63 more than cows that were not F1s. Cows in lots that contained cows that were re-bred would be expected to sell for $124.14 per head more than lots that were not re-bred. Cows in lots made up of BraunBray cows would be expected to sell for $204.27 per head more than other breed types.

Table 3. Regression Estimates for Model for Pairs

	Beta	S.E.	t-test	Prob(t)
Intercept	1545.1	74.71	20.68	0
Order*	-21.78	4.46	-4.88	0
OrderSQ*	0.39	0.11	3.5	0.001
LotSize	-0.23	21.34	-0.01	0.991
LotSizeSQ	0.23	1.88	0.12	0.903
2006*	-298.79	34.81	-8.58	0
2007	9.01	35.67	0.25	0.801
Black*	76.54	35.23	2.17	0.033
F1*	129.63	42.76	3.03	0.003
MixedLot	-52.63	51.08	-1.03	0.306
ThreeInOne*	124.14	63.33	1.96	0.053
BraunBray*	204.27	66.54	3.07	0.003

* denotes significance at the 0.1 level.

N	96
F-test	17.162
R^2	0.692

The model for bred heifer prices was estimated using least-squares with results shown in Table 4. The results indicated that the model is highly statistically significant,

given the F-statistic of 13.147. The results yielded an R-squared value of 0.509, comparable to results of previous research on feeder cattle prices.

As shown in Table 4, prices for bred heifers were significantly affected by sales order. In this case, the measure of quality of the bred heifers in each lot, and the linear and quadratic terms both had the expected sign. As was the case with the model for replacement pairs, lot size did not have a significant impact on price. Bred heifers that were sold in the 2006 sale were discounted by approximately $139 per head, which was expected due to severe drought conditions. The results for bred heifers indicated that there was not a statistically significant premium for lots that were black in color, as opposed to the results for replacement pairs. As was the result with the replacement pairs, there was a statistically significant premium of $152.43 per head estimated for lots made up of F1 heifers. The parameter estimate for BraunBray bred heifers was not statistically significant, which was inconsistent with the result for replacement pairs. The parameter estimate for Brahman bred heifers was statistically significant, and estimated at $239.85 per head for lots made up of Brahman heifers.

The model for open heifer prices was estimated using least-squares with results shown in Table 5. The results indicated that the model is highly statistically significant, given the F-statistic of 26.727. The results yielded an R-squared value of 0.615, comparable to results of previous research on feeder cattle prices.

Table 4. Regression Estimates for Model for Bred Heifers

	Beta	S.E.	t-test	Prob(t)
Intercept*	1283.91	93.58	13.72	0
Order*	-12.01	2.86	-4.2	0
OrderSQ*	0.1	0.04	2.63	0.01
Head	49.25	41.46	1.19	0.237
HeadSQ	-5.8	5.16	-1.12	0.263
2006*	-139.15	48.38	-2.88	0.005
2007	34.25	48.23	0.71	0.479
Black	41.46	39.82	1.04	0.3
F1*	152.43	40.2	3.79	0
BraunBray	36.64	66.5	0.55	0.583
Brahman*	239.85	56.57	4.24	0

* denotes significance at the 0.1 level.

N	138
F-test	13.147
R^2	0.509

The prices for open heifers were significantly affected by sales order, in this case the measure of quality of each lot. However, in this case only the linear component of the model was statistically significant from zero indicating that quality in this case had only a linear impact on price, as opposed to the results obtained for replacement pairs and bred heifers. As expected, open heifers that were sold in the 2006 sale were discounted

by approximately $94 per head. The results for open heifers indicated that there was a statistically significant premium for lots that were black in color of $44.83 per head. As was the result with the replacement pairs, there was a statistically significant premium of $135.05 per head estimated for lots made up of F1 heifers. The parameter estimate for BraunBray open heifers was statistically significant and estimated at $137.45 per head. The parameter estimate for open Brahman heifers was statistically significant, and calculated at $232.33 per head.

In general, these results indicate that Brahman cross replacement females are significantly more highly valued than any other breed type entered in the sales. The Brahman cross replacement females are generally recognized as being better adapted to climactic conditions that exist in South Texas. Both Brahman cross types, the F1s, and BraunBray commanded premiums pairs and open heifers. The premium for straight Brahman replacement females was estimated to be considerably higher than any other breed. It is likely that this occurs for two reasons, the first being the high demand for Brahman cross replacement females that can be produced from the straight Brahman females. The second reason could be that a larger premium needs to exist for production of straight bred Brahman females; as they are male siblings that cannot be retained for breeding purposes and will likely sell at a sizable discount into the feeder cattle market.

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Table 5. Regression Estimates for Model for Open Heifers

	Beta	S.E.	t-test	Prob(t)
Intercept*	1050.58	56.03	18.75	0
Order*	-5.09	1.32	-3.86	0
OrderSQ	0.01	0.02	0.63	0.526
Head	-28.37	23.33	-1.22	0.226
HeadSQ	2.24	2.71	0.82	0.411
2006*	-94.18	19.16	-4.92	0
2007	-4.94	17.89	-0.28	0.783
Black*	44.83	18.52	2.42	0.017
F1*	135.05	22.3	6.06	0
BraunBray*	137.45	70.03	1.96	0.051
Brahman*	232.33	45.11	5.15	0

* denotes significance at the 0.1 level.

N	178
F-test	26.727
R^2	0.615

The parameter estimates for the drought year of 2006 may also be of interest to producers who are trying to make reinvestment decisions in breeding livestock after a drought. These results indicate that from drought induced levels, a producer would probably have to pay approximately $95 per head more for an open heifer, $140 per head more for a bred heifer, and approximately $300 per head more for a replacement pair when moisture conditions became more favorable.

CONCLUSIONS

The statistical results indicate that significant premiums exist in South Texas for F1 replacement females across the categories of pairs, bred heifers and open heifers, and straight Brahman breeds across the categories of bred heifers and open heifers that are sold as replacement beef cattle females. Quality factors also had a positive impact on price. Lot size was statistically insignificant across all classes of replacement females. Drought conditions also had a statistically significant impact on prices.

The results of this study are of interest to both producers of replacement females, as well as commercial cow-calf producers that purchase or raise their replacement females. Producers who are in the business of raising replacement females can use this information when considering how changes in breed type and quality will impact the prices they receive for their replacement females. Conversely, producers who purchase replacement females have better information on which to formulate price expectations relative to their purchase decisions. Further research, with data sets from other regions, is in order to see if the premiums that are paid for beef replacement females, that have a high percentage of Brahman breeding, are specific to the South Texas region.

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