DETERMINING THE VALUE OF BIRTHRANK AND PARENT AGE IN THOROUGHBRED RACEHORSES

Authors Author Affiliation and Contact Information

Xiurui Cui

Email: xiurui.cui@uky.edu
Phone: (859)913-9439

Selected Paper prepared for presentation at the

2016 Agricultural & Applied Economics Association Annual Meeting, Boston, MA, July 31- Aug. 2

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**DETERMINING THE VALUE OF BIRTHRANK AND PARENT AGE IN THOROUGHBRED RACEHORSES**

Xiurui ‘Iris’ Cui, M.S., Department of Agricultural Economics, University of Kentucky

**DATA DESCRIPTION**

- 22,734 yearlings sold at KEESEP 2006-2010
- Sources: Keeneland website - Sale catalog
- 2011 American Produce Records
- Blood-Horse Stallion Registry
- EquineLine Mare Produce Records
- Excluded observations:
  - Horses never started racing
  - Horses with zero lifetime earnings but a winning record

**OBJECTIVES**

- Investigate whether sire age, dam age, foal birthrank are taken into pricing decisions.
- Examine whether these factors are correlated with progeny career earnings.
- Compare the marginal effects.

**RESULTS**

Results from the three hedonic pricing models are below.

**MOTIVATION**

- Foal Birthrank:
  - Finocchio, D.V.M. (1986): A mare’s 3rd foal has the best chance to become a stakes winners, followed by the 5th, 2nd and 4th foal.
  - Barron (1995): Foals born at early birth ranks are more successful during their racing careers than those born later; peaks at around the 4th foal.
- Mare Age:
  - Barron (1995): Timeform ratings are correlated with maternal age, and peak at around 9 years; younger mares (<11) produced the most successful offspring.
- No research relative to sire age.

**VARIABLES**

<table>
<thead>
<tr>
<th>Classification</th>
<th>Total meanings</th>
<th>Average Price</th>
<th>Average Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jr. Female</td>
<td>4,594</td>
<td>$515,876</td>
<td>$26,746</td>
</tr>
<tr>
<td>Sr. Female</td>
<td>4,494</td>
<td>$458,496</td>
<td>$23,818</td>
</tr>
<tr>
<td>Filly</td>
<td>4,274</td>
<td>$499,406</td>
<td>$24,976</td>
</tr>
<tr>
<td>Stallion</td>
<td>4,412</td>
<td>$937,776</td>
<td>$46,936</td>
</tr>
<tr>
<td>Gelding</td>
<td>1,846</td>
<td>$89,018</td>
<td>$4,471</td>
</tr>
<tr>
<td>Year of Birth</td>
<td>11,872</td>
<td>$919,912</td>
<td>$46,948</td>
</tr>
<tr>
<td>Dam Age</td>
<td>0-11</td>
<td>7,047</td>
<td>$930,978</td>
</tr>
<tr>
<td>Sire Age</td>
<td>7,037</td>
<td>$930,978</td>
<td>$46,948</td>
</tr>
</tbody>
</table>

**Empirical Model**

- Hedonic Price Model: \( b_i(x_j) = a + x_j\beta + \epsilon \) (1)
- Multivariate Regression Analysis: \( \ln(earnings) = a + x_j\beta + \epsilon \) (2)
- Marginal Effects:
  - For continuous variables \( x_j \) (age, birthrank): the marginal value is estimated as: \( MV = \beta \)
  - For other continuous variables \( x_j \), we use the log form in the model, the marginal value is estimated as: \( MV = \frac{x_j\beta}{y} \)
  - For dummy variables \( x_j \), the marginal value is estimated as: \( MV = \frac{e^{\beta x_j} - 1}{y} \)

**DISCUSSION & IMPLICATION**

- Yearling buyers are willing to pay more for the 3rd crop foals, followed by 2nd and 1st crop foals.
- Breeders are willing to pay more for the foals out of younger mares (age 4-10 years old), foals by sires age 11 to 18 years.
- Progeny birthrank, dam age, sire age all have negative effect on race earnings.
- Reverse effects are discovered:
  - Day of sale (Books), RNA, stud fee
- Non-significant variables:
  - Date of birth, dam produce record (black-type progeny)
- Provides information on yearling buyers’ behavior at TB auctions:
  - Yearling sellers/owners: pricing strategies.
  - Breeders/Mare owners: breeding plans.
  - Stallion owners: stallion pricing & marketing strategies.
- Racehorse buyers can benefit from these findings in making investment decisions.

**CONTACTS**

Xiurui ‘Iris’ Cui: juansjuan68@hotmail.com