

**IMPACTS OF THE RECESSION AND HORSE
SLAUGHTER BAN ON THE U.S.
THOROUGHBRED INDUSTRY**

by

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ABSTRACT

Over the last decade, the United States horse industry has seen a decline in all segments of the industry. Both people and organizations within and outside the industry have debated the cause of this decline, with the 2007 horse slaughter ban being at the center of this debate. The purpose of the report is to analyze a specific segment of the industry to determine what has led to this decline over the last decade.

To do this, we will look specifically at the total number of thoroughbreds sold over a thirty-year history, and using regression analysis, determine if a controversial bill that banned the slaughter of horses in the United States for the purpose of meat was the cause of this decline or if other key variables that played a key role. These additional variables will include hay prices, corn prices, oat price, gas prices, and a macro economic indicator variable.

The regression results show that the horse slaughter ban did in fact have an impact on the decline of the total number of thoroughbreds sold within this specific segment of the industry. Also, both hay and the unemployment rate had an effect on the decline of the total number of thoroughbreds sold, while gas prices appear to have had an unexpected positive effect, which is contrary to common thought. This thesis shed a new light on the decline of the horse industry within the United States and the effect the ban has had on the thoroughbred industry.

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CHAPTER I: INTRODUCTION

1.1 Introduction

Over the past decade, the American horse industry has experienced many changes: passage of the Horse Slaughter Ban Act and significant increases in costs associated with maintaining these animals like fuel and feed costs. Not surprisingly, these industry specific economic factors and domestic laws have had a dramatic effect on the industry as a whole, leading to an increase in unwanted horses, an increase in animal neglect, and a decrease in the value of horses, specifically the low to mid-range priced horses. Even still, there is little known on which of the factors contributed more or less to many of these effects on the industry. Several reports on the effects of the ban on the price of the horse have been released, but few have analyzed the effects of the ban along with other industry specific variables that account for the increase in cost required just to maintain a horse. More specifically, many have believed that these changes have been limited to the low to mid-priced horses, and have had little to no effect on the top priced horses within the industry. But as the sample size available pre and post the horse slaughter ban and recession increases, we may possibly be able to determine if these perceptions are true. To date, that has simply not been analyzed.

1.2 Status of the Industry, Then and Now

While horsemeat is not a delicacy that many people in the United States enjoy, it is meat that is consumed widely around the world. In Europe, Asia and the Middle East, it is considered to be a delicacy. Because of the close human bond, and close interaction with humans, particularly in the U.S., the consumption of horsemeat is frowned upon domestically. The status of the horse in the U.S. is deemed to be a pet by some and

livestock by others. This leads us to why many have supported a bill that would ban horse slaughter. The industry is broken into two main segments. On one side, you have the people who believe that horse slaughter should be banned. They perceive a human bond or a connection exists with the horse. Most of these individuals see the horse as a pet or a companion more than a piece of property.

Then there are those that perceive the horse as a work animal or tool. Those individuals perceive that the horse has a function or purpose in life instead of just a pet. If that function or purpose cannot be met, then the animal no longer has a purpose. They may perceive the value and bond with that horse similar to that with cattle or swine.

Domestically, the Amish community is the closest example of this, as the horse is their means for transportation and moving farm equipment. Right or wrong, they perceive the horse as an equal to a car, truck or tractor. That is not to say that some may still not have an emotional attachment to that animal, but for the most part their purpose and role is for work. If the animal were not able to perform its daily function, it would be equivalent to putting gas into a truck every week and never driving it anywhere. Neither side is all right nor wrong. However, it puts the U.S. horse industry in a very precarious position moving forward.

By the mid 2000's, the mistreatment of horses being transported in the U.S. for the purpose of horse slaughter was slowly being uncovered. There were reports of animals being abused and mistreated in transport to the slaughtering plants, and this is still found to be a common problem today for horses being transported to Mexico or Canada for the purpose of slaughter. The horses are transported over very long distances in trailers not designed for the capacity of horses. It is also not uncommon for there to be very few stops

for the horses to rest, eat or drink, which causes the animal considerable stress. This combined with the fact that there were several reported accidents across the country where horses were packed into double deck trailers and either died or had to be euthanized as a result of the accident¹ has brought light to a problem that needed to be addressed. Because of the publicity, and the increase of focus put on the matter, animal activists were up in arms and it increased the amount of attention that was being put on the matter.

Additionally, the increase in the percent of horse owners who perceive horses as pets more than work animals or tools, has caused the outrage to increase rapidly. All of this attention led to the horse slaughter ban in late 2007, which put an end to horse slaughtering in the U.S, and pushed the problem across the borders into Mexico and Canada. Some feel that this may have only made the transportation problem worse, and did little to address the issue of the increase in unwanted horses that were left as a result of the ban. It also effectively eliminated a bottom price that a horse owner could expect to receive for their horse for the purpose of slaughter if they could not find another buyer. This base price acted to prop up horse prices so that there was always a minimum price that could be obtained, and with the ban in place, the baseline price was eliminated. Instead of being able to take a horse that was suffering or no longer being able to serve its purpose to the sale barn to receive a market price, it now cost the horse owner to have a veterinarian come to their farm to humanly euthanize the animal.

Unfortunately, this act somewhat coincided with the recession that hit the U.S. in the late 2000's which had an effect on the whole U.S. economy. While the animals may be viewed as that of a companion animal in most people's eyes, the cost associated with maintaining these animals is not at all similar to that of a cat or dog. Because of the

¹ <http://www.horsechannel.com/horse-news/double-deck-trailer-accident.aspx>

recession, many of the common feed products began to increase the cost associated with simply maintaining horses. Grain prices increased as more bio-fuels were in increased demand and drought created grain shortages; oil prices continued to increase, which also led to higher input costs into hay production and trailering the horses from one location to another. While the horse slaughter ban has been placed front and center on the decline of the horse industry, and is known to have had an impact on the low to mid-priced horses, variables like these have yet to be used to fully analyze and determine their specific effects on the horse industry. One thing we do know, that throughout the 2000's, there has been an increase in the number of unwanted horses, and in horse owner neglect cases. While one or multiple variables may have caused this, we do not yet fully understand.

1.3 Objective of this Study

Previous research that addressed this issue will be discussed within this paper, along with the proposed impact of the ban on the horse industry. Much of the former research clearly found causation and correlation to the ban and a fall in horse prices on the lower end horses, which were most likely already intended for slaughter. What has not been analyzed as closely is the mid to higher end horses and what, if any, decline has been attributed to this segment of the industry. The objective of this paper is to look specifically at the thoroughbred industry, as a majority of these horses fall within this range, and to determine the impact of the ban and several other industry specific economic variables on the number of thoroughbred horses sold.

To do this, we will need to determine what impact, if any, the horse slaughter ban and other industry specific economic variables have on the increase or decrease of the number of thoroughbred horses sold within a given year. This will be accomplished by using regression analysis and a sample size of 30 years. The variables that will be used in

the regression analysis will include a variable representing horse slaughter, hay price, corn price, oat price, gas price, and an economic indicator variable, which will be represented by the unemployment rate. Finally, we will take this data, and determine what, if any impact these industry specific variables, including the horse slaughter ban, have had on the total number of thoroughbred's sold over a thirty-year sample size.

CHAPTER II: LITERATURE REVIEW

Most of the articles on related literature were written before and during the ban, which was implemented in November 2007. Most recently, the Government Accountability Office (GAO) issued an extensive report conducted to investigate the consequences of this ban and what actions need to take place as a result. In general, most of the research written on this topic does support the fact that the ban not only had implications on the actual price of the horse, but also shows this ban had both a substantial economical and local horse welfare impact consequences as well. The following is a review of these articles as it relates to the impact of the horse slaughter ban in the United States.

2.1 GAO Horse Welfare Report

The Government Accountability Office's report on "*Action Needed to Address Unintended Consequences from Cessation of Domestic Slaughter*" is by far the most in depth report on the impact of the horse slaughter ban since the ban was implemented in 2007. The objective of this report was to examine three main questions: the impact of the horse slaughter ban on the U.S. horse market since the ban was implemented in 2007, the impact of the ban on the welfare of horses, and, the third question, what were the challenges to the USDA's oversight of the transport of horses intended for slaughter? There were a number of key points that were discovered as a result of this study that show the impact of the cessation of horse slaughter in the U.S.

The first area the report looked to address was the impact the cessation of horse slaughter had on the U.S. horse price. To do this, they used a regression analysis to determine what this impact was, but also included a number of other economic and industry variables as well. They collected data on more than 12,000 sale transactions from spring

2004 through spring 2010 from three large horse auctions located in the western, southern and eastern United States. The horse sale prices ranged from \$4 to a maximum of \$48,500 per horse. They used multiple variables to analyze the effect to the horse price, which included but were not limited to, a dummy variable that represented the cessation to horse slaughter, breed, age, gender, and an economic variable (unemployment rate). Through this regression, they found a number of variables to be statistically significant. First, the cessation did show to be statistically significant on the low to medium priced horses, but it was not statistically significant on the 60th and 80th percentile price category, or the higher priced horses. More specifically, it was found that the average sale price for horses in the lowest price category (20th percentile) dropped by about \$110 per head (from \$433 to \$323), and the average price for the highest price category (80th percentile) dropped by about \$140 per head (from \$2,380 to \$2,241)². This was found to be about an 8 to 21 percent decline depending on the sale price of the horse. The economic variable did show to cause a decrease in the sale price by approximately 5 percent on all price categories from lowest to highest. The estimates suggest that the closing of domestic slaughtering facilities had a significant and negative impact on horse prices at the low-to-mid levels of horse price at these auctions, while relatively higher priced horses appear not to have lost their value due to the cessation of slaughter.

² GAO-11-228 Horse Welfare

Table 2.1: Estimates for Effect of Cessation of Slaughter and Economic Downturn on Horse Sale Prices by Sale Price Category, Spring 2004 through Spring 2010

| Variables | Type of Change | Effect by sale price category (percentile) | | | | |
|---|-------------------|--|------------|---------------|------------|------------|
| | | 20th | 40th | 50th (Median) | 60th | 80th |
| Cessation of slaughter on horse prices (per head) | Price Change | \$(125.61) | \$(104.24) | \$(109.58) | NS | NS |
| | Percentage Change | -20.93 | -10.42 | -7.83 | NS | NS |
| Economic downturn on horse prices (per head) | Price Change | \$(30.90) | \$(52.26) | \$(67.22) | \$(82.09) | \$(142.91) |
| | Percentage Change | -5.15 | -5.23 | -4.8 | -4.69 | -4.76 |
| Upper Bound for category (price per head) | | \$600.00 | \$1,000.00 | \$1,400.00 | \$1,750.00 | \$3,000.00 |

Source: GAO analysis of data from selected horse auctions and the Department of Labor’s Bureau of Labor Statistics.

The next area that this report addresses is “What has been the impact to welfare of horses”? To do this, they interviewed 17 state veterinarians to gain a better perspective on a local level as to what extent the cessation has had on horse welfare. In general, one thing was consistent, and that is that the overall welfare has declined since 2007. There has been an increase in the number of reports of horses that are being abused or neglected. Colorado alone saw a 50 percent increase in investigations in abuse and neglect from 1,067 in 2005 to 1,588 in 2009.³ Similar data were found in other parts of the country. When interviewed, while the 17 veterinarians would not pinpoint one variable that caused this increase, they attributed these factors to a number of variables, which include the cessation, poor economic conditions, and low horse prices, or lack of sale opportunities. This has put a strain on the horse rescue operations as well as state and local financial resources that are used for rescue operations. This has even led to a number of state and local officials being unwilling to investigate abuse with worries of what to do with the horses if abuse is found.

The third area that this report addresses is the three challenges the USDA faces in its oversight of the welfare of horses during their transport for slaughter. While there is no longer slaughtering in the United States, it is still legal in Canada and Mexico. The

³ GAO-11-228 Horse Welfare

cessation also does nothing to limit the transportation of these horses to Mexico or Canada for the purpose of slaughter. This has also led to a number of horse welfare issues due to the fact that these horses are being transported hundreds of miles without stopping for rest, food or water. Also, many of the trailers that these horses are being transported in are not intended for horses, and definitely not intended for horses being transported over long distances. However, there are several issues with implementing a transportation program. The first is delays in issuing a final rule to give the agency greater oversight over horses transported for slaughter to protect their welfare. Second, limited staff and funding that complicates the agency's ability to ensure the completion, return, and evaluation of owner/shipper certificates; and the third issue is the lack of current formal agreements with Canadian and Mexican state officials whose cooperation is needed for program implementation.

This report concludes that not only has the number of horses that are being purchased for the purpose of slaughter not decreased, but it has also had some ill consequences on the U.S. horse industry. One of which is that it has had a significant impact on the low-to-mid level price horse in conjunction with the economic downturn. Secondly, it has at the very least played a role in the decrease of horse welfare in this country. And lastly, it has also created a need for more legislation on the transportation of horses to Mexico and Canada that are intended for the use of slaughter. They conclude that some type of action will need to be taken, but funding will be a road block going forward, not only for regulation on transportation, but also for the rise of unwanted horses across the country.

2.2 The Unintended Consequences

The objective of "The Unintended Consequences of a Ban on the Humane Slaughter (Processing) of Horses in the United States" was to analyze the unintended

consequences of the *Horse Protection Act* from an animal welfare and economic standpoint if it were to be implemented given the current industry in 2006.

The first section of the report addresses welfare considerations that should be considered if this ban were to be implemented, and goes into detail about the increase in the number of unwanted horses that would continue to rise as a result. As of 2005, the United States horse population was estimated to be around 9.2 million (AHC, 2005), with approximately 1% of these horses being marketed for the purpose of human consumption. Horse slaughter also gives horse owners who may have lost the means to take care of the animal due to financial hardships, or because the animal no longer has usefulness due to injury, disease, or some other reason, a means to disposing of the animal while still recouping some of their cost. It is thought, the processing plants assist in maintaining animal welfare by preventing unsound or lame horses from further use (McGee et al., 2001). The point the report makes is that if this avenue were eliminated, there would be a sudden and sharp increase in the population of unwanted horses. Instead of being able to sell the horse, it would now cost the horse owner money to properly euthanize the horse. As a result, some horse owners may choose to not properly take care of the animal because of a lack of means to end the horse's life and a means to dispose of the animal properly. This would put a strain on animal rescues that are under both private and government control. One report published on the number of neglect cases from the years of 1994 and 1995 in California showed there were a total of 2,177 malnutrition cases, with 321 horses impounded for periods ranging from 15 days to 7 months. The average cost for impounding a horse was between \$10.50 per day to \$225 per month. With no extra funding being offered by the government with this act, this additional cost will put

significant strain on resources, and the rescue facilities would be unable to handle the increase in the number of unwanted horses without additional funding.

The second area of this report addresses potential economic considerations if this ban were to be implemented. The author goes on to state that the ban will impact four major areas. These four areas are as follows⁴:

- Cost of maintaining unwanted horses;
- Building and improving infrastructure to sustain unwanted horses;
- Environmental impact of horse euthanasia and carcass disposition;
- Revenue loss from the sale and export of horsemeat;

Approximately 65,000 – 95,000 horses are processed for food export each year, and the impact of the ban on processing was reported to be \$152 million to \$222 million per year⁵. The number of unwanted horses will increase each year, as unwanted horses are not processed. Additionally, most horse owners are not affluent. Approximately 45% of horse owners have an annual household income between \$25,000 and \$75,000⁶. If the horse owner does not have a means to sell the horse, even a slight change in a household income, may make the household unable to care for the horse.

Another point of concern is the potential infrastructure that would be needed to take care of these unwanted animals. While shelters and rescues have been increasing, more funding would be needed to take care of the sudden increase in unwanted horses. The cost to maintain an unwanted horse until its death averages around \$2,340 per year⁷. This estimate does not include veterinary care or cost to care for sick horses. Since little

⁴ Copyright 2006, by Animal Welfare Council, Inc.

⁵ North et al., 2005

⁶ AHC, 2005

⁷ North et al., 2005

government support is offered to fund these programs, the majority must come from private resources. Currently funding is insufficient to support the additional number of unwanted horses that will be a result of the ban on horse slaughter. The Indiana Horse Rescue South, which has taken in abused and neglected horses since April 2005, estimated that based on the total number of horses processed, cost would increase from \$97 million in 2002, to \$175.9 million in 2005. This number represents the cost to maintain inventory of unwanted horses that would otherwise have been slaughtered.

And lastly, there would be environmental implications of the proposed ban. If the horse owner can no longer appropriately take care of the animal, the owner may choose to euthanize the horse if no other means are available. However, burial options are dictated by the state. Because of potential ground and surface water contamination there are certain restrictions on burial: distance restrictions from neighbors, proximity to previous burial sites and depth of burial equipment. Some of the proper methods, like incineration, can prove to be costly to the horse owner, and many other methods, like disposal in a landfill, are becoming increasingly harder to do. As a result, without a means to appropriately and effectively dispose of the horse, this again could be putting greater hardships on the horse owners alone.

2.3 The Potential Impact of the Proposed Ban

Economic impacts were not an area that were not fully understood or considered prior to proposed H.R. 857 being implemented, nor were they really considered. H.R. 857 focused only on making sure that horses were not being slaughtered for the purpose of human consumption. This wording is critical because other means of euthanasia can be conducted and are allowed as long as the animal is not being used for human consumption. Secondly, the act does not address what should be done with the abandoned horses that

remain, and who should pay for the care. The article titled “The Potential Impact of a proposed Ban on the Sale of U.S. Horses for Slaughter and Human Consumption” analyzed this potential impact prior to the implementation of the ban in the U.S. The cost to the industry and the country is staggering and should be taken into account as to what this ban would and has meant to the horse industry. While America does not consume horsemeat, others do. In France for instance, horsemeat is considered a delicacy. So what does this mean for the U.S. horse industry? Michael North suggests that by simply taking away slaughtering, the direct impact to the U.S. horse industry is around \$50 million annually (\$26 million in lost export revenue and \$20-\$29 million in increased disposal costs). This does not account for the horses that are not slaughtered and should be since there will be ripple effects due to the fact that the bill does not address how to deal with the unwanted horses. In this case, there will need to be an increase in rescue facilities to care for these horses, but what will that cost? Cost to care for an unwanted horse at a rescue facility is estimated at around \$2,340 per year⁸. The American Quarter Horse Association (AQHA 2003) estimated that approximately 65,00 to 95,000 horses were slaughtered each year for human consumption. This gives us an annual estimate to care for these animals to be around \$152 - \$222 million per year. Another and more controversial way to deal with the unwanted horses would be to euthanize the animals which would cost between \$11 million to \$16 million⁹. All of these are real costs that must be considered. The reason is, the unintended consequence of the proposed H.R. 857 significantly decreased the value of the

⁸ The Potential Impact of a Proposed Ban on the Sale of U.S. Horses for Slaughter and Human Consumption, 2005

⁹ The Potential Impact of a Proposed Ban on the Sale of U.S. Horses for Slaughter and Human Consumption, 2005

horse, and as a result it has put many horse owners in financial hardship with no way to maintain the animals.

CHAPTER III: THEORETICAL MODEL

3.1 Models from the Literature

Many of the articles that were reviewed contained a regression to estimate the impact of the horse slaughter ban on the U.S. horse price. The GAO report was the most prominent of these reports, and was also the most recently completed. However, many of these regressions, including the GAO report only looked at a very small time period and do not take into account industry economic impacts, which could have had just as much of an impact on the horse price as the ban itself. For example, while the GAO report does use the unemployment rate as a way to measure an economic index, it leaves out other direct key industry economic variables that may have had a direct impact on the horse industry. Additionally, some of the other reports that were completed occurred before the recession and the ban were implemented, which does not allow for a true estimate of the impact of the ban and economic impacts. If we are going to get a true estimate of the ban and the recession on the horse industry, industry specific variables should be taken into account to accurately represent the changes. To show these changes, the following model was used to determine what effects the recession and horse slaughter ban had on the industry:

(3.1) Total horses sold = f(horse slaughter, alfalfa price, oats future, corn futures, gas price, unemployment rate.)

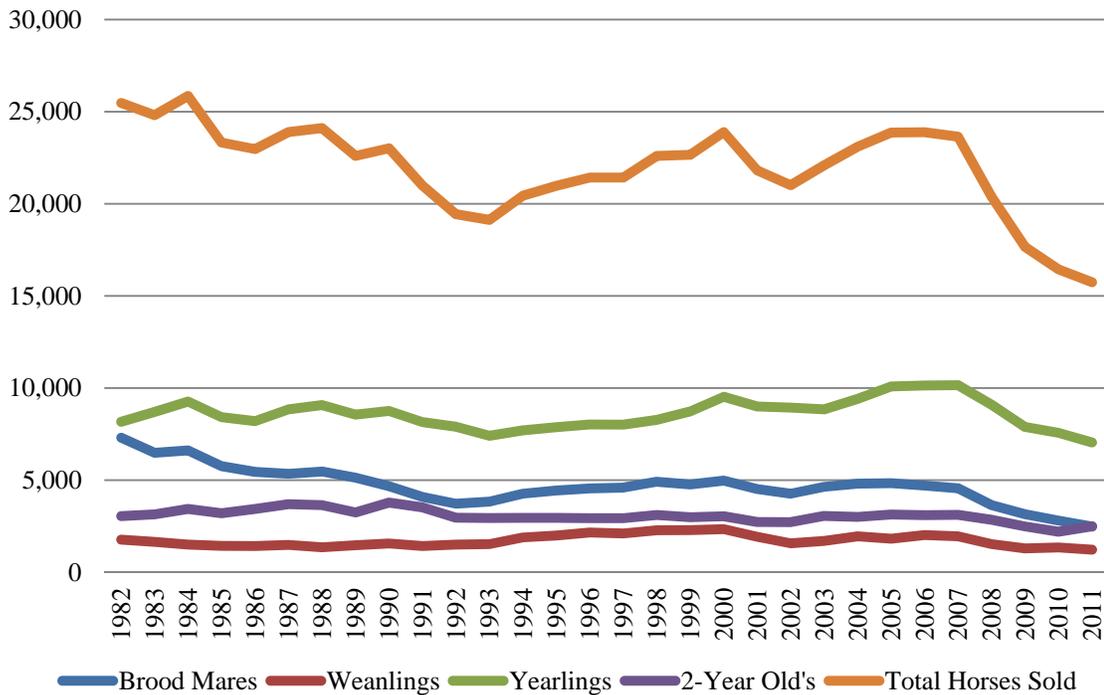
3.2 The Dependent Variable

For this regression, a variable for total number of horses sold was used to determine the economic impact of the recession and the horse slaughter ban on the United States thoroughbred industry. The data were obtained from the Jockey Club¹⁰ fact book, which can be found online. These data represent all of the thoroughbreds that were sold in

¹⁰ <http://jockeyclub.com/factbook.asp?section=13>

the U.S. on a yearly basis from 1982 through 2011. It is then broken down into four main categories: weanlings, yearlings, two-year olds, and brood mares. To account for all four categories in the regression, a total was calculated across these categories for each year. In figure 3.1, the total number of thoroughbreds sold in each category can be seen over the thirty-year history.

Figure 3.1: Head of Horses Sold Per Category and Total 1982 to 2011



Jockey Club Fact Book: <http://jockeyclub.com/factbook.asp?section=13>

To further clarify why total number of thoroughbreds sold was chosen as the dependent variable over average sale price, as it was in the GAO report, is because average sale price was found more closely representative of the effect in decline in supply and demand over this time period. One would expect that average sale price over this time period would likely follow the same trend line as total number of horses sold. However, if the number of horses supplied is decreased, price may not decrease as rapidly as the supply of horses depending on the demand for the top horses sold. Therefore, the total price of the

horses sold in that year may be skewed even though the supply fell. For example, if breeders see that the demand for the market is decreasing and prices are falling, they may begin to produce fewer horses, which in effect could increase the average sale price over that year, but it would be with fewer horses. Therefore, we could actually see both supply and demand fall within the industry, but average price may not fluctuate as consistently depending on how the breeders maintain and control the supply. That is why total number of thoroughbreds sold in a year was chosen as the dependent variable for this regression. Additionally, thoroughbreds were chosen over other breeds, like the quarter horse for example, because of the specific price category into which these horses fall. Thoroughbreds are most often bred for a specific purpose, and because artificial insemination is not permitted within the industry in order to increase the value of certain bloodlines, the value of each thoroughbred goes up as a result of a limited supply. Quarter horses on the other hand have multiple uses. They can be used for everything from racing, sport, trail riding, and herding. They also allow artificial insemination, which makes it easier to reproduce a large number of horses and bloodlines in a very short time period. Because of these differences, Quarter horse prices can vary much more than what we would find with thoroughbreds. Because of the smaller number of horses and the fact that they are bred for a specific purpose, we can look at a more specific category of horses to determine the impacts to a particular segment within the industry.

3.3 The Independent Variables

As mentioned before, many of the regressions used in prior analyses of the horse ban and economic recession left out many key variables that have an impact on a horse owners decisions to purchase and sell horses, and affect their ability to maintain the health of the horse. As a result, the following independent variables were chosen for this

regression to analyze the effects of the economy and the ban on the thoroughbred industry: horse slaughter dummy variable, alfalfa price, oat futures price, corn price, gas price, and unemployment rate. These variables should take a more micro view of the industry.

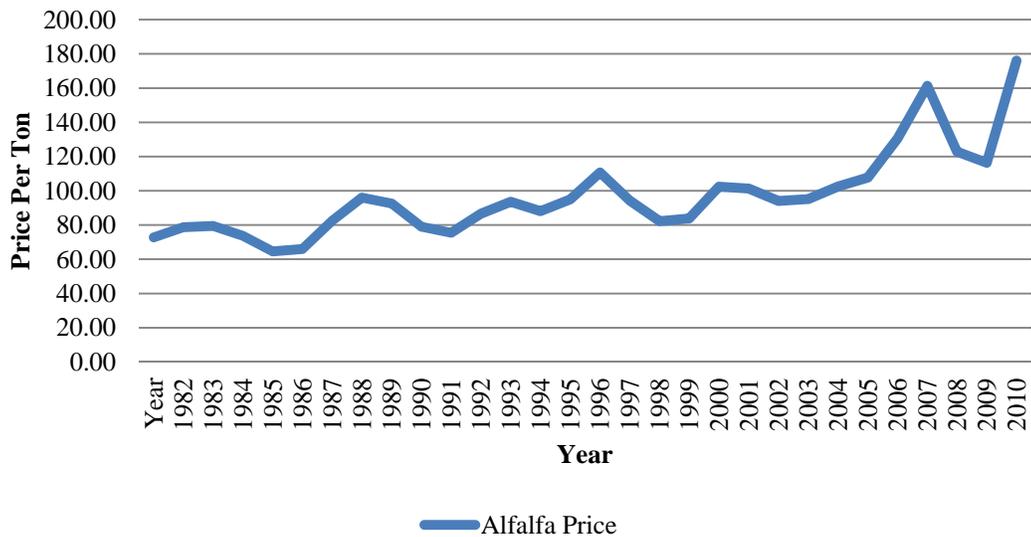
The Horse Slaughter Ban - Those that are familiar with the industry are aware that the ban on horse slaughtering in the United States was lifted in November 2011, four years after it was implemented. However, slaughtering did not immediately shut down in 2007 after the ban was implemented. Additionally, even after the ban was lifted in 2011, to date there is still no active horse slaughtering in the United States due to a number of reasons: both political and local issues. Therefore, even if a dummy variable was used to represent the horse slaughter ban, it would be difficult to account for the fact that there is still no horse slaughtering currently in the United States, which is a result of this ban. Therefore, a dummy variable was chosen to represent a full year that there is no active horse slaughtering in the United States. Because of this, 2007 was represented as a year where there was slaughtering and 2011 was represented as a full year where there was no horse slaughtering.

The horse slaughter ban has been discussed in prior reports as to how the ban would and has impacted the U.S. horse industry. It has been shown that it has had a negative impact on the lower to mid-level priced horses, but little to no impact on the higher priced horses. Even though this report looks only at the U.S. thoroughbred industry, which primarily includes mostly mid to upper priced horses, I still expect the ban to have a negative impact on the total number of horses sold. In Figure 3.2 you can see a sudden drop in the number of horses sold around the year 2007, which continues through 2011. This would indicate that there was an impact to this sector as a result of the ban and one

would expect this to be statistically significant based on the drop seen after 2007. Lastly, this variable would be classified as a supply shifter as it would discourage breeders to over supply the market in order to maintain market prices.

Alfalfa Price - is the first of several industry specific economic variables that could have had an impact on the change in the number of horses sold over this period. Hay is one of the primary components of a horse ration. Therefore, one would expect that this would have statistical significance to the total number of horses sold. If alfalfa prices begin to increase, as they have in recent years and as seen in figure 3.5, one would expect it to be harder to maintain a large herd of horses. This is a considerable input cost for a ranch that maintains a higher number of horses, and if it fluctuates, so would you expect the number of horses they can maintain. But why would this price fluctuate? This can be tied to a number of factors, which could include climate changes, fuel prices, and less hay production. As mentioned above, this input could cause many farms and ranches to increase or decrease their herd size based on alfalfa price. This would then impact the number of horses available in the market. For these reasons, I would classify alfalfa prices as both a demand and supply shifter since it increases input cost for both breeders and buyers of thoroughbreds. Because of this, I would also expect alfalfa to be statistically significant and to have a negative impact on the total number of horses sold based on the change in average price per ton seen in figure 3.2.

Figure 3.2: Yearly Average Alfalfa Price per Ton from 1982 through 2011

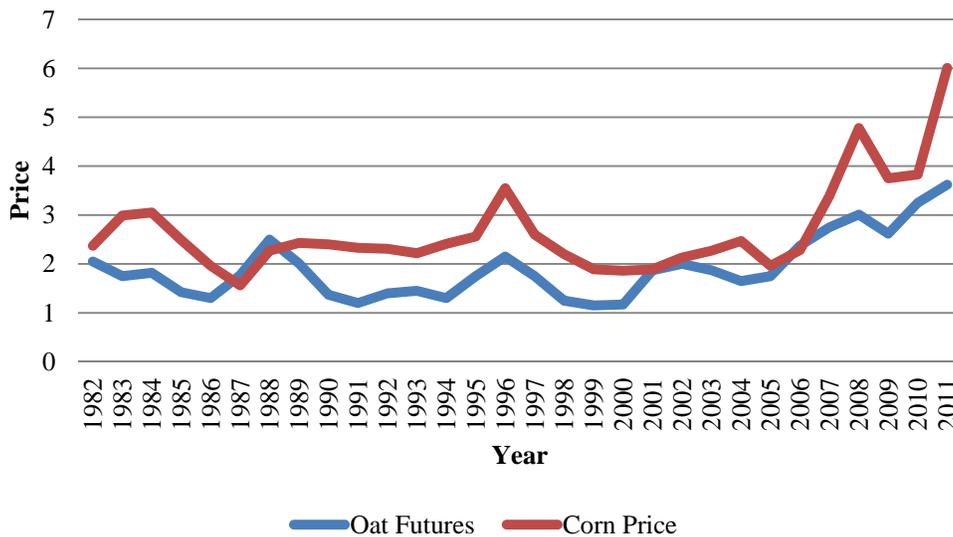


University of Wisconsin: http://future.aae.wisc.edu/data/monthly_values/by_area/2053?area=US&tab=feed&yoy=true

Oats and Corn Futures Prices – are the next two independent variables that will be included in this regression. Hay is the primary component in a horse’s ration, usually accounting for more than seventy five percent of the horse’s daily intake. But, depending on a horses use, grain is also a significant source of many of the important nutrients needed to meet a horses daily intake requirement. Because of this, like hay, grain can have an impact on a farm or ranch’s bottom line, as well as potential buyers who are looking to purchase horses. This is an expensive input cost, especially in recent years as grain prices have been consistently increasing due to a number of different factors including fuel costs and corn being used for alternative uses such as ethanol. As a result, one would expect that an increase in these two variables would have a negative impact on the total number of horses that are sold in a given year as both a supply and demand shifter since this additional cost would impact both breeders and buyers. In figure 3.3, one can see that both of these two variables have increased over the last thirty years, but not as much as they have in the last five. That is why one would expect that the increase in both of these two variables

would be statistically significant and would have a negative impact on the total number sold in a given year. The only reason that this may not be true is due to alternative feed sources. These two variables do not account for all of the different feed sources that a ranch can obtain as an ingredient for a grain ration. There are alternative sources that can be obtained from the processing of grains that may be used in these rations to lower cost as corn and oats increase in price. Therefore, while these two ingredients are one of the primary ingredients in many horse grain rations, alternative inferior sources may be used in the event that these two ingredients become too costly. In this event, these two variables may actually be statistically insignificant.

Figure 3.3: Yearly Average Oat and Corn Futures Prices from 1982 through 2011

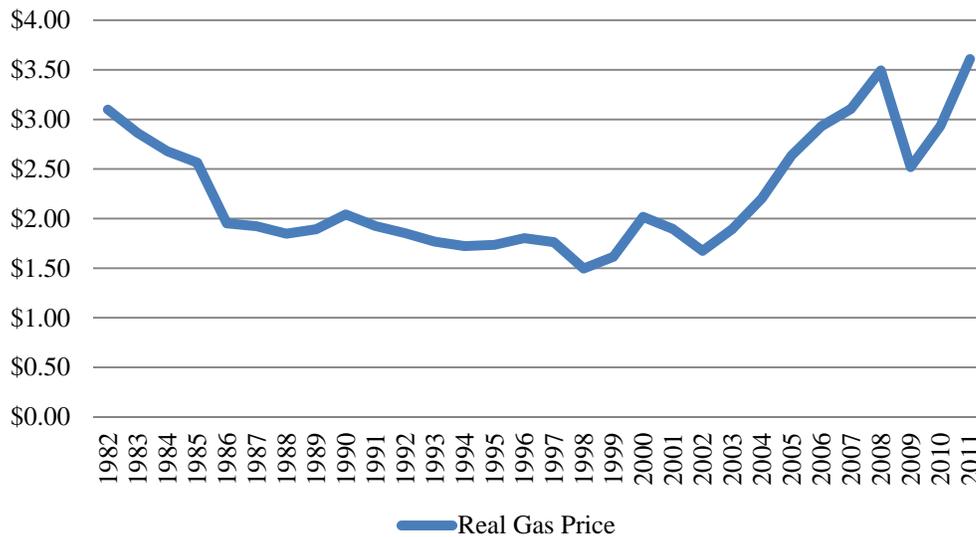


Oat Prices downloaded from FC Stone: www.inelfcstone.com
 Corn prices downloaded from farmdoc: <http://www.farmdoc.illinois.edu/manage/uspricehistory/USPrice.asp>

Gas Price – Gas price is the last independent variable that will be used that adds a direct input cost for horse ranches and farms that are breeding horses, and individuals that are interested in purchasing horses. Gas price is one of the variables that would have a

negative correlation on the total number of horses sold and would likely have a negative impact on all horse owners since traveling and trailering is very common in this industry, and in effect would impact most of the other input variables that were listed above. If this cost increases too significantly, ultimately it could impact many farms and ranches to the point that they may have to liquidate their herd. This would decrease the total number of horses and eventually decrease the total number of horses sold over time. This also means that horse owners would be less likely to purchase more horses since larger trucks and trailers would be required. As most know, gas prices have been steadily increasing over time, but not as much as we have seen in the last decade. In figure 3.4, we can see that since 2002, gas prices have increased from approximately \$1.50 per gallon to over \$3.50 per gallon. Like the independent variables before, this represents a large input cost that could lead to negative impacts on the industry. As a demand shifter, or a variable that will have a larger impact on a horse owner's ability to purchase more horses, I would not only expect this to be statistically significant, but also to have a negative impact on the total number of horses sold in a given year. Lastly, in order to accurately represent gas price minus inflation, a variable called real gas price was used to account for inflation over time.

Figure 3.4: Yearly Average Real Price per Gallon of Gasoline from 1982 Through 2011

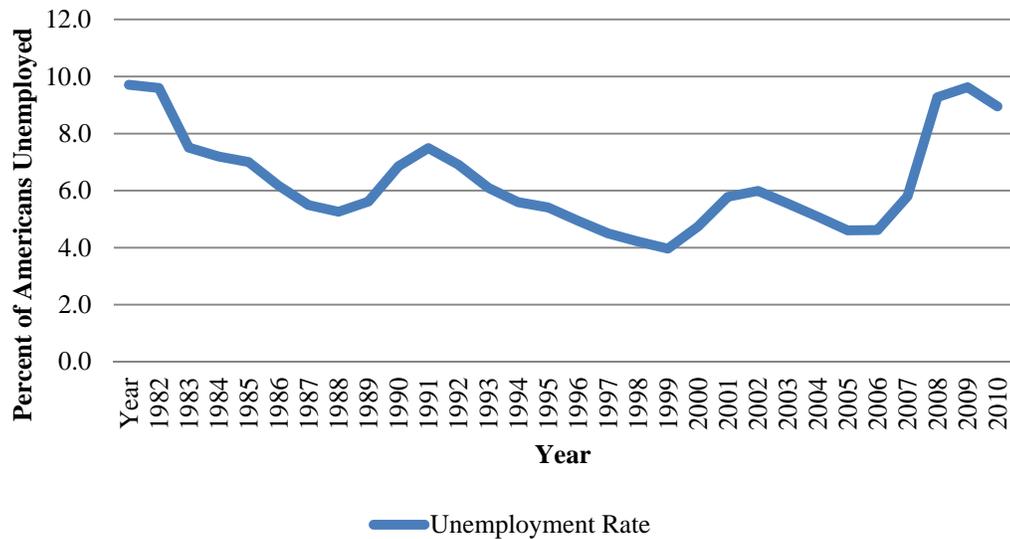


Gasoline Price History: www.eia.doe.gov

Unemployment Rate – The last and final independent variable that will be used to determine the economic impacts on the number of horses sold is unemployment rate. This will be used as an economy variable to gauge what the overall effects of the economy have been on the thoroughbred industry. Many things, such as strength of the economy, wages, taxes, etc, affect unemployment rate and thus would also affect the amount of disposable income that a person has. As the unemployment rate goes higher and the disposable income decreases, individuals will be less likely to purchase additional horses for pleasure, or in the thoroughbred industries case, racing. This would then affect the overall number of horses that a farm or ranch produces and sells. Therefore, the unemployment rate should be highly correlated to the total number of thoroughbreds that are sold in a year. One would expect as the unemployment rate increases the number of horses that are sold will decrease. This is why we would again classify this variable as a demand shifter as it would decrease the demand within the market. As we can see in figure 3.5, the unemployment rate increased dramatically in 2007, and has not decreased much if any at all in recent years,

which coincides with the sudden decrease in the number of thoroughbred horses that are being sold. As a result, I would expect that the unemployment rate will be statistically significant and will negatively impact the total number of thoroughbreds sold in a given year.

Figure 3.5: Average Yearly Unemployment Rate from 1982 through 2011



Labor Force Statistics: <http://data.bls.gov/timeseries/LNS14000000>

CHAPTER IV: METHODS

4.1 Data Collection and Scope

Data for this project were collected from multiple sources to determine what the economic impact and the effect of the horse slaughter ban has been on the U.S. thoroughbred industry. The first issue that had to be addressed before moving forward is the exact time frame that will be used to analyze these effects. While some data for many of these variables were harder to find than others, a thirty-year history was ultimately decided upon to increase the sample size. Because of this, we are able to have a twenty-six year sample of data before the horse slaughter ban was put into effect and a four-year sample of data post implementation of the ban. Secondly, by using a thirty-year sample, a more thorough view can be obtained for what effects the remaining variables had on the industry. While this made data collection more difficult, because of the lack of information on a number of variables, it proved to offer a larger sample size for increased accuracy.

Thoroughbred statistics: The first set of data to obtain was on the average number of horses sold over this time. First of all, there is a lack of data that is readily available in the public domain on annual breed statistics. The government will conduct periodic census reports on the total number of horses, but little data are available on number of horses sold or price statistics. Secondly, many of the breed organizations do not offer or record statistics on a national basis. Data may be obtained at a local level at local sale barns, but then there is no guarantee of the accuracy and how far these records go back. This also limits the sample size and thus limits us to analyze the impacts on a national basis, which is the objective of this report. That is why the data were obtained from the Jockey Club. The Jockey Club¹¹ was formed in 1894, and ensures the correct pedigree and identification of

¹¹ <http://jockeyclub.com/registry.asp>

every thoroughbred whether breeding or racing. There are approximately 25,000 thoroughbreds registered annually with the Jockey Club, which gives us a very large sample size of horses that are registered on an annual basis. Additional benefits from using the Jockey Club data are that it fits the segment of horses that is being analyzed in this report. Since the effects of the horse slaughter ban and economy are well documented on the lower priced horses, effects on the higher end horses have not fully been analyzed to the maximum extent to understand if and why there has been a decline in the mid to higher priced horses. Using thoroughbreds as the target breed for this analysis, gives us just that. Many of these horses are sold in the mid to upper priced level, which gives us data that specifically look at the data that are targeted in the objective.

Horse Slaughter Ban – As discussed in the theory section, a dummy variable was used to represent a full year in which there was no active horse slaughtering. While the ban was implemented late in 2007, slaughtering was not immediately halted, although it had slowed in the years leading up to 2007 due the fact that there was an expectation that it would be implemented. The same issue arose for the year of 2011 when the ban was overturned and essentially allowed horse slaughtering once again in the U.S. However, because of public perception and concern over how long that would stand, there has not been active horse slaughtering in this country since the ban was enacted in 2007. There lies the problem for this variable within this regression. That is why a variable was chosen to represent a full year in which slaughtering was active in the U.S., and thus the data represents this accordingly. The year of 2007 was thus represented as a full year of active slaughtering and 2011 was represented as a full year where there was not slaughtering.

Alfalfa Prices – Hay and alfalfa price is another variable that is inconsistently recorded across the country, and much research was done to obtain data that could be found on a national level that dated back thirty years. Also, while alfalfa is a richer hay and most likely would not be commonly fed to the lower range horses, it would be more common for the mid to higher range horses that were analyzed in this report. It also would be even more common in horses that are being use for sport or racing. While there are many types of hay that horses can eat, one type needed to be analyzed to create some consistency in price for the regression, and thus that is why alfalfa was chosen as the type of hay to be entered into the regression. The data for the regression were then obtained from the University of Wisconsin¹² and are recorded on a per ton basis. These data are a national average per year and can also be broken down on a price per ton per state.

Corn and Oat Prices – The next variable that we must take into account, which can drastically increase or decrease upkeep cost, is grain. Most grain rations unfortunately vary from manufacture. Additionally, most of the common grain rations that can be purchased at a local mill or feed store can vary on consistency from month to month. Currently, many of the common rations that are available on the market do change due to what ingredients are available, or depending on the ingredient costs. That is why many of these rations do, and can change in price on a regular basis. And lastly, many of these name brand rations were simply not available twenty or thirty years ago. Therefore, in order to create some consistency around grain diets, two of the more common ingredients of these diets are included as independent variables in this regression. While simply including corn and oats may seem rudimentary, they are the primary ingredient for many of these diets, and if not the primary ingredient, impact other ingredients that may go into the

¹² http://future.aae.wisc.edu/data/monthly_values/by_area/2053?area=US&tab=feed&yoy=true

diet. While obtaining the average price of corn was relatively easy, the price of oats was a little more difficult. The average price of corn on a yearly basis was taken from the University of Illinois. The data were taken on an average price per month and converted to an average price per year. The oats price used was actually the average futures price per year. This would not include the basis that would be applied on a local level and thus that needs to be noted.

Gas Price – the average price of a gallon of gasoline was one of the relatively easier variables to account for in the regression. The data for this portion of the regression were taken from the U.S. Energy Information Administration. It is important to note that this variable represents real gas price, which takes into account inflation over time. An average of each year was taken and then used to account for the fluctuation of real gasoline prices on an annual basis. Again, this variable is important to take into account, because most horses are routinely transported. This variable could dramatically affect a potential horse owner's ability to purchase more horses.

Unemployment Rate – The final variable that was analyzed in this regression was unemployment rate. This is the only variable that was also in the GAO report, and was found to be the most statistically significant for the targeted horses in this study. Therefore, it was included in this regression as well to analyze the same effects, but on the thoroughbred industry. Also, like the variable discussed before, an increase in the unemployment rate can decrease a horse owners' income. Additionally, since the thoroughbred industry is closely tied to racing, it may also affect individuals' ability to gamble on races and decrease the overall race revenue, which would in turn affect the number of potential horse owners or buyers. This data were again taken from the Bureau

of Labor Statistics. An average unemployment rate per year was then calculated for the purposes of this regression.

CHAPTER V: THE RESULTS

5.1 The Estimated Model and Regression Analysis

The following is the estimated model on the effect of total thoroughbreds sold:

$$(5.1) \quad \text{Total Thoroughbreds Sold} = 26,566 - 3002 * \text{Active Horse Slaughtering} - 81 * \text{Alfalfa Price} + 366 * \text{Oat Futures} + 128 * \text{Corn Price} + 3,392 * \text{Gas Price} - 790 * \text{Unemployment Rate}.$$

Table 5.1, presents the full results of the regression analysis and can be analyzed for interpretation.

Table 5.1: Regression Results

| Regression Statistics | | | | | | |
|---|---------------------|-----------------------|------------------|-------------|----------------|----------------|
| <i>R</i> | | 0.90777 | | | | |
| <i>R Square</i> | | 0.82405 | | | | |
| <i>Adjusted R Square</i> | | 0.77816 | | | | |
| <i>S</i> | | 1,156.40966 | | | | |
| <i>Total number of observations</i> | | 30 | | | | |
| ANOVA | | | | | | |
| | <i>d.f.</i> | <i>SS</i> | <i>MS</i> | <i>F</i> | <i>p-level</i> | |
| <i>Regression</i> | 6. | 144,054,710.9051 | 24,009,118.48418 | 17.95365 | 0. | |
| <i>Residual</i> | 23. | 30,757,515.7949 | 1,337,283.29543 | | | |
| <i>Total</i> | 29. | 174,812,226.7 | | | | |
| | <i>Coefficients</i> | <i>Standard Error</i> | <i>LCL</i> | <i>UCL</i> | <i>t Stat</i> | <i>p-level</i> |
| Intercept | 26,566.42931 | 2,393.44213 | 20,583.14293 | 32,549.7157 | 11.09967 | 0. |
| Active Horse Slaughtering | -3,002.98567 | 1,347.16819 | -6,370.72661 | 364.75527 | -2.22911 | 0.03586 |
| Alfalfa Price | -81.38358 | 25.74198 | -145.7351 | -17.03207 | -3.16151 | 0.00436 |
| Oat Futures | 366.24854 | 671.17689 | -1,311.60424 | 2,044.10131 | 0.54568 | 0.59054 |
| Corn Price | 128.60085 | 594.3376 | -1,357.16395 | 1,614.36565 | 0.21638 | 0.8306 |
| Real Gas Price | 3,392.84759 | 583.84686 | 1,933.30823 | 4,852.38694 | 5.81119 | 0.00001 |
| Unemployment Rate | -790.91537 | 240.71484 | -1,392.67038 | -189.16035 | -3.28569 | 0.00324 |
| <i>T (2%)</i> | 2.49987 | | | | | |
| <i>LCL - Lower value of a reliable interval (LCL)</i> | | | | | | |
| <i>UCL - Upper value of a reliable interval (UCL)</i> | | | | | | |

5.2 Data Interpretation

The regression analysis provides both some expected, but also unexpected results. In general, the R squared of .82 and the adjusted R square of .77 suggest we can conclude that the overall model is a good fit, and the model takes into account a number of factors that affect the total number of thoroughbreds sold in a year.

Active horse slaughtering - We will start with the active horse slaughtering variable, as this is the most notable change that happened in this time period, and the area of most controversy. As predicted, and suggested by the fact that it has a correlation coefficient of -0.7 which can be found in figure 5.2, horse slaughtering does appear to be statistically significant, and did indeed have a negative impact on the total number of horses sold in a given year. This variable does appear, and has been supported by data to in fact have an impact on the thoroughbred industry, which is a section of the horse industry that yields some of the most well-known and expensive horses. Additionally, its coefficient of -3002, tells us that for every full year that active horse slaughtering was prohibited in the United States, 3002 fewer horses were sold. This is significant, because some reports in the past using average sale price have concluded that this variable has had less of an impact on this portion of the industry. And while this does not suggest that the implications from the horse slaughter ban were fully responsible for the decline in the total number of thoroughbreds sold, it does suggest that that it has been one of the key components for the decline.

Table 5.2: Correlation Coefficient Matrix

| | Total Number of horses sold | Active Horse Slaughtering | Alfalfa Price | Oat Futures | Corn Price | Real Gas Price | Unemployment Rate |
|------------------------------|--------------------------------------|------------------------------|---------------|----------------|---------------|-------------------|----------------------|
| Number of horses sold | 1.000 | -0.715 | -0.573 | -0.449 | -0.577 | -0.086 | -0.339 |
| Active Horse Slaughtering | -0.715 | 1.000 | 0.750 | 0.759 | 0.815 | 0.596 | 0.492 |
| Alfalfa Price | -0.573 | 0.750 | 1.000 | 0.786 | 0.826 | 0.592 | 0.045 |
| Oat Futures | -0.449 | 0.759 | 0.786 | 1.000 | 0.800 | 0.711 | 0.351 |
| Corn Price | -0.577 | 0.815 | 0.826 | 0.800 | 1.000 | 0.699 | 0.446 |
| Real Gas Price | -0.086 | 0.596 | 0.592 | 0.711 | 0.699 | 1.000 | 0.484 |
| Unemployment Rate | -0.339 | 0.492 | 0.045 | 0.351 | 0.446 | 0.484 | 1.000 |

Alfalfa Price – Another variable that was predicated to have a negative impact on the total number of thoroughbreds sold in a year was alfalfa price. This represents a large input cost of owning and maintaining a horse. Forage is a key component in the animals’ diet, and can represent a large cost. The regression suggest that this is in fact accurate, and that it, like the variable before, is statistically significant at the 95% level based on the *t-stat* being above 2 and the *p-level* at 0.05. In fact, for every dollar that alfalfa price increases, there are 81 fewer total horses sold in that year. But what has caused the increase in hay price? Weather certainly can play a key role. Drought can decrease the supply, and heavy rainfalls can help increase supply. But this would certainly level out over time. A more likely cause is that there are fewer individuals that are producing hay, which could decrease supply and cause hay prices to increase. Another thought is that we know grain prices have been steadily increasing in recent years. Acreage that was previously being used for hay production may now return a higher profit for farms in corn or soybean production. This again would decrease the number of acres available for hay production, and thus cause hay prices to go up. Since hay accounts for more than 70% of a typical horse ration depending on its use, any increase in hay price may cause the demand for horses to decline over time.

Oats and Corn Variables – Some of the more surprising results came from the data on corn and oats variables. As discussed before, while we have seen a steady increase in grain prices in recent years, which has spiked since 2006 and was represented in figure 3.6, it appears to have had little significant effect on the total number of thoroughbreds sold in a year. While this is not to suggest that when corn and oats incrementally go up, so does the number of horses sold, we can conclude that grain price increases have not had a negative impact on the total number of horses sold. In fact, based on their low *t-stat* and high *p-level*, we can conclude that they have little statistical significance. This was offered as a possible outcome earlier. While corn and oats is a primary ingredient for many of the grain rations on the market, and more than likely dictates the prices of many of the other possible grain substitutes, the cost of this variable is small compared to the effects of the other variables that are discussed in this report, like alfalfa for example. While this is an important economical variable for all horse owners, there are other costs that greatly increase and decrease the cost of owning and raising horses. While I expected this variable to be significant, and have a negative impact on the total number sold, it is not surprising to see that it is not.

Gas Price Variable – One key variable that was left out in prior reports, that we thought would have a significant impact on the total number of thoroughbreds sold in a given year was gas price. This was mostly due to the fact that it impacts not only horse owners directly because of transportation purposes, but also indirectly because it is an input cost for many other variables that increase cost for horse owners. With a *t-stat* above 2 and *p-level* below 0.05, our theory on this variable is confirmed. It does indeed appear to be a statistically significant variable that has had some effect on the number of thoroughbreds

sold in a given year. However, surprisingly, it is not affecting the number sold negatively, in fact it has positive coefficient of 3,392, which suggest that for every dollar that gas increases by, the total number of thoroughbreds sold increases by 3,392 in that year. Again, like corn and oats, we do not expect that if gas prices continue to rise more horses will be sold. But this does suggest that while the price of gas has some statistical significance, we can conclude that from this study it has not negatively impacted the industry as was previously thought. Many within the industry point to the increase in the price of gas as a cause for the decline in the industry because of the increase in input cost. However, at the very least, gas price remains inconclusive, and from this report appears to have not had the negative impact on the industry as previously thought.

Unemployment Rate Variable – The last and final variable that was analyzed on the effect of number of horses sold was the unemployment rate. Again, this was used as an index on the economy as a whole. Since individual income and employment directly impacts horse owners' ability to purchase more horses, and thus this variable was expected to negatively impact the industry. Again as expected, it did show to be statistically significant and has a negative coefficient of -790. These results do in fact support the GAO reports findings, which suggest that the unemployment rate and recession did in fact negatively impact the horse industry. In this case we are specifically looking at the thoroughbred industry, and we are using total horses sold and not horse sale prices, but the findings are similar, and suggest that this may have been one of multiple factors that have negatively impacted the industry. Again, as we think about why unemployment rate might be causing a decline of the total number of thoroughbreds sold, it is because unemployment rate directly impacts the amount of disposable household income. As the unemployment

rate increases, and disposable income decreases, horse owners are going to have less money to purchase more horses, in addition to maintaining their current horses.

Unemployment rate would not exclusively affect just the sale of horses, but would also affect tack sales, veterinarian use, grain sales, and trailer sales. While we can see that the unemployment rate has directly caused the total number of thoroughbreds sold to decrease, it may have much farther reaching effects within the industry that have yet to be analyzed.

5.3 Summary of the Independent Variables

While there were some outcomes that we expected to see, there were some surprises as well. Active horse slaughtering, while previously thought not to have had an impact on this section of the industry, does appear to have had an impact on the total number of thoroughbreds sold. While slaughter is not the main outcome for thoroughbreds, it can be stated that it ultimately hurt the base price of the industry by eliminating a possible avenue for horses that are not suited for racing or sport. Another answer would be that there might have simply been over production due to the fact that breeders knew they had a base price that could be obtained at the sale barn. With that now gone, we are seeing the population correcting itself to a number that is more in line with the demand. Also, the fact that alfalfa does appear to have a direct impact on the total number sold in a year was also not surprising. This is an economic variable specific to the industry, and cost can dictate the number of horses that a breeder maintains. The fact that this does appear to have had a negative impact on the number of horses sold is not surprising, since it is one of the key components in a horse ration.

Additionally, the fact that corn and oats were not statistically significant was not expected. With corn and oats being one of primary ingredients in most grain rations, we would expect them to be a key driver of the total number sold because of the additional

input cost when price increases. However, breeders may simply use alternative grains or feed more forage, which would again decrease the overall cost. More surprisingly were the impacts of gas price on the total number sold. While it does show significance, the fact that it had a positive effect on the number sold was surprising. It is not clear as to why this may have happened, however we could argue that it has indirectly negatively impacted the industry by increasing input cost for hay production. That leaves us with unemployment rate. Similar to the results of the GAO report, unemployment rate does appear to be negatively impacting the thoroughbred industry, which is most likely a result of the decrease in disposable income. With these results, we have taken another step forward by analyzing some economic variables specific to the industry, as well as the effect of the horse slaughter ban on the total number of thoroughbreds sold.

CHAPTER VI: CONCLUSION

While it will still be many years before we can fully grasp the true impact of the horse slaughter ban and recession on the U.S. horse industry, we are beginning to get a large enough sample size to get a general feel for the impacts that these variables have, if not specifically on the thoroughbred industry.

Because of this regression, we can say that the horse slaughter ban did have an effect on the total number of horses sold, given the thirty-year sample that we had for this report. While prior reports focused on the impact to the sale price, total number of horses sold is a good indicator on the true change in supply and demand within the industry. Based on the results, we can conclude that the ban has impacted supply, causing farms and ranches to produce and sell fewer horses. Likewise, it impacted demand. However, this may be why prior reports concluded that average sale price was not impacted on the higher end horses. As supply decreased, average price may have stabilized due to the decreased supply in the market. With total number being sold annually, the pool of horses to buy from becomes smaller, effectively stabilizing the average price sold. While we cannot say without a doubt that is exactly what is going on within the industry, it does still appear as though the thoroughbred industry was not left untouched by the effects of this ban and the effects of the horse slaughter ban was not exclusive to horses bred specifically for the purpose of slaughter.

Secondly, there does appear to be multiple factors that have led to this decrease in the total number of thoroughbreds sold outside of what we previously thought. Aside from the previously known effects of the unemployment rate on the industry as a whole, hay also appears to be a statistically significant variable that negatively impacted the total number of horses sold within a year. This may be because it is one of the key components in a horses

ration, and without forage, a horse could not survive. While a horse may gain many nutritional benefits from grain, it is not necessary for survival. In fact, grain might be substituted by hay, but hay cannot be substituted by grain. Therefore, the thoroughbred industry might be highly susceptible to hay prices increasing. But what would cause this? One answer might be that gas, which is used in this regression, is highly correlated to the price of alfalfa. This means that gas prices may have ultimately driven up the price of hay. Additionally, corn has a strong positive correlation with alfalfa. It may also be, as the price of corn and other grains have been going up, land that was previously being used for hay production is now being put into grain production. This would also increase the price of alfalfa since there is less hay available. And the third reason is weather. Hay production is highly dependent on weather, and we know that there were several droughts within this time period, which may have impacted the production of hay enough to alter the price across the industry. Either way, we can say that hay has had an impact on the total number of thoroughbreds sold, and is a key variable as we move forward. We can also say, that contrary to what we expected to see, grain prices did not have a significant impact, if any at all, due to the fact that grain can be substituted by hay.

Lastly, the unemployment rate and gas prices also appear to be significant, but gas prices did not have had the negative effects on the industry as previously thought. Gas price had a positive coefficient; meaning as gas price went up so did the sale of horses. But I would not venture to think that it caused the total number of horses sold within a year to increase as gas prices increase, as this would be illogical. However, what we can conclude is that it may not have had the negative effects on the industry like we thought. While it may have increased input and transportation cost, it did not directly negatively affect the

total number of thoroughbreds sold within the year. The same cannot be said for the unemployment rate. Like the horse slaughter ban and alfalfa prices, it too had a negative coefficient and was statistically significant, and does appear to have had the same effect on total number sold as did the ban and alfalfa prices.

It is my goal that this report begins to expand upon some of the impacts that the horse slaughter ban and the changes in economy have had on the thoroughbred industry, but there are still some ways that this regression could be improved for future analysis. Future analysis may want to look at both horse sale prices and total horses sold as a dependent variable, or take a deeper look into each of the four thoroughbred categories, and if there are differences within the thoroughbred industry itself. We also could look at multiple breeds to see if these effects are happening in other breeds within the industry or if this is only specific to the thoroughbred industry. There may also be some other key independent variables that were not included due to limitations in gathering data. For example, there are alternative grains that may be more impactful to total number of thoroughbreds sold, but price availability vary and data are not always consistent. This also leads us to why we could not look at specific grain rations, as they vary in consistency over time. Also, we only looked at alfalfa prices, and one may want to consider grass hay prices since alfalfa is more expensive and grass hay may be more impactful to the lower and mid-priced horses. However, this was also a challenge since grass hay consistency also varies and prices are simply not available on a national basis like we found with alfalfa prices. While this report does not fully explain all of the causes for the change in the total number of thoroughbreds sold, maybe it shed some light on the effects that a controversial ban has had on the industry from top to bottom. The ban did impact segments of the industry where

horses were being bred for other purposes outside of slaughter. And as proponents of the ban can see, there were other causes for the decline in the total number sold, like increased alfalfa prices. However, there may be fewer variables that had an impact than previously thought. So while it still may be many years before we can get a clearer picture on the effects on these variables on the industry, at least now we are getting a better idea on where to look.

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