

# **Czech University of Life Sciences Prague**

Faculty of Economics and Management

*Department of Economics*



**Bachelor Thesis**

## **ECONOMIC ANALYSIS OF CHOSEN ELEMENTS OF EQUINE WELFARE**

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Declaration

I declare that I have worked on my bachelor thesis “Economic analysis of chosen elements of equine welfare” by myself and I have used only my personal experience and the sources mentioned at the end of the thesis.

In Prague, .....

.....

Lucie Barešová

## Acknowledgement

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# Economic analysis of chosen elements of equine welfare

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Economická analýza vybraných prvků welfare chovu koní

## Summary

One of the most favourite domestic mammals, except a dog and a cat, is a horse. The trend of breeding horses is increasing all over the world. In the Czech Republic the number of horses has risen significantly from 18 800 in 1993 to almost 74 000 in 2010. Around 5000 are involved in equestrian competitions, sponsored by The Czech Equestrian Federation and around 1300 in races according to data from The Jockey Club. Most of them are kept for leisure time activities. The horse has become a symbol of luxury, friend or sports tool.

Even though the number of horses has grown over the past two decades, there is little improvement in terms of animal welfare. Strong evidence suggests that horse life expectancy in human care in Europe is shorter than its natural lifespan. There are several factors that contribute to this shortened life such as inadequate living conditions, fatal sport injuries as well as cruelty to horses. In this thesis, living conditions in the question of equine welfare are analyzed from the economic standpoint of view, using a hedonic price method. This analysis provides useful information for horse owners in order to improve animal welfare and efficiency as well as cost-effectiveness in the equine farms.

**Keywords:** equine welfare, natural keeping conditions, lifespan, hedonic price method, cost-comparison, value of recreational horse

## Souhrn

K oblíbeným domácím zvířatům, kromě psa a kočky, bezpochyby patří kůň. Obliba jeho chovu celosvětově roste. V České Republice počet koní vzrostl z 18 800 v roce 1993 na téměř 74 000 v roce 2010. Z toho kolem 5000 startuje v jezdeckých soutěžích a kolem 1300 dle dat z The Jockey Club v dostihových závodech. Většina ze zbývajících počtu je využívána k volnočasovým či rekreačním aktivitám. Kůň se stal symbolem luxusu, dobrým kamarádem nebo také sportovním náradím.

Přestože počet koní v posledních dvou desetiletích vzrostl, žádné velké změny ve zlepšení jejich welfare nejsou zaznamenávány. Přesvědčivé důkazy naznačují, že v Evropě se koně chovaní v zajetí dožívají kratšího průměrného věku než volně žijící jedinci. Jsou známy některé faktory mající vliv na krátkověkost koní, jako jsou nevyhovující životní podmínky, sportovní úrazy či případy týrání. V této bakalářské práci jsou posuzovány životní podmínky rekreačních koní z hlediska welfare a z ekonomického hlediska použitím hedonic price method. Analýza poskytuje informace pro majitele koní vedoucí ke zlepšení welfare koní a ekonomické efektivitě koňských rekreačních zařízení.

**Klíčová slova:** welfare koní, přírodní podmínky ustájení, délka života u koní, hedonic price method, porovnání nákladů, hodnota koně pro rekreační účely

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# 1. Introduction

The horse has been of use to man almost since the beginning of human history. Firstly as a source of meat, fat, fur and bones, later around 5000 B.C. it became domesticated. But the history of the horse as we know it today is millions of years old. During this period the horse has become perfectly adapted to his environment – prairie. All his biological needs are connected with its natural environment. *“It is important to realize that the horse living in the Ice Age, the present-day wild horse, and the high-performance breeds of today are all anatomically, physiologically and psychologically alike”* (Strasser, 1998). Since the time that the horse and man have lived together one could consider that man is grateful and tries to give the best care to horses and make their life longer and healthier than their counterpart living in wild. However the opposite is true. Majority of domesticated horses live only for a proportion of a wild horse’s lifespan.

There are many difference reasons why the average lifespan of domesticated horses is shorter. Many horses die prematurely because of human cruelty, which can be seen every day. Some of the reasons are obvious to everyone, such as the so-called ‘transports of death’ from Poland to Italy slaughter, where hundreds of horses suffer from thirst, fear, injuries and lack of space in tracks, some died already on the way.<sup>1</sup> Plenty of cases, about horses kept in terrible conditions without any food, water and with non-treated injuries, are known to almost everyone. This behaviour is commonly recognized as wrong and people doing it are taken to court for this. Many cases are seen by majority of horse owners, riders, breeders or lovers as “normal” cause damages to horses’ mental and physical health and shortening their lifespan markedly. There are thousands of sport horses, mainly race horses, which are put down every year at a young age because of injury (commonly broken legs).<sup>2</sup>

But there are even more “normal” habits and myths about horse care. With the development of society horses has been treated according to human needs and not for equine needs. Humans consider to providing human standards for comfort to horses as

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<sup>1</sup> More information: <http://www.youtube.com/watch?v=u7V1oR90rsk>

<sup>2</sup> One example: <http://www.ctv.ca/CTVNews/Canada/20110709/rodeo-stampede-horse-death-1100709/>



the best and almost necessary. Horses are kept in stables to provide a roof and protection from the bad weather, but the real reason usually is a lack of land, security, easily reachable and more. They are shod with metal shoes to be usable in every condition with the explanation that horses are not able to walk bare. People use different tools to make horses do what they want to, such as riding with bits in their mouths when in fact they just need to feel more control or using the whip to make them go forward. Horses are often stress by training which doesn't consider their natural behaviour maybe because of lack of knowledge, time or desire. It is common to cover horses with blankets as protection from bad weather and cure them with antibiotics. Although the above mentioned devastating consequences are not universally recognised there is clean evidence that they are connected to problems and diseases which are not known for wild horses. Domestic horses suffer from degenerative lameness, respiration problems and other systemic problems such as allergies or metabolic problems (Strasser, 2011).

Why don't people consider keeping of dressage horses for the whole day in the boxes when they know nothing else than their box or training as cruelty? In comparison with dogs it is like keeping them for a whole day in a kennel four times of their size and taking them once or twice a day for unnatural movement training. Every dog lover would consider this as cruelty. What is even more incomprehensible is fact that horse is naturally a herbivore and an animal living in open environment with whole day possibilities to move. A dog is a predator having its own territory and resting in one place when it is not hunting. Why is such behaviour to a dog consider as cruelty and to a horse it is normal? Many people have spent their lives proving and demonstrating how harmful this "normal" handling is. Why don't people want to listen? Is it because the majority is doing it, or that the professionals are doing it, or because the consequences show up in the long term so people are not willing to admit their mistakes?

Fortunately interest in animal welfare, especially horse welfare is increasing internationally. Numerous articles, studies and research speaking about this topic prove this tendency. The impact of these works is seen in the growing number of horse owners thinking about changing of their conventional (unnatural) ways of keeping horses and handling them. There are many ways of providing better welfare for domesticated

horses. Speaking about boarding we can find boarding pastures with shelters, paddocks or active stables. In the question of training, more people are following natural horsemanship methods, professionals are looking at training methods that consider horse nature limits. Instead of using a bit-bridle many alternatives exist; halter, bit-less bridle, hackamore etc. For hoof protection horse boots or special trimming methods are available. And the new alternatives for improving horse welfare are coming onto the market every year.

Actually horses are valuable to almost all countries at several levels; economic, social, cultural and individual. The equine industry has a big impact on any economy for example the US economy. The total economic impact included indirect impacts reached \$101.5 billion in 2004. Recreational horses<sup>3</sup>, which accounted for about 42% of U.S. horse numbers, had the largest contribution on that. The impact of the recreational sector including indirect impacts had the share at \$32.0 billion dollars and direct impacts at \$11.9 billion (Freeborn, 2009). The social importance is appreciated in general. Events, such as horse polo and horse racing is part of British culture, rodeo and western competitions are important in the US and Canada, dressage competition are famous in Germany and more. *“The development and expansion of the very extensive pastoral industries in Australia depends on horses. Almost all of the early transportation of people and much of the transportation of goods and produce also depended on horses. Consequently, the horse has a significant historical position in this country”* (Atkinson, 2007). Obviously human development was built on horse power. Now each horse owner values his horse because it brings him profit in some way; money, pleasure, friendship, freedom or smiles.

The trend of breeding horses in the Czech Republic decreased after 1989 but started to increase after 1993 respectively from 1996 and from that time is still increasing. At the end of year 2010 there were 73932 registered horses, according to data from ČSÚ<sup>4</sup>, the majority of them used as pleasure or recreation horses. Around 5000 are involved in equestrian competitions, sponsored by The Czech Equestrian Federation and around 1300

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<sup>3</sup> In this thesis (Freeborn, 2009) recreational horse has not been defined precisely. In this context the recreational horse can be consider as a horse not used for showing, racing, or other purposes, such as serious competition industries or for business or breeding.

<sup>4</sup> ČSÚ (Český statistický úřad) The Czech Statistical Office

in the racing industry according to data from The Jockey Club. The numbers of horses kept for human pleasure and the growing number of recreational riding businesses confirm that. Horses are here surely not just for sport or recreation, but they help in agriculture, transport, but slowly they are losing the importance in these industries. More and more they are finding a place in hippo-therapy, the relaxation industry, and personal development. In recent history new programmes have started using work with horse to develop leadership, self-control or communication skills.

Even if the stress on horse welfare is increasing it is still insufficient. In the sports industry the main role is played by money, a horse is here a sports tool. This fact is confirmed by many cases of doping, use of pain killer medicine or whips and bits as harmful tools. In the breeding industry the welfare point of view is generally better. Most of the breeders, even though driven by demand, try to provide as much comfort as they can dependent of their budget and their personal conviction of what is the best for the horses. In the recreation industry owners are usually limited by the profit they have to make, but strategies they use are very individual.

Unfortunately even if the horse owners truly love their horse-friend, and are not influenced by money power or the market, they are not focused on the welfare conditions provided to their horse in the equine point of view. Commonly they choose the most comfortable solution for themselves without considering the horse's needs. The reason might be a money issue, keeping old traditions, lack of information or maybe a personal conviction to do the best.

## **2. Objectives and Methods**

However although equine welfare is an often discussed topic the connection with economic wealth is poorly seen. One looks in economic research for the answer or at least some framework to be able to make better decisions.. More information on this topic could help to improve living conditions for the horses as well as increasing the economic wealth of farms.

The primary objective of this thesis is to define the individual factors that have an impact on horse welfare and evaluate how specified welfare factors applied on a particular recreational farm contribute to its performance, cost effectiveness and horse value. It is expected that this thesis will prove that the chosen welfare factors influence not only the health of the horse but also its market price. The cost comparison should demonstrate the economic benefits of keeping horses in welfare friendly conditions. In addition, accurate information on this topic could provide a useful guide for farm owners or horse owners the decision making process.

From the accessible literature and scientific papers, factors influencing equine welfare have been chosen by using synthesis, induction and deduction. To evaluate how these factors have significant effects on a horse's price a regression analysis was applied by using hedonic pricing method in a linear function form. Typically the hedonic pricing method has been applied to evaluate the price of the animals used for making profit as race horses, breeding horses, show horses or cattle. The price in these particular pieces of research was principally influenced by sex, age, racing results or breeding worthiness. The assumption of the model used in this thesis is that the price of recreation horses can be influenced by the age, sex, breed, type of boarding, previous sports career and hoof care according to the literature review. Data collection was done within Q4 2011 on chosen Czech farms. The comparative analysis of the annual cost of keeping a horse on chosen Czech farms including boarding, hoof care, rent, labour, hay, grain, veterinary care, necessary supplements and others costs was done in welfare and non-welfare friendly conditions. More details are listed in Chapter 4.

### **3. Literature review**

By analysing accessible literature and internet resources no similar research, article or scientific work to the topic of this paper has been found. Numerous studies about equine welfare in connection with sport practice, transportation to slaughter, stable keeping, and more were used as a basement for factor selection. The economic analyses are mainly focused on the sports or breeding industry using mostly a hedonic price method to evaluate the characteristics that have impact on price.

### 3.1. Welfare definition

Animal welfare is a worldwide topic mentioned in news, newspapers, books and magazines. Its definition is repeatedly discussed and the most frequent words which are used to describe welfare are **happiness, health, prosperity or well-being**. But the truth is that everyone can explain these words differently. This is supported as well by the opinion of a Canadian writer. *"However, the term can mean different things to different people. Understandably, in the past, veterinarians and farmers have seen animal welfare chiefly in terms of the body and the physical environment (shelter, feed, etc.)... However, there are limitations to seeing animal welfare only in terms of the body. One limitation is that genetics and the environment can produce desirable physical outcomes, even though the animal's mental state is compromised"* (Hewson, 2003). From these sentences and the meaning of the whole article it can be assumed that the care of animal feelings has the same importance as the care of their body, but unfortunately not all humans realize this.

To cover both the physical and the mental well-being of animals the well-known approach of Five Freedoms was constructed in the Brambell Report<sup>5</sup>, December 1965. Hence the concept is used as the basics for the welfare evaluation. The basic explanation, of what it means, is behind the names of individual freedom.

The Five Freedoms are following:

- **Freedom from Hunger and Thirst** - by ready access to fresh water and a diet to maintain full health and vigour.
- **Freedom from Discomfort** - by providing an appropriate environment including shelter and a comfortable resting area.
- **Freedom from Pain, Injury or Disease** - by prevention or rapid diagnosis and treatment.
- **Freedom to Express Normal Behaviour** - by providing sufficient space, proper facilities and company of the animal's own kind.
- **Freedom from Fear and Distress** - by ensuring conditions and treatment which avoid mental suffering.

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<sup>5</sup> Edited: HMSO London, ISBN 0 10 850286 4

If this concept of Five Freedoms sufficient is or it needs to be renewed is a question for a long discussion. The explanation of Five Freedoms is not always absolutely clear. An interesting opinion that animals don't have to have a total freedom from pain, cold or fear but they need to have the freedom to fight against it by their own activity to avoid suffering is recognized (Šonková, 2006). Apparently to follow this concept is a minimum to provide unnecessary welfare to all kinds of domesticated animals, it just depends on how the animal's owners or lawmakers understand this concept.

### **3.2. Animal farms and economic point of view**

The importance of free market power in a question of farm animal welfare is huge, usually it is true that the more valuable the animal for the farmer is the better welfare conditions can the farmer provide. Even if the farmers have the desire to improve standards of farm animal welfare they are driven by demand (Webster, 2001). According to Webster for the improvement of welfare problems it is necessary to know not just the five Freedom approach but as well answers on three main independent lines to fully fill economic needs:

- A scientific understanding of the factors contributing to the welfare state of farm animals.
- An ethical understanding of how and why we should respect the intrinsic value of these animals.
- An economic understanding of the factors that determine the extrinsic value we actually do give to these animals.

To know the answer for these three lines is contributory for farmers and the cost effectiveness of their farm, when they decide to improve welfare conditions. The modern approach to change the traditional farming to green farming brings more expenses to the farmers and this could be a way how to prevent economic instability of a farm. Because of growing demand for cheaper meat and other animal products the natural needs are disregarded and the whole agriculture system serves to free market power. The solution of green farming is undeniably good for animals and their welfare. But for solving the problem of farm animal welfare the support from consumers which has huge impact on the market is required (Šonková, 2006).

### **3.3. Horse welfare**

Horses are ordinarily considered to be a livestock and their welfare is evaluating according to the same principles as for pigs or cows. There are many opinions about if horse is a pet, a livestock or a companion animal. For purposes of this thesis is the horse viewed as a companion animal which deserves the best conditions for living, because it brings benefit and pleasure to humans.

As a result of insufficient knowledge about proper boarding, care and training, there is unfortunately increasing number of cases which cause a neglect of horse health. People, who own horses, ride on it, deals with the breeding or otherwise uses it, must ensure to their horse the healthiest living conditions, which correspond to most of his psychological needs. A prerequisite is knowledge about the anatomy of horse body and function of organs and knowledge about the natural course of his life from birth to death (Ende, 2006).

#### **3.3.1. Boarding**

The more we are able to adapt horse life to natural conditions the lower risk of development of any problems (Bayley, 2004). Unfortunately numerous domesticated horses in the Czech Republic (and in most of the European countries) are kept in almost opposite way than is the natural one, mainly in the stables. That stabling does not provide the same condition as are in nature can be easily manifest. *“Stables differ from the free-ranging environment in a number of factors including space, nutritional environment, social environment, types of environmental substrates and the ability to make controlled environmental choices. These factors may individually or in combination contribute to the development of stereotypies”* (Cooper, 2002). This opinion is supported by pointing out the total difference between natural environment and conventional boarding (stables) condition provided to horses by humans in a Table 1.

On the comparison can be easily recognize the difference what horses need and how humans treat them. That the horses don't appreciate humans' standards for comfort should be clear to everyone. Horses don't mind the cold or snow, the only uncomfortable is a direct wind and heat, which can be solved by offering a shelter or group of trees.

The restriction of movement a horse consider as cruelty because in nature it means danger. Horses of all breeds and ages can live outside whole year even without luxury of blankets after all they live like that in wild (Bayley, 2004).

Although keeping horses in stables may cause significant damages on horses mental health display as stereotypic behaviour and on physical health display as many diseases, humans still consider this way as “normal”. Not to cure stereotypic behavioural problems can create hardly removable habits which may bring injury to the horse or even to the humans.

Table 1 – Table of Natural Environment and Conventional Boarding Conditions

	Natural Environment	Conventional Boarding
Environmental temperature	Fluctuates continually	Changes abruptly
Movement	Continuous	Restricted (too short, too infrequently) and often unnatural
Lifestyle	Herdlife	Solitary ( herdlife impossible)
Nutrition	Vast variety and continuous uptake	Restricted and insufficient variety, set meals
Body posture	Natural, mostly head-low	Unnatural, mostly head-high
Body weight	Changes gradually, actively	Change suddenly, passively
Exposure of hooves to water	Daily	Rare to none
Resting places	In the open	In closed spaces
Presence of grease or oils on hooves	Non-existent	Common
Immediate and direct ground contact of hooves	Always	Rarely
Clothing & protective wear	Non-existed	Common ( leg wraps, blankets, bandages, etc.)

Source: Strasser, A lifetime of soundness, 1998

Such behaviour is not isolated case.” *Stereotypic patterns of behaviour, such as weaving, crib-biting and box-walking, are particularly associated with stabling, affecting between 10 and 40% of stabled horses“* (Cooper, 2002). That stereotypic behaviour does not influence just horse health but as well his value is shown in first part of Table 2 below.



Table 2 – Result of survey about stereotypic behaviour

Object of study (result are in %)	Racing stables	Riding schools	Comepetition establishments
Horse owners are concerned about stereotypic behaviour because of			
reduce the performance of a horse	31	30	27
it has adverse clinical effects on the horse	52	55	56
reduces the monetary value of the horse	45	59	31
Management of affected horses			
not allowed on to the premises	4	32	17
attempts to remove the causal factors	35	43	36
physically prevented	77	67	79
affected horses are kept separate	39	30	48

Own processing, data source: Mason & Cooper, The identification of abnormal behaviour and behavioural problems in stabled horses and their relationship to horse welfare: a comparative review, 1998

When is evident that horse exhibits stereotypic behaviour humans are using different techniques to remove or prevent this behaviour as shown in second part in Table 2. But to choose the right way how to cure it is very important. *“The mechanical prevention or surgery prevention does not solve the cause of stereotypic behaviour and even more it can have a reverse effect. The only possibility has been seen in removing or improving factors which cause stereotypic behaviour”* (Cooper, 2002). The similar attitude to this problem has (McBride, 2001) who wrote that the unquestionable fact is that physical prevention of stereotypic behaviour does not help to solve the cause of the problem.

Although the function of stereotypic behaviour is not clearly specified, there is evidence it can allow the horse to “cope” with unnatural environment and stress. *“Preventing the behaviour might therefore block this coping mechanism, thereby placing the animal in state of continual stress and having detrimental effects on its welfare”* (McBride, 2001). If humans chose improper way to remove stereotypic behaviour they can even break a Freedom from Fear and Distress.

Stereotypic behaviour is not the only damage on horse health caused by wrong way of boarding. Errors in a boarding have significant impact on the occurrence of many diseases (Ende, 2006). As Mason and Cooper express in their work the stereotypic (or abnormal, how authors used) behaviour is not just question of economic or cultural benefits or cost but mostly the question of good quality of the animal life (welfare). They

formulate their opinion how to solve this situation as follow: *“Where the behavioural ‘problem’ causes no harm and is not related to poor housing, then the education of the reporter, rather than treatment of the performer, may be the best solution”* (Mason & Cooper, 1998). The education of people working with horse is one of the most important things. If there is a misunderstanding of horse need people are wasting their resources and even causing damages on a horse health.

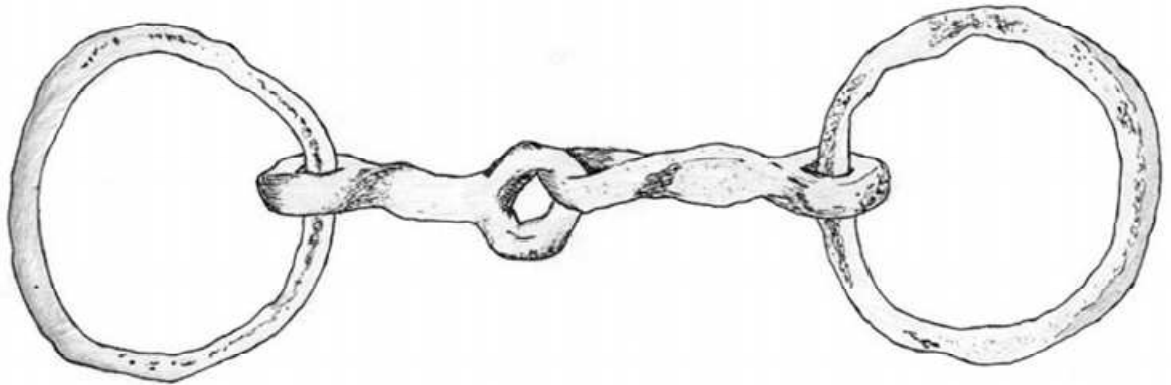
*“Behavioural problems are undesirable as if they are harmful or if they are a sign of a poor environment, but at present they will generally only be treated if they are undesirable to people”* (Mason & Cooper, 1998).

### **3.3.2. Training**

Since horse has started to be domesticated people needed to learn the horse to understand their orders. On the beginning just a simple orders where sufficient, but with the diversification of horse’s utilization more precise techniques were needed. Some evidence says that horses started to be ridden around 6000 years ago. The process of learning the horses underwent development influence by the location, purpose or mentality of the nation. *“The term ‘training’ is commonly used to describe the processes whereby the human handler introduces the horse to new situations and associations”* (N.Waran, 2007).

The conventional approaches and tools were developed to control the horse for the purposes of the transport, work or military needs. To judge the propriety of this old method it is necessary to say that in past horse was predominantly seen as a livestock with value of his meat. In present we can observe specific development in the question of usage of a horse and his value especially speaking about Europe. But the methods of training are remaining almost the same. *“...it has been conventional practice to change a horse’s behaviour through negative reinforcement, whereby an unpleasant stimulus is applied to the horse until it exhibits a desired response. This approach to training horses is still very much in evidence today”* (N.Waran, 2007). How pure is a development of bits demonstrates the Figure 1 which show a bit from Early Roman Empire obviously similar to bits used nowadays.

Figure 1 - Early Roman bit designs resemble the bits still used today



Source: Waran, Training Methods and Horse Welfare, 2007

Some of the conventional practises are causing significant damages on a horse health. Sometimes it can be visible to an amateur's eyes that riders are using improper way of "punishment" as beating with whip, "sawing" on bite (rider pull right and left reins in quick turns) or kicking to a horse's belly with spurs. In those cases the big impact on a situation has the understanding and applying by rider or trainer. Important fact is to realize that even the education of a rider is part of training. Some riders' way of riding is more motivate by vision of first place in the competition than true love to their horse. Thereby can be often seen that: *"They (horses) are also trained to respond to a stimulus with often unnatural or over-emphasised behaviour, such as some of the dressage movements"* (N.Waran, 2007). The most active discussions about breaking the rules of horse welfare are commonly in sport's riding mostly dressage (e.g. hyperflexion<sup>6</sup>), jumping (e.g. rapping) or racing (e.g. injury from whips, fractures of legs). Such behaviours to these animals decline the number of equine fans. *"The non-racing industry of horse-riding, as a sporting and leisure activity for animal-lovers, can survive only if equitation in general retains a good public image"* (N.Waran, 2007).

A movement forwards did some tradition trainers even in sport riding (dressage, jumping, cross-country etc.) which started to use more "natural" techniques, positive

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<sup>6</sup> By FEI conference in Lausanne on 9 of February 2009 was the training methods rollkur and hyperflexion defined as "force bending of the horse's neck". The international equestrian federation FEI prohibits the use of this training methods on the 9 of February 2010( <http://www.horse2rider.eu>).

reinforcement methods or developing their own methods considering horse's anatomical limits. In fact it can be said that the main method to learn horses in nonviolent way is by using a positive reinforcement. It is a training method giving to a horse positive stimulus when he performs desired response. *"A horse is more likely to perform a behaviour that is associated with a pleasant experience"* (N.Waran, 2007). The positive stimulus can be food, break, scratch, play, voice etc. Unfortunately there are still domesticated horses which are trained according to old riding schools techniques. *"Thus, inappropriate training practices can lead to conflict behaviours that jeopardise the safety of riders and handlers and can have a negative impact on the horse's welfare"* (McGreevy, 2007).

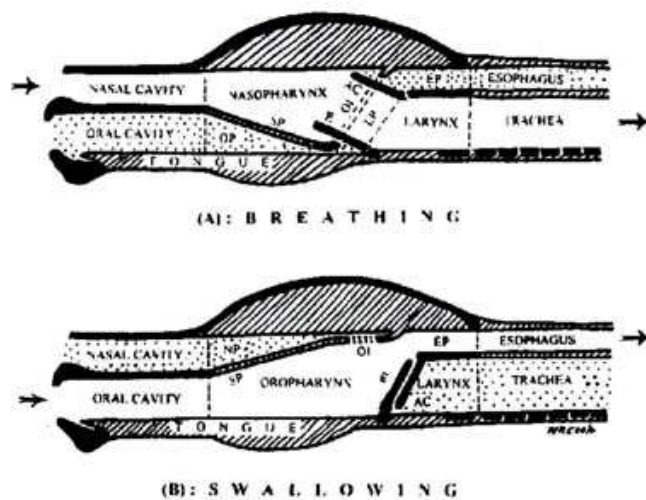
The safety of the rider and the horse is one of the big issue supports by proper training. As was mentioned above some of old techniques are leading to danger situation for both. *"Despite the long history of horsemanship it appears that we have progressed only a little in the techniques used for training horses. Most contemporary techniques are still based upon conventional methods and negative reinforcement"* (McGreevy, 2007). Horsemanship often called as sympathetic horsemanship, natural horsemanship, natural training, horse whispering or alternative training method is commonly focus on horse welfare and riders safety. *"The welfare of horses trained using sympathetic techniques may not necessarily be better than that of conventionally trained horses. However, the relaxed demeanour of many sympathetically trained horses and their reduced tendency to show aversive responses, including panic, means that they are easier and safer to work with"* (N.Waran, 2007).

The good names for these methods create an impressive work of famous "horsemen" as are for example Pat Parelli, Tom Dorance, Monty Roberts, Stacy Westfall, Jean-Francois Pignon, in the Czech Republic Honza Bláha and many more. This trainers or horsemen are using techniques following natural behaviour of horses especially the body language and they try to deliver their skills to others horse lovers. It is understandable that a coexistence of humans and horses is not natural, but using methods which follow principles used by horses in a nature is presently called as natural and for a horse is easily understandable. These methods are highly demanding the human self control, self

education, patience, fairness and self criticism therefore they are often difficult to apply in the practice.

Humans are usually looking for the simplest solution how to manage or control the situation. Instead of looking for the best solution humans are following old conventional technique as for example bridles with a bit. Although use of a bit is commonly assumed as “normal” and necessary tool to control the horse but in fact the opposite might be true. Significant evidence shows “... *the bit is the most common cause of complete loss of control*” (Cook, 2008). Moreover hardly anybody knows that it has a negative impact on horse health.” *A survey of 65 horse skulls revealed painful, bit-induced exostoses on the mandibular diastema in 49 (75%). It was concluded that a bit is harmful to the health and safety of horse and rider, and an impediment to performance* “ (Cook, 2003). The bit works on a negative reinforcement principles, if the horse response correctly the pressure is released. The harmful riding with a bit is not exceptional, good example is hyperflexion saw mostly in dressage training. “*It can compromise welfare since horses can learn that there is nothing they can do to remove the pressure* “ (McGreevy, 2007). Even a rider with “good hands” which does not bring the paint by the bit causes health problems to the horse. Anatomically the horse is constructed to breathe or to eat, as is demonstrated at Figure 2.

Figure 2 – Picture demonstrating the breathing and swallowing process



Source: Cook, Bitless :Pathophysiology of bit control in the horse, 2010

All problems or damages caused by using a bit are not scientifically documented yet. There are clear evidence that bridle with a bit might inflict oral and dental problems, abnormal behaviour as headshaking, veering, boring and pulling, “*leads to premature fatigue, poor performance, and asphyxia-induced pulmonary edema ("bleeding")*” (Cook, 2010). In addition it can bring dangerous situations for both, the horse and the rider. Everything depends on mentality and “resistance” of individual horse. What is known is that each of mentioned problems has a significant impact on horse’s welfare and in some cases on a price.

### **3.3.3. Sports Career**

The equine sports industry is sometimes isolated from horse racing industry (Collins, 2008) and horses for leisure time are in the same category as sports horses. It is because the authors are discussing legislative, statistical and responsible point of view. They are focusing on governmental law and acts connected to horse welfare mostly in the racing and sports industries. In the Collins’ article had been pointed out that even sport can be done by two different ways. One group is focusing on a horse performance and its improvement that can be measured and the second group is primary remit to improve welfare standards for the horses. Collins mentioned that:” *Improving standards of horse welfare is an aim that takes second place to improving human returns; financial rewards, personal achievement, competition successes*”. Authors still stress the importance of group fighting for the welfare improvement (Collins, 2008). The main thoughts were that the welfare standards should be kept for all animals, respectively horses, does not matter for what purpose they are used. Thus it could be supposed that more valuable the animal is the more likely will humans tend to improve its welfare. Unfortunately these thoughts were undoubtedly disprove. And sadly in some cases the opposite is true.

The equestrian competitions in the whole Czech Republic are managing by Czech Equestrian Federation (ČJF).<sup>7</sup> ČJF with cooperation with FEI<sup>8</sup> authorized the rules under which the competitions run. According to these rules the riders in chosen competition

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<sup>7</sup> Česká jezdecká federace - ČJF was founded and registered as a full member of the International Equestrian Federation in 1993. Originally there was Czechoslovak Equestrian Federation that has been member of FEI since 1927

<sup>8</sup> The Fédération Equestre Internationale- FEI, founded in 1921

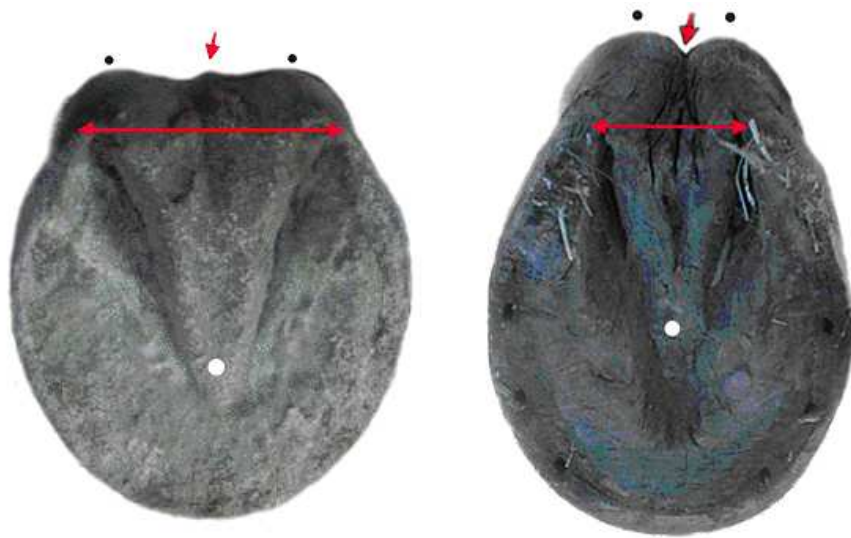
(dressage, show jumping, and racing) have to ride with a bit as necessary tool for a horse control, as was mentioned in Chapter 3.3.2. Training above use of a bit might cause significant health problem or develop stereotypic behaviour. Additionally to ride with a bit may be even more dangerous for rider and horse. Following the ideas from the World Horse Welfare the sport horse welfare is one of the best we give to the animals due to huge investment going in this industry. If is this welfare judge from human or horse point of view as to be consider. There are still existing and common issues of doping, whip punishing and using painkillers, which are clearly influencing horse welfare but the desire to win is more valuable for some people that to keep horse welfare standards.

### **3.3.4. Hoof care**

The wild horses are totally depended on a health of their hooves for two main reasons, predators and food. To survive horses in nature have to spend over 70% of their day by movement on different types of a ground. Therefore whole organism together with the quality of horn and the shape of the hoof are hooked to their lifestyle. The hooves are very important for the whole horses' organism; they have specific functions which were developing over millions of years. *“The main functions of the hoof are protection of its internal structures, secure footing on any terrain, shock absorption, and a heart-supporting circulatory pump”* (Strasser, 1998). In the case when humans close the horse in small area without small possibilities to move and put metal shoes on their hooves, the horse health is immediately negatively influenced, because the hoof cannot be functional. The shoes create deformation of the natural shape of the hoof. Keeping the hoof in proper shape and correct angles is important for good function of the hoof. Comparison of shoed hoof shape on right side and natural shaped hoof on the left side is on the figure 3.

As is shown with arrows the heels of shoed hoof are contracted. It is caused by the shoe that fixate the hoof as is grows so the wall are forcing towards the inside. Like that is laminar corium pushed between walls and coffin bone, and higher up, between the lateral cartilage. More deformations inside the hoof follow. The contraction in the heels causes “navicular syndrome” which is one of the most common reason of horses' lameness and subsequently putting down. Even this is a curable deformation by providing special conditions and trimming method. (Strasser, 1998)

Figure 3 – Comparison of natural shaped hoof and deformed shoed hoof



Source: Susan Kauffmann, <http://theequinist.blogspot.com/2011/08/if-you-enjoy-this-article-please.html>, downloaded 3/3/2012

Different point of view is quite popular by public and even supported by the farrieries and the veterinaries. Surprisingly this opinion prefers the utility of a horse for humans than the health and the welfare of the horse itself. Mr. Vinčálek argues that use of a horse was changing to fast due to technical development of the world. He thinks that a development of a horse body, mainly the limbs and the hooves is unable to cope with rapid changes in the use. The explanations why horses need to be shoed said that the growth of hoof horn was always sufficient till the time humans put horses in new conditions where insufficient become. That human had to look for different solution how to be able to use the horse still. The new conditions are hard ground or swift turn (Vinčálek, 2009). From this point of view there are two possible solutions: change conditions or shoed the horse.

Obviously the problem is not artificially hard ground, as mentioned in (Vinčálek, 2009) , but the conditions under which are horses kept and their influence on the quality of a horn. It can be demonstrated on an experience with wild mustangs; originally horses from Europe, their hooves were perfectly adapted to rocky ground in their new environment in relatively short time. Another example could provide an experiment done in Australia with wild horses called Brumbies. There are herds of Desert Brumbies living



in central Australia, travelling from water resources to pastures many miles in three, four days periods. Their hooves are tough and adapted to rocky ground. Scientists from Australian Brumby Research Unit transported a mare naturally living central Queensland into the desert. In Queensland are water reservoirs and pastures everywhere, the ground is sandy and soft so horses are having easier life and their hooves are longer with cracked walls. The scientist wanted to find out if these two groups of wild horses living separated about thirty generation can be genetically different or if the differences are shaped just by the environment where they live. This mare spent three month in desert and after was recaptured and give back to her home environment. Her hooves after three month in desert look exactly like a hooves of desert brumbies (Borse, 2009).

Speaking in general there are two main practices of hoof care: trimming<sup>9</sup> and shoeing. As everywhere we can find bad ferrier as well as bad hoof trimmer. In every accessible literature is mentioned that the healthier way of a hoof care is a bare hoof care. The bare hoof movement is the healthiest form of movement for the growth of a horn and even for horse itself (Ende, 2006). According to studied literature both main ways of hoof care have as a goal to provide welfare to a horse. The main rule is the Freedom from Pain, Injury or Disease – by prevention or rapid diagnosis and treatment is according to (Vinčálek, 2009) one of the duties of every ferrier. With this opinion agree as well majority of bare hooves professionals but their point of view is different. From the ferrier side is the short term solution, immediately removal of paint. Utilization of horse is one of the most important factors influencing decisions. Diseases or injuries consider as incurable are solve by euthanasia. From bare hoof trimming side is the long term solution, providing condition to cope with present paint, health of horse and prevention and treatment of all disease. These methods are trying to provide as longest lifespan to a horse as possible in a good shape.

### **3.3.5. Nutrition**

Naturally horses actively seek out the necessary food to meet their energy needs. All over the world are horses able to survive on different kinds of plants. Obviously the most important is access to fresh water but besides that the quality of pasture. “*It is vitally*

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<sup>9</sup> the cutting and shaping of hooves by special knives, rasp and other tools is called trimming

*important for the health of the horse that a wide variety of vegetation be part of its nutrition*” (Strasser, 1998). Energy requirements are different to age, breed, rate of growth, work, environment, health and more. The horse is getting the energy by the breakdown of starch and other soluble carbohydrates. The horse is naturally adapted to receive constantly low amount of energy due to grazing. *“Its relatively small stomach and large gut have evolved to be perfectly suited to this virtually continuous ingestion of relatively small amounts of vegetation”* (Strasser, 1998). Therefore good quality of pasture or eventually hay and its access is the most important part of horse nutrition. The requirements of minerals (mainly calcium and phosphorus), salt and vitamins have to be satisfied too. The best way is let horses to take what they need.

In human care the horse lost the possibilities to choose what to eat and when. People developed a massive business about horse nutrition e.g. different kinds of feeding mixtures, vitamins and minerals in powder, lot of different supplement in liquid or powder form. Horse lovers are willing to pay enormous prices to give their horse the best. Evidently this way of feeding is not sufficient for a horse even more it may cause damages on its health. *“Epidemiological and empirical studies consistently indicate an association between equine stereotypies and two management factors in particular, the feeding of low fibre/high grain content feeds and restrictions on social behaviour”* (Cooper, 2002). The unnatural routine of feeding is one of the important factors influencing horse welfare. Frequently are stabled horses fed twice or three times by high grain content feed and small amount of fibre feed.

It is not just mental health what suffer from bad feeding routine and unnatural feed. *“...the stomach produces digestive acids, and if, for prolonged periods, it is empty and its walls touch, the stomach lining can be damaged. Stress or chemicals (butazone, wormers, etc.), or excess or improper mineral supplements, can also damage the stomach”* (Strasser, 1998). In the same resource is stated that the most important for digestion is the large intestine, where is a large number of bacteria. To keep the balance between reproduction and digestion of different types of bacteria is necessary to provide a continuous food uptake. A disturbance of this balance may cause one of the most common and frequent health problem colic. According to research made in Kentucky University, Department

of Animal Science, Equine Section called Basic Horse Nutrition; *“Horses fed hay or those on pasture are more able to maintain gastro-intestinal tract normalcy, experience less colic and are less prone to developing annoying stable vices when compared to horses not receiving a long stem roughage source.”*

According to these paragraphs the importance of nutrition consists in permanent access to fresh water, good quality of pasture (variety of plants) or hay together with movement and sufficient access to minerals, vitamins and so on. Following nowadays experience these requirements are not fulfilled in conventional boarding. Therefore welfare friendly conditions of boarding have to fulfil these requirements.

### **3.4. Hedonic price method**

A hedonic pricing model is a common method used for evaluating factors influencing a price of a horse or other livestock. Speaking about the horse segment the most common analyses being done were focus on the pure breed horses. As good examples serve research about thoroughbred broodmares (Maynard & Stoeppel, 2007) and (Stoeppel & Maynard, 2006), show quality of quarter horse (Taylor M. R., 2004) or quarter horse yearlings (Lansford, 1998). Numerous similar articles have been published, not just on thoroughbred racing industry or quarter horse industry but as well on breeding industry mostly thoroughbreds (Smith, 1999). No research was found on the evaluation of other pure bred horses as warmbloods, Andalusian or Arabians. There are three pieces of research using a hedonic pricing method to evaluate non pure bred horses' price. About recreational horses segment wrote (Freeborn, 2009), about ranch horses sold in auction (Lange, 2010) and wild horses (Elizondo, Fitygerald, & Rucker, 2011).

*“The hedonic value approach is based on the assumption that the value of an animal is a function of the phenotype (and genotype) characteristics embedded in this animal”* (Roosen, 2004). Phenotype is the genotype and environmental impact. The main physical and genetic characteristics; sex and age, were included in all above mentioned studies and had always a significant impact on a price. The significant of others as a colour, white markings or a size of the horse was differed from case to case. By the environmental impacts are commonly meant money bringing characteristics. Especially the pure breed

horses' price evaluation by an overwhelming majority includes characteristics mainly connected with results in races, competitions of all kinds, awards in show competitions, stud fees or other. The present market uses these results as the most significant factors to estimate the price; how many winner mare or stallion have produced, how many races the mare or stallion have won, total earnings of mare or stallion have made and others.

In (Taylor M. R., 2004) article about show quality Quarter horses sold in public auction has been used the hedonic pricing function, where the sale price is a function of genetic and phenotypic (physical) characteristics, pedigree, performance, sale order and economic conditions. The physical characteristic; sex, age, colour, if the mare was bred mare or not and presence of a genetic diseases (hyperaemic periodic paralysis - HYPP<sup>10</sup>) has been tested. Age, sex and colour (except a Chestnut) has a significant impact on a price, bred mare was not statistically different from zero. The HYPP were significant under the specific conditions. An evaluation of a performance has been divided in to the five primary classes: western pleasure, hunter under saddle, halter, all-round (multiple classes), or other (cutting, reigning, or roping). In the results just last class other was significant. Other factors including in the performance as awards, placing at World Show has been increasing the value of a horse. The bloodlines (quality of pedigree), the sales order and a year of sale were found significant.

For price forecasting of Thoroughbreds Broodmares in foal was used hedonic pricing model (Stoeppel & Maynard, 2006). The authors have made the categorization of independent variables into the breeding, racing, genetic, and marketing factors. The breeding factors were including the racing result of mare's foals and measurement of quality of the stallion, the racing factor was the racing records of mare, genetic factor refers to the placement of mare on the spectrum of speed and stamina, as the marketing factor in this study was the day the mare was sold in the auction. No physical characteristics, except age, were included in the model.

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<sup>10</sup> "HYPP is an inherited disease of the muscle, which is caused by a genetic defect. The gene occurs primarily in horses bred for halter classes (where heavy muscling is desired) and can cause sudden paralysis or death in an animal carrying the gene. Horses will carry either the n/n gene (no HYPP), the n/h gene (50 percent chance of passing on to offspring), or the h/h gene (100 percent chance of passing HYPP on to offspring). Testing for the gene has been required on new foals by the AQHA since 1998" (Taylor M. R., 2004).

Studies about wild horses or non pure bred horses usually serve as recreational, ranch or pleasure horses have been found sporadically. In research about wild horses in Northern America have had physical features significant impact (Elizondo, Fitygerald, & Rucker, 2011). Authors have been focused on a probability of disposal using empirical model based on physical characteristic and a marginal price using hedonic pricing model to identify the characteristic that are valuable for buyers or adopters. The results demonstrate interesting facts for each characteristic.

- Age; young horses are easier to manage and train even so its affect can be nonlinear due to willingness of buyers to pay for it (the fee increase to between 6 and 7 year of age and after the price premium is negative).
- Injury; current or past injuries make the price lower.
- Sex; stallion has 10.4 higher probability to be adopt than mares, mares has 8.1 higher probability to be adopt than geldings according to empirical model. The fee paid was the lowest for the mares and almost the same for stallion and geldings.
- Colour; the bay-brown horses has the lowest probability to be adopt compare to all other colours and even to lowest fee.
- Markings; any kind of marking increase the change to be adopt

The training has a significant impact in this study, because horses which get training already are most likely to be ridden. The estimation of significance was higher, but the results could be influence by the cost-effectiveness.

Other research about ranch horses sold in auction (Lange, 2010) has used the hedonic analysis to determine the factors influencing a price of a ranch horse. Because the ranch horses are not earning any money the tested characteristic are slightly different to the pure breed horse evaluation. The main independent variable in this study were order in sale, year of sale, the specific sale, the colour of the horse, the age of the horse, the sex of the horse, the sire offspring earnings and the consigning ranch. All testing factors have a significant impact on a price.

Similar factors influencing price were found in study of recreational horse market (Freeborn, 2009). The author use internet as source of data and this choice influence even the choice of independent variables. Independent variables were: type of Advertisement, State, Age, Sex, Colour, Breed, Mares in foal, Method of Sale, Temperament score and Registration. Using the hedonic pricing model all independent variables were found significant except colour. No research included a focus on the factors influencing horse price and its welfare was found.

### **3.5. Cost comparison**

The cost comparison is commonly used to compare two or more possible choices to provide arguments for more efficient decision making process. The realizations are various from case to case and individual approaches to every case are requested. The knowledge basement about compared objectives are necessary.

In study about road works in Ghana the author compare Labour-based and Equipment-based method. After understanding the economic and social situation in African country author used three different approaches. The individual task, the hypothetical cost and the costs of similar projects were analyses. To compare cost per kilometre done by each method, regression analyses in linear form was applied. The author was focus on determinate relationships between all possible influencing factors. Results were given in totals, averages and percentage values. (Taylor G. , 1998)

Cost comparison in ethnical question of Burn or Bury from several points of view was done in Netherlands. Authors were focus on this topic from environmental, social and private aspects. Their counting was completed with sensitivity analysis. Focusing on all possible factors influencing costs as type of used technology, governmental restriction, price of land, etc. Their conclusion was build up on the percentage comparison and arguments for each method (Dijkgraaf & Vollebergh, 2003).

The cost comparison was used to determine the best way how to deal with disposal of mortality in poultry industries. By specific criteria four methods were chosen and compared: Burial (several different variations), Rendering, Composting

and Incineration. Average number of dead hen per year, death rate in % and average weight of dead body had to be set up to calculate the operating cost of each methods. After the capital investment, annual fixed cost and annual variable cost were compared (Wineland, 2007). Any cases of cost comparison of living condition for horses including welfare factors were not found.

## **4. Analyses**

The most important and measurable factors influencing equine welfare were determined by summarizing knowledge of psychic and physical horses' needs. The concept of Five Freedom and the economic questions were taken into account. The data were collected base on previous experience with a short study done in Canada within summer 2011. To analyse how big impact chosen factors have on a horse price and costs of a farms the strict condition were specified.

### **4.1. Overview & Conditions**

The horses included in this study are commonly called as recreational horses. To define a recreational horse it is not so simple, for example in USA, in California, according to USDA is recreational horse every horse which does not falls in definition of "agricultural". In Australia recreational horse has very large range of activities including dressage, pony camps, trail riding and riding for the disabled. (Atkinson, 2007) For purposed of this thesis recreational horse is a horse used for commercial purpose as trail riding, riding lessons and alike for fee. Horses used just for free time activity of their owner bringing no financial benefits, neither horses used for school riding, hippo-therapy nor other weren't included in this analysis. Several conditions for selecting farms to interview and for chosen variables are mentioned in Chapter 4.1.1. These conditions have to be fulfilled to get appropriate results.

#### **4.1.1. Czech Farms**

The way of keeping horses in the Czech Republic is mostly conventional, using conventional way of boarding and managing horses. Even though the new (natural) approaches are coming to the mind of horse lovers the trend and its importance is not well-known yet. Therefore the Czech farms were chosen to provide data and necessary

information for this thesis. Fifty possible farms were analysed, but just ten of them were meeting required conditions. During personal meetings just six of them provided completed data. All chosen farms fulfilled several conditions:

- location (30km radius from Prague)
- rental of property and land they used
- provide recreational riding services as riding lessons, trail rides etc.
- owning at least 10 horses used for this service

For the cost comparison and the evaluation of the factors influencing a horse's price were farms divided into two groups. Three farms were providing welfare friendly conditions to their horses and three non-welfare friendly conditions. Welfare friendly conditions, is the term used in this study, for type of boarding and managing horses which are supporting horse welfare. These conditions were chosen according to literature review and they are following:

- freedom of movement in majority of a day
- company of a horse (better possibility to be in a herd)
- possibility to graze or to eat hay (in unlimited time period)
- unlimited access to fresh water
- freedom to cope with discomfort (shelter, enough space)

The farms with the welfare non-friendly conditions were breaking at least two or more of these necessary conditions. Horses were kept in stables, allowed to go out mostly on a muddy surface just for short part of a day, getting limited hay portion twice a day.

In this thesis were compared most common costs connected with horse care on the Czech farms. Prices were done in CZK and counted annually for one horse. The impact on an annual average cost for one horse could have different factors that could be the distance from Prague, efficiency of employee, ability to buy for good price etc. These factors were taken into account but they could not be included directly in the cost comparison due to the insufficient measurements.



### **4.1.2. Variables**

To evaluate the factors influencing a horse's price were chosen 10 horses from each farm which fulfil require condition. In total 60 horses were including in this study. The evaluation of a horse price was set up by horse specialist working in this area for at least 5years. The price as dependent variable was evaluating according to present horse market situation and utility of a horse to a horse owner.

As significant independent variables influencing a horse price according to studied material, but not connected with evaluation of horse welfare, for regression were chosen: age, sex, and breed. Colour does not be considered as important for recreational horses. Other independent variables closely connected to horse welfare are: boarding, hoof care, and previous sports career. These variables were chosen because it is possible to measure and evaluate them.

Analysing the available literature no studies, no proofs about stereotypic behaviour observe by horses kept according to welfare friendly conditions weren't found. From this fact can be said that stereotypic behaviour is question of how the horse is kept. According to telephone survey (Mason & Cooper, 1998) stereotypic behaviour observing by stable horses can significantly influence price of the horse. That is why in this thesis is suggest if the horse is kept in boarding meeting physical and psychic horse needs, its welfare and even economic value will be maintain.

The training has an indisputable impact on a horse's price. In the present equine world people evaluate if the horse is able to win in competitions with the training he has, not the way how he was trained to do it. Although in most of the economic work (Freeborn, 2009) is training accepted independent variable is hard to estimate the quality of welfare principles covert by the training. Because the fact that welfare standards are not the main priority in managing and training sport horses (Collins, 2008) in this paper is consider training as s part of different variable; sports career.

Previous sports career was included in this research to recognize if there is some difference in an importance for a price evaluation of a recreational horse and a sport horse.

From welfare point of view the training needed for a horse involved in sport competitions often break the Freedom of fear and distress. From economic view the sports career increases the price.

For purpose of this thesis was bare hoof trim chosen as welfare friendly practise because it is connected with longer lifespan and less problems with locomotors organs. Accessible data were found to show this decision as well-reasoned. "A 1993-1995 insurance study revealed that the most common cause for permanent loss of use (including death and euthanasia) was locomotors organs, at an incredible 83%." (Strasser, 1998) Because the horses studied in this study were making profit and costs of inputs for their training etc. are significant it might be suggested that the longer and healthier life the horse has to better economic result will make. The comparison of pluses and minuses of different trimming methods have not been covered due to wide-range of this topic.

### **4.1.3. Data collection**

The data collection process was done personally by visit at chosen farms and interviewed appropriate person within Q4 2011. Interviews were run in friendly atmosphere approximately three hours with each individual. The interviewed persons used a relevant administrative documentation as invoices, contracts or bills to support truthfulness of providing information. To protect the human rights no names of persons, neither farms nor horses is included in database.

## **4.2. Hedonic price method**

The hedonic price method was chosen by considering the most common economic analyses used to evaluate the factors influencing a horse price. The mathematical function forms were ranging from the linear regression to quadratic BOX-COX<sup>11</sup>. In this thesis the linear regression function has been consider as sufficient. Because there is no clear division of quality continuum, no dummy variables were included here. The assumption of this model is that welfare factors have an impact on a price of a recreation horse.

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<sup>11</sup> The Box-Cox method can be used to automatically identify a suitable power transformation for the data based on the relation. Source: Relia Soft Corporation (2008), [www.weibull.com](http://www.weibull.com)

To evaluate how significant effect these factors have on a horse's price (P) was applied a regression analysis using hedonic pricing method in a linear function form:

$$P = f(A, A^2, S, D, B, H, C) + \epsilon$$

whereas age (A), age squared ( $A^2$ ), sex (S), breed (D), boarding (B), hoof care (H) and previous sports career (C).

#### **4.2.1. Variables**

Choice and definitions of independent variables in the model was conducted as follows:

- A = number of years (no foals were included), counted was the running year
- $A^2$  = the number of years powered by two
- S = to 1 if gelding or 0 if mare, as recreational horse no stallion were found
- D = to 1 if pure bred horse or 0 for crossbreed horse, for simplification just these two possibilities were considered
- B = to 1 if satisfying welfare friendly conditions or 0 if not
- H = to 1 for horses which were trimming all their lives or majority of that time were considering as mostly trimming, or 0 for horses wearing shoes more than one third of their life even just on front hooves were considering as shod
- C = to 1 if the horse had some previous sports career starting in conventional disciplines (in case of this thesis it was; dressage, show jumping and racing) at least for two seasons or five competitions of all kind, conventional training is assumed, or 0 for horses never trained or used for sport purposes

#### **4.2.2. Results**

The results of linear model exhibited an R-squared value of 0.69 and an adjusted R-squared value of 0.4139, indicating that 41.39% of the linear variation in the dependent variable is explained by the model. The F-significance value of 0.0000075 demonstrates that this model is statistically significant; this result is supported by P-value of 0.000058 for intercept. The average price of a recreational horse in this study is CZK 37 850,

the minimum price CZK 10 000 and maximum CZK 90 000. The only statistically significant impact on a price of recreational horses at the 5% level had sports career, and this result indicated that a horse with previous sports career is valued CZK 14 199 more than a horse without it. Sex was statistically significant at 10% level and indicating that geldings are valued CZK 6 902 more than mares. Boarding showed statistically significant impact at 15% level and this result indicated that horses kept in welfare friendly conditions are valued CZK 7 680 less than horses kept in non-welfare friendly conditions. These results are shown in Table 3.

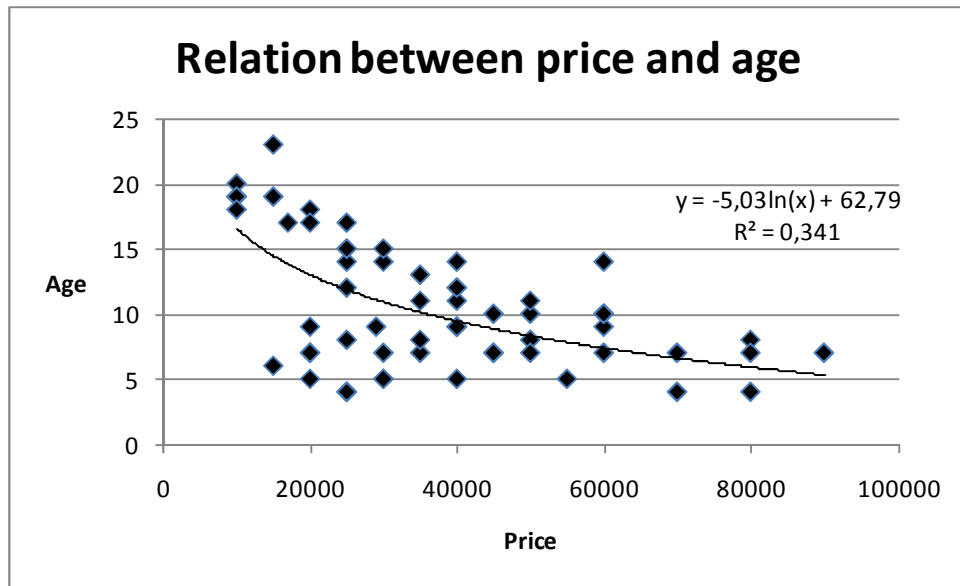
Table 3 - Results of linear model

Linear model results (Dependent Variable = Price)				
N	R-Square	Adj R-Sq	F-Value	F-Significance
60	0.695346372	0.413978616	6.954131	7,58921E-06
Variables	Coefficient	Standard Error	t Statistic	P value
Intercept	52501.889020	11992.224551	4.377994	5.806644E-05
Age	-505.779428	2149.245276	-0.235328854	0.81487782
Age2	-94.307731	86.141993	-1,094793933	0.2786520906
Sex	6902.834824	4151.287562	1.662817793	0.10236573
Breed	-702.636435	4674.733208	-0.150305141	0.881105391
Hoof care	-2818.443462	5157.484166	-0.54647641	0.587075804
<b>Sport Career</b>	<b>14199.078124</b>	<b>5145.133086</b>	<b>2.759710562</b>	<b>0.0079702533</b>
Boarding	-7680.757357	5142.125229	-1.49369317	0.141299359

Source: Barešová, Economic analysis of elements influencing equine welfare, 2012

The age variable has in most of the studied sources a powered trend, not in this case. Neither the age squared did show statistically significant impact on horse price. To determine the relation between the price and the age in this study the graph were created. On the graph is shown that with increasing price the age is lower and frequency too. The logarithmic connecting line was chosen by empirical choice to show the trend due the highest value for  $R^2$ . The  $R^2$  were for exponential 19.7%, linear 25.7%, polynomial 32.0% and logarithmic 34.1%. But still can be seen that the percentage of copy the trend line is low. On the graph can be observe that majority of recreational horses are in the price around 30000 - 40000 CZK. The decreasing tendency can be observed in amount of horses for higher price.

Figure 4 – Graph showing relation between price and age



Source: Barešová, Economic analysis of elements influencing equine welfare, 2012

The second model was modified to consider just the two most significant variables sports career and boarding. The result showed significant impact of boarding on a horse price, indicating similar result as first model that more expensive horses are usually kept in non-welfare conditions. The difference in amount might be caused by number of factors in this model.

Table 4 – Results of modified linear model

Modified linear model (Dependent Variable = Price)				
N	R-Square	Adj R-Sq	F-Value	F-Significance
60	0.101771620	0.070254835	3.229124416	0.046937830
Variables	Coefficient	Standard Error	t Statistic	P value
Intercept	43185.034013	4024.253539	10.731191	2.656538263E-15
Sport Career	1954.08163	5214.638353	0.374730038	0.709251876
Boarding	-11972.789115	4916.408188	-2.435271575	0.018032165

Source: Barešová, Economic analysis of elements influencing equine welfare, 2012

### 4.3. Cost comparison

The cost comparison was done on welfare friendly farms and non-welfare friendly farms. Due to lack of data cost-benefit analyses could not be apply. To give an overview about revenues versus cost proportion simple percentage calculation were added. For

purposes of this thesis is cost comparison sufficient, because it provides more general results, which might be apply on every horse farm.

### **4.3.1. Calculations**

Data were analysed and recalculate due to different number of horses on a farm. The annual average cost for one horse was count to carry the same weight. Totals of annual average costs for one horse, their averages and standard deviation for three welfare friendly conditions farms in all categories were counted. The same for non-welfare conditions were done. The total difference, percentage differences of total in all categories and their standard deviations in comparison for non-welfare and welfare conditions were counted. For percentage comparison of costs and revenues fee for one lesson and price for boarding for a month were used. Due to low ability to get proper data of numbers of lessons give in a year period and horses boarded at the farm, just average prices and their differences in welfare and non-welfare friendly conditions farm were counted.

The compared costs were followed: labour, hay, grain, rent, veterinary care, hoof care, supplements and others.

- Labour cost was counted as salary of employee(s) times twelve months divided by number of horses on the farm.
- Hay price was counted as amount of hay package consumed annually times price of one hay package divided number of horses kept in farm.
- The grain expenses have to be taken in average, because amount of grain is different to individuals. So price of grain was counted as annual consumption of grain in kilograms multiplies the price per one kilogram divided by number of horses.<sup>12</sup>
- Rent was usually paid monthly in some case for pasture annually. To get the annual average price for one horse was used the same technique as in previous cases.

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<sup>12</sup> For counting the consumption of hay and grain and rent expense it was necessary to set up the number of horses consuming food and boarded at the farm for the whole year. The number of horses at the farm may sometimes slightly change during the year. In such cases the average number of horses was used for calculation.

- Veterinary care included in all farm the necessary vaccination and worming, additionally cost of treating, medicament or veterinary services. This variable is highly dependent on individual horse, even though annual cost average was counted.
- Hoof care expense was determines as tariff done by ferrier for trimming or shoeing times average amount of this services a year for each horse individually.<sup>13</sup> After there was set up and average for ten chosen horses on each farm as average price of evaluating horses' hoof care. The cost of Ferrier transport was not included in counting.
- Supplements were included expenses on salt, minerals, carrots, apples or industrial supplements.
- In the category others were mainly covered waste disposal or waste storage or both.

### 4.3.2. Results

The cost comparison of three welfare friendly farms and three non-welfare friendly farms demonstrates that horse welfare conditions are in those cases less expensive. All compared expenses were higher in non-welfare conditions as demonstrate in a table 5.

Table 5 – Result of cost comparison

	Labour	Hay	Grain	Hoof care	Vet,med	Supplements	Rent	Others	Total
Difference of totals	8919.23	11508.46	11521.79	15596.79	8900.00	5200.00	15192.30	5150.00	81988.58
Percentage difference	19%	37%	70%	63%	59%	75%	38%	60%	43%
Standard deviation	4891.02	3978.71	2509.18	2599.46	1655.55	866.66	5032.05	1027.77	16286.70

Source: Barešová, Economic analysis of elements influencing equine welfare, 2012

In total saving of 43% were indicated on welfare friendly farms. The percentage difference in cost for five factors was found to be 50% or higher as can be seen in table 5. The share on total saving for the three remaining factors was 57%, even if for labour it was only 19%, 37% for hay and 38% for rent. The percentage comparison of revenues showed

<sup>13</sup> The average time interval for trimming is every 4 to 6 weeks, for shoeing every 6 to 8 weeks. The interval depends on the quality of horn, amount of movement and more. As exact data as possible is required.

18% higher revenues from riding fees and 27% higher revenues from boarding on non-welfare friendly farms. Even if the revenues in non-welfare friendly farms were higher the cost savings that can be made on welfare friendly farms might cover that difference and even exceed it.

## **5. Discussion and Conclusion**

Although the model used in this thesis did not show any statistical significant impact of welfare factors on horse price interesting facts were demonstrated. The factor that horse owners positively evaluated was the previous sports career even if it might have a negative impact on the welfare of the horse. The sports career might increase the horse price by CZK 14 199. The reasons might be different; maybe it is because of the possibility to put a higher fee for riding lessons on the horse with sports experience or the possibility to resell this horse for an even higher price. Other factors having a statistical significant effect were sex and boarding. According to the accomplishment result geldings are more valuable than mares by CZK 6900, possibly because of their more suitable character for recreational business. Welfare friendly conditions included in boarding factors are mostly providing to lower valued horses.

However the age variable has a statistically significant impact in the studied literature, a different result was indicated in this case. It could have been caused by a trend, common in the recreational riding business, to use the horses which are not satisfactory for sports or the breeding industry because of their age, injury or bad bloodlines. The most valuable age group is from 10 to 15 years as has been demonstrated on a graph.

According to the results of the cost comparison the costs in welfare friendly condition are more than significant. In addition the costs might even demonstrate some often discussed questions about the health of the horse. The total expense for veterinary care was lower by 59% for those kept in welfare conditions. The reason could be that these horses are healthier or able to deal with diseases easier. The expenses for hay, grain and supplement was higher in non-welfare conditions probably due to no other source of nutrition such as pasture, trees, soil. The operating costs were higher in non-welfare conditions caused by higher rent of buildings used for stables, more requirements



of working hours and more waste. Hoof care cost might be influenced by choice of farrier, method of trimming or shoeing, transportation cost for farrier etc. It can be stated that bare hoof care is cheaper, but in economic terms the utility of a shod horse, which enables the horse to work in every condition, helps explain why it can be more profitable for an owner to shoe the horses. In total the savings on welfare friendly farms were 43%.

The comparison of the usual expenses showed that to provide better welfare does not mean higher costs. Eventually, to provide welfare friendly conditions can be a way for farms to be cost-efficient. It is obvious that investment in converting farms without welfare conditions to welfare conditions is significant. To calculate the return on such an investment more research is required. It should take into account that people provide horses with unnecessary human comfort (such as stables, blankets, industrial supplements and more) that is usually more cost demanding. In addition it could even have a negative impact on health of the horse. The horse kept in welfare condition is more likely to have an even temper with less mental and physical health problems. Such a horse is easier to train, manage, ride and the risk of injury is lower. According to studied literature no “problem horses” are found amongst those bred and live in welfare conditions

Even though the economic model did not show the statistical significance of welfare factors on a horse's price from an ethical point of view the value of the life of horse with higher welfare has a large importance for a world. New techniques and skills to evaluate horse welfare and the damages caused by human's unsuitable behaviour are available. The results of research, studies, as well as books and scientific works have been done to prove human mistakes and offer alternatives. In existing economic literature the importance of the sports and breeding equine industry is quite clear. Gaps exist in the recreational and pleasure sector even though the number of horses used for these industries are significant and still increasing. The connections between the economic and welfare points of view are often overlooked. There are many options for further examination of this topic.

The information found in this thesis might be useful to numerous horse lovers; especially those wanting to provide the best welfare to their horse and still be economically

efficiency. It is clear that in the question of the horse's price evaluation its welfare doesn't have a significant effect. This study is hopefully a starting point to put more interest in welfare issue linked with the economic issues. It provides a basic process with which to possibly model data and establishes some expectation of economically significant variables connected with welfare, as boarding or training. However, possibly due to small number of observations or lack of data, it does not clearly establish whether hoof care is of interest or not. Alternatively, studying individual welfare factors more closely or even choosing different one could establish more significant links in this area. Finally, the objectives of this thesis to define the factors influencing horse welfare and evaluate their effects on horse price and determine if providing welfare friendly conditions has an impact on the cost effectiveness of recreational farms, have been hopefully achieved.

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Appendix 1: Collected data – regression analysis

Horse	Age	Age2	Sex	Breed	Hoof care	Sport Career	Boarding	Price	Hoof expense
1.	10	100	0	0	1	1	1	60000	4200
2.	4	16	0	0	1	0	1	80000	3000
3.	10	100	0	0	0	0	1	50000	7700
4.	7	49	0	0	1	0	1	20000	3000
5.	7	49	1	1	0	1	0	55000	7700
6.	14	196	0	1	0	1	0	40000	7700
7.	8	64	0	0	0	0	0	50000	7700
8.	8	64	0	1	0	1	0	80000	7700
9.	5	25	0	0	1	0	1	30000	3000
10.	11	121	1	1	1	1	0	50000	3000
11.	9	81	1	1	0	0	0	60000	7700
12.	19	361	1	1	1	0	0	10000	3000
13.	7	49	1	1	0	1	0	80000	7700
14.	12	144	1	0	1	0	0	40000	3000
15.	7	49	1	0	0	0	0	70000	7700
16.	19	361	0	1	1	1	0	15000	4900
17.	10	100	0	1	1	0	0	60000	4900
18.	4	16	1	0	0	0	0	70000	5600
19.	5	25	0	0	1	0	0	40000	4900
20.	7	49	0	1	1	0	1	20000	4900
21.	7	49	1	0	1	0	1	30000	4900
22.	12	144	1	1	1	1	1	25000	4900
23.	4	16	0	0	1	0	1	25000	4900
24.	8	64	0	0	1	0	1	50000	3000
25.	7	49	1	0	0	0	1	35000	5600
26.	18	324	1	0	1	0	1	20000	2500
27.	14	196	1	0	1	0	1	25000	2500
28.	7	49	1	1	1	1	1	60000	2500
29.	4	16	0	0	1	0	0	25000	2500
30.	15	225	1	0	1	0	1	25000	2500
31.	9	81	0	1	1	1	1	40000	2500
32.	17	289	1	0	0	1	1	17000	5600
33.	8	64	1	0	1	0	1	35000	2500
34.	20	400	1	0	1	0	1	10000	2500
35.	5	25	1	0	1	0	1	30000	2500
36.	19	361	1	1	1	1	1	10000	2500
37.	17	289	1	1	1	0	1	20000	2500
38.	9	81	0	1	1	0	1	20000	2250
39.	6	36	0	1	1	0	1	15000	2250
40.	8	64	1	1	1	0	1	25000	2250
41.	7	49	1	0	0	0	1	45000	5600
42.	14	196	1	0	0	0	1	30000	5600
43.	23	529	1	0	0	1	1	15000	5600
44.	11	121	1	0	0	0	0	40000	5600
45.	9	81	0	0	0	1	0	40000	8400
46.	5	25	0	0	0	0	0	20000	8400
47.	10	100	1	0	0	0	0	45000	8400
48.	14	196	0	1	1	1	1	60000	8400
49.	15	225	0	1	0	1	0	30000	10500
50.	9	81	0	1	0	0	0	40000	10500
51.	7	49	1	0	0	0	0	50000	10500
52.	13	169	1	0	0	1	0	35000	10500
53.	15	225	1	1	0	1	0	25000	10500
54.	11	121	1	0	0	0	0	35000	10500
55.	5	25	1	1	0	0	0	55000	10500
56.	7	49	1	1	0	0	0	45000	6300
57.	9	81	0	0	0	0	0	29000	10500
58.	18	324	0	1	0	1	0	10000	10500
59.	17	289	0	1	0	1	0	25000	10500
60.	12	144	1	0	0	0	0	40000	10500

Appendix 2: Collected data – cost comparison

<b>Welfare</b>	Labour	Hey	Grain	Hoof care	Vet.med	Supplements	Rent	Other	Total
Farm K	7200.0	5280.0	200.0	2700.0	1600.0	200.0	2000.0	1200.0	20380.0
Farm J	9230.8	3461.5	461.5	3907.7	2500.0	1000.0	8307.7	1000.0	29869.2
Farm M	21000.0	10800.0	4166.7	2703.8	2000.0	500.0	15000.0	1250.0	57420.5
Total	37430.8	19541.5	4828.2	9311.5	6100.0	1700.0	25307.7	3450.0	107669.7
Average	12476.9	6513.8	1609.4	3103.8	2033.3	566.7	8435.9	1150.0	35889.9
Standard deviation	5682.1	2857.4	1704.8	535.9	311.1	288.9	4376.1	100.0	14353.7
<b>Non-welfare</b>									
	Labour	Hey	Grain	Hoof care	Vet.med	Supplements	Rent	other	Total
Farm K	12750.0	8250.0	6750.0	7700.0	5000.0	2400.0	7500.0	2250.0	52600.0
Farm T	21600.0	4800.0	2400.0	6708.3	3000.0	1500.0	12000.0	1500.0	53508.3
Farm P	12000.0	18000.0	7200.0	10500.0	7000.0	3000.0	21000.0	4850.0	83550.0
Total	46350.0	31050.0	16350.0	24908.3	15000.0	6900.0	40500.0	8600.0	189658.3
Average	15450.0	10350.0	5450.0	8302.8	5000.0	2300.0	13500.0	2866.7	63219.4
Standard deviation	4100	5100	2033.33333	1464.81481	1333.33333	533.333333	5000	1322.22222	13553.7037