Is there value in buying at breeze-up sales?

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I certify that this project is entirely my own work

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Executive Summary

'Ready to Run' is the term associated with breeze-up horses in Australia, as the name suggests these horses are considered a ready-made product sold with the intention that they have been prepared to make their racecourse debut. This presents cost and time-saving advantages to the purchaser compared to buying a yearling where the owner will have to wait a minimum of six months before seeing their purchase set foot on a racecourse. Despite the obvious monetary benefits and proven racecourse ability, a number of biases have impacted the breeze-up sales environment. Perceptions suggest that horses who have graduated from breeze-up sales are only short term racing prospects, hindered from the level of training that they have endured from an early stage in their racing careers.

The Breeze-up Consignors Association (BUCA) represents the interests of those selling breeze-up horses. This project was aimed at providing empirical evidence to investigate if horses sold from a breeze-up sale display career longevity and consider if the breeze-up market presents value to a purchasing client on behalf of BUCA. To investigate these aims, sales and race data were extracted from a three year period (2013-2015) and compared to data from yearlings sold at public auction as both groups are bought with the intention of participating in flat races from two years of age. The sample size consisted of 1,473 breeze-up horses and 8,634 yearlings sold from public auctions in the UK and Ireland.

Results from the analysis suggested that;

- Graduates from breeze-up sales exhibited career longevity and raced for as long as horses that were sold as yearlings.

- From the sample years analysed, 8.3% of breeze-up horses failed to make the racecourse, this rate was found to be decreasing annually with a higher percentage from the yearling cohort failing to race each year (13.2%).

- The Breeze-up market produced a higher percentage of two-year-old runners annually. On average 72% (+7%) of horses sold at breeze-up sales raced at two years old compared to 65% from yearling sales.

- Purchasers buying breeze-up horses made an average saving of 18% from point of purchase to date of first start

- Both groups displayed a trend suggesting that when a higher purchase price was paid, higher performance was achieved. This was particularly evident in the increased amount of wins higher-priced breeze-up horses recorded at 2.6 wins per horse.

- Racing form analysis suggested that breeze-up horses performed to a similar level as yearling purchases on the racecourse. Breeze-up horses recorded an average Timeform rating of 77.9 compared to 79.7 from the yearling cohort.

Overall, the results can be utilised by the client to provide evidence to highlight that the breeze-up preparation does not negatively impact the horse's career performance and that the market should be acknowledged as a valid environment for sourcing racehorses. The results should be of interest to those considering the pursuit of flat racehorse ownership as well as anyone involved in producing or purchasing breeze-up horses.

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1.0 Introduction

The bloodstock market is an environment that can be seen to operate on a 'boom and bust' basis which attributes some accountability to the fragility of the thoroughbred sales environment (Neibergs and Thalheimer, 1997; Thomas, 2018; Waldron et al., 2011). Owning racehorses can be considered an in-vogue activity, therefore the sales ring is susceptible to macroeconomic factors having the ability to dictate the elasticity of the marketplace (Rodgers, 2011). This can create a turbulent selling ground for those who produce and sell thoroughbreds at public auction, commonly termed as 'consignors' or 'vendors' (Plant and Stowe, 2013). Furthermore, the elasticity also creates difficulty for purchasers as forecasting price prediction becomes a challenging task in an uncertain environment (Vickner and Koch, 2001).

The commonly used platform for buying and selling thoroughbreds to race in the UK and Ireland is by public auction rather than by fixed-price agreement (Plant and Stowe, 2013; Seder and Vickery, 2005). This project will focus on the flat thoroughbred market, which can be defined as the environment where horses are purchased with the intent of running in flat races (Huggins, 2014). There are three major opportunities for purchasing flat thoroughbreds prior to the horse entering into their training career. These interims can be categorised as; foal sales, yearling sales, and two-year-old sales commonly termed 'breeze-up sales' (ROA, 2019).

Willoughby (2016) points out that purchasers would rarely buy a car without a test drive and the advantage of purchasing from breeze-up sales is that some of the guesswork is eliminated. Buyers can observe a horse's performance working on a racetrack compared to when purchasing at yearling sales where the focus lies almost purely on conformational and genotypic factors (Cassidy, 2002; Hansen and Stowe, 2018). The day prior to sale, a horse with a sales entry will canter up a designated racetrack and be asked to gallop at full speed, hence the term 'breeze', over the final two to three furlongs (approx. 400-600m) in front of a number of potential buyers (Robert and Stowe, 2016). The observers will be provided with a snapshot indicating the horse's level of ability which lends the advantage of purchasing decisions being based on more concrete evidence (Hansen and Stowe, 2018; Robert and

Stowe, 2016). The fundamental idea of the breeze-up sale is to offer a quick transition from sales ring to the racecourse by providing an almost ready-made product to be entered in two-year-old races. This can be seen to minimise preparation time and monetary funding for the purchaser (Urken, 2017). For this reason, breeze-up sales in the southern hemisphere are termed as 'Ready to Run Sales' (Robert and Stowe 2016).

The concept of breezing horses stems from America with the idea extending to British soil in 1977 at Doncaster (Rowlands, 2019). Initially, breeze-up sales were devised as a means of offloading unsold yearlings from the autumn sales to permit consignors a last opportunity at dispersing stock- allowing them to be replaced by fresh ventures (Skelly, 2017). However, the same cannot be said today, as sales companies are becoming more selective, market rejections would fail to make shortlists in today's sales entries (McGrath, 2019). From an industry perspective, the breeze-up market acts as a '*barometer*' for the whole bloodstock industry, commencing in early spring, breeze-ups are the first major flat sale of the season and can provide a solid reflection of the market from the previous year (McGrath, 2019). If breeze-up consignors have an unprofitable year, this will be mirrored in their spending at the yearling sales the following autumn which can be reflected in the overall foal crop the subsequent season, thus creating a self-perpetuating cycle (McGrath, 2019).

In 2015, The Racehorse Owners Association conducted a survey to gauge the annual average cost for an owner to have a flat horse in training; findings published presented the figure to be £22,595 per annum (ROA, 2015) (see appendix A). For an owner that has purchased a yearling to be prepared to race as a two-year-old, this means that approximately six to eight months of training fees will be spent before the horse will make a racecourse debut. Therefore, if a breeze-up graduate makes a debut on the same date, the owner has already evaded around six months of training fees (Knight, 2019). Although this presents obvious financial advantages, one of the key aims of this project will be to establish if there is value in purchasing horses from breeze-up sales.

1.2 Analysis of the issue

The industry regard in which breeze-up horses are held has been a tenuous one (McGrath, 2019; Willoughby, 2016). Contrary to why breeze-ups were established in America during the 70's, the sector is considered to have developed into a highly specialist nursery for purchasing ready to race equine athletes (McGrath, 2019). Yet, despite this type of sale producing winner's year on year, there have still been biases associated with buying breeze-up graduates (Rowlands, 2019; Willoughby, 2016).

Primarily, there is the perception that breeze-up horses have been accelerated through the preparation process with commercial pressures eclipsing the overall welfare requirements of the horse (Miller, 2014). Willoughby (2016) explains that it is not uncommon in the industry to hear comments being circulated such as breeze-up horses *"burn out*", "*breeze-up horses don't progress*" and "*they only run for two furlongs*". Another common perception is that they have been "*fried"* from the level of overtraining they have received during preparation, with one article even referring breeze-up horses as being "*oven-ready*" (Skelly, 2017). However, these perceptions lie on anecdotal beliefs which has presented an opportunity for research to investigate these claims.

Trainers and bloodstock agents are the key purchasing clients at breeze-up sales who will usually be buying on behalf of racehorse owners (ROA, 2014). Some individuals view breeze-up sales as a favourable method of buying a horse considering the economic benefit to the purchaser (Robert and Stowe 2016). In contrast, some individuals perceive that the preparation of a breeze-up horse will be detrimental to their career longevity as they feel that they have been pushed too early in the developmental stages which highlights welfare concerns (Miller, 2017, ROA, 2014). This is not only a perception of breeze-up sales but also can be widely associated with perceptions of two-year-old racing.

1.3 The aims of this research

This study had two principal aims;

Aim 1: To investigate if the breeze-up preparation and sale impacts the career longevity of a racehorse

Objectives:

A comparison of data from breeze-up graduates and yearling sale graduates sold at Irish and UK sales to assess;

- Date of first start
- Which market provides a better chance of a two-year-old runner
- Number of two-year-old starts and wins
- Number of careers starts and wins
- Attrition rate from sales to racetrack

Thoroughbreds sold at breeze-up sales and yearling sales are sold with the intent of running at two years old. By investigating the objectives, results will suggest if horses sold from a breeze-up sale have been negatively impacted in terms of career longevity and ability to perform by comparing them to horses that were sold from yearling sales.

Aim 2: To analyse the cost efficiency economics of purchasing from the breeze-up market

Objectives:

- A comparison of sales price and earnings data from breeze-up and yearling sales graduates, sold in Irish and UK flat sales
- Evaluation of estimated costs from point of purchase to first start for both breeze-up and yearling sales graduates, sold in Irish and UK flat sales
- Analysis of industry performance measures - achieved Timeform rating and black-type earnings exhibited by breeze-up and yearling sales graduates, sold in Irish and UK flat sales

The objectives will provide guidance to understand which market presents better value to the purchaser. As residual value can sometimes be more important than monetary return, black-type form and performance indices have been included to reach the aim of this section.

1.4 Background to the client

The Breeze-up Consignors Association was established in 2015 in order to represent the interests of those producing and selling breeze-up horses. The organisation is involved in publicising breeze-up sales as a valid opportunity to source quality thoroughbreds as well as showcasing the performance of breeze-up graduates on the racetrack. More information can be found at: https://www.breezeupwinners.co.uk. This research will provide the client with empirical data and results to provide a deeper level of analysis to answer some of the scepticisms which breeze-up consignors have faced when trying to sell their product.

2.0 Literature Review

2.1 Welfare: Introduction

The first section of the literature review is aligned to the first aim of the study, to review any literature pertaining to welfare implications in preparing and racing the thoroughbred at two years old.

2.2 Welfare: The Importance of Equine Welfare to the Thoroughbred Industry

When assessing the welfare requirements of the thoroughbred in training, Heleski and Anthony (2012) suggest that addressing equine welfare needs cannot be judged on scientific evaluation alone, as it is important to consider how welfare is perceived by the public. Horseracing currently ranks to be the second biggest spectator sport in the UK which increases the need for the welfare of the racehorse to be kept at the forefront of stakeholder decisions to ensure the sustainability of the sport (Blake, 2019; RCA, 2018).

Public perception is an area racing has contended with in the past due to mixed feelings towards the sport's use of animals for entertainment (Bergmann, 2015; Huggins, 2013). Associations such as Animal Aid and People for the Ethical Treatment of Animals (PETA) have been forthright in their marketing campaigns. These groups have stated that the horseracing industry fuels enthusiasts with images of horses being "*cossetted like kings*". Specifically, Animal Aid argues that these athletes are "*victims*" that are easily disposable to industry if they do not prove ability (Animal Aid Horseracing Briefing, 2012; Graham and McManus, 2016).

Protestors promote the notion that enthusiasts and industry stakeholders are purely interested in the sport for monetary enjoyment. The bloodstock arena is presented as a hunting ground where "*market failures*" are killed and passed on to "*hunting yards for meat*" (Animal Aid Horseracing Briefing, 2012). To further represent their cause, emotive language and images (Figure 1) are utilised to cause distress and anger towards those involved in breeding and racing horses (Graham and McManus, 2016). Einwohner (2002) highlights that

although these organisations are being supported by an increasing number of followers, much of their published literature is based almost purely on hearsay.

Source: PETA (2019)

Fig 1: PETA images to represent the inhumane use of horses for racing purposes

There will always remain an element of risk within horseracing, which cannot be completely eradicated as with any sporting activity. Therefore, it is necessary to consider not only reactively meeting equine welfare needs, but also proactively to consider the area of ethics which is defined by Rollin (2007) as "*how animals ought to be treated"*. Various branches of ethical theory hold different views on the use of animals for sport. There is a need to respect the differing opinions in existence and a recognition of what the sport of horseracing can do within its own limitations – minimise the possible risks over which it has control. The case for if we should be using horses for racing purposes was addressed by World Horse Welfare;

"Animal rights groups and others are attracting more attention for their view that it is inherently wrong to use horses for entertainment. So, is it ethical to use horses in sport? World Horse Welfare strongly believes that it is – so long as the horses' welfare takes precedence over all other considerations" (World Horse Welfare, 2015).

Considering the current climate of society and the rapidly shifting opinions surrounding the treatment of animals along with the growing popularity of the veganism trend, this is an area

where the industry cannot become complacent (Pendergrast, 2016; Vizzier Thaxton et al., 2016). It has been demonstrated that efforts have been made by the horseracing industry to ensure that equine welfare is prioritised, however these are largely only understood within the industry and there may be a need for racing to be more proactive in its approach in order to deliver this information to those outside of the sport's parameters (Blake, 2019). For this reason, Blake (2019) and McGreevy and McManus (2017) suggest that social license could be a positive move towards the welfare of the sport in terms of public perception. This can be defined as an intangible agreement whereby the community gives industry authority to act. This could work well in showcasing the benefits horseracing contributes to the economy such as increasing employment and improving the infrastructure and business prosperity of locations that host racing events which may in turn help racing to be viewed in a more favourable light (McGreevy and McManus, 2017).

The economics of thoroughbred racing has encouraged owners and trainers to produce horses to perform at two years old. Consequently, this has created concern for those who raise welfare concerns towards breeze-up sales and the racing of horses at two years of age (Firth and Rogers, 2005). To help understand if there are welfare concerns, it is relevant to investigate literature focussed on juvenile thoroughbreds in training- this will be addressed in the next section.

2.3 Welfare: Development of the Two-year-old Thoroughbred

The conditioning of the young thoroughbred to be able to withstand the demands of training has been a widely investigated topic (Rogers et al., 2007). Evans (2007) suggests that musculoskeletal injuries are commonplace in athletic horses with lameness being the main concern. 'Wastage' is the term applied to thoroughbreds that exit the industry predominantly associated with injury or lack of ability (McLean and McGreevy, 2006; Thomson et al., 2014). There are many studies to examine industry wastage levels which encompass both welfare and economic industry concerns, for example; Bailey et al. (1997); Jeffcott et al. (1982); Parkin and Rossdale (2006).

According to Evans (2007), one of the most common apprehensions in the preparation of two-year-old thoroughbreds for both trainers and breeze-up consignors is the musculoskeletal

condition scientifically referred to as 'Dorsal Metacarpal Syndrome' (DMD) or 'sore shins' as it is commonly called in the industry. Wilsher, Allen and Wood (2006) highlighted that the condition affected 29% of two-year-old's in training in the UK. However, the rate is thought to be far higher at around 80% in Australian trained horses due to training on predominantly oval tracks (Bailey et al., 1997; Buckingham and Jeffcott, 1990; Yates, 2010).

Ferraro (1990) explains that traditional theories suggest that young horses should have very minimal exercise to enable the metacarpal bone adequate development time. However, more recent studies such as Georgopoulos and Parkin (2016), present the benefits of loading to the musculoskeletal system from an early age, which can decrease the risk of fatal mid-cannon bone fractures during horses' subsequent racing and training careers. According to Nunamaker (2002), the condition of DMD can be just as commonly experienced in horses that begin training at a later stage and is not a condition that should be exclusively associated to two-year-olds, which suggests that monitored exercise from a young age is beneficial to the long term musculoskeletal health of the horse.

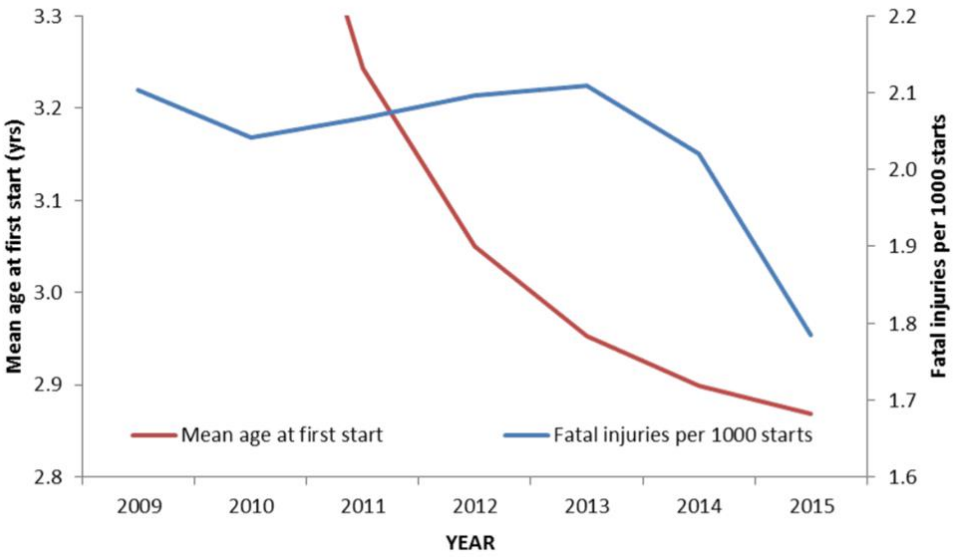
Preparing a breeze-up horse entails additional risk as the horse will require an introduction to ridden exercise as well as a monitored training plan to enable them to display peak performance on the day of the breeze. Taking this into account, consignors should be vigilant in monitoring the progression of their purchases as failure to reach the breeze-up sales has a negative economic impact through lost revenue to the consignor (Hernandez and Hawkins, 2001).

2.4 Welfare: The Effect of Early Racing Start on Long Term Career

Racing two-year-old thoroughbreds remains a contentious subject for people outside of the racing industry. Studies from Butler et al. (2019) and Horseman et al. (2016) gauged opinions regarding equine welfare amongst horse owners from allied equine disciplines. Results highlighted that people felt thoroughbreds were the most vulnerable horse breed with the majority of this perception associated with the fact that they disliked the idea of horses being prepared for racing so young. A Racing Post article by Miller (2017), took a more extreme approach calling for two-year-old racing to be banned. Miller aligned the preparation of

yearlings and breeze-up horses to be fuelled solely by commercial intention, which suggests misunderstanding on the benefits of early exercise even within the equine sector.

Albeit, racing a thoroughbred at two years of age presents a faster investment return to the owner, there has been an increasing amount of research to contemplate if racing thoroughbreds at two years of age will be detrimental to the horse's long term performance. More recently published literature is starting to mould the theory that horses commencing racing at two years are more likely to have longer careers than those starting later in life due to improved musculoskeletal development. Velie et al. (2013) examined a cohort of 115,000 Australian runners and found that racing the thoroughbred at two years old was not harmful as long as an appropriate training regime was implemented in preparation for racing. Similarly, Georgopoulos and Parkin (2016) examined risk factors causing fatal injuries in flat horses over a nine-year period and found a significant trend of lower fatality rates from horses that raced at the age of two years compared to those who started later in life (Figure 2).



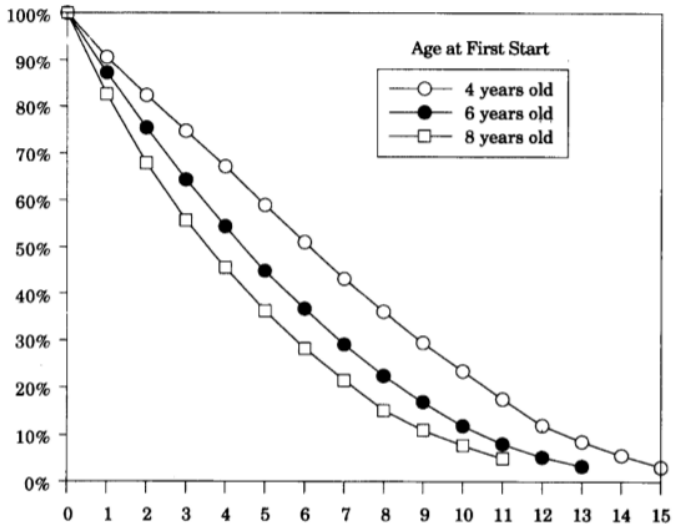
Source: Georgopoulos and Parkin (2016)

Fig 2: Reduced fatality rate in horses that started racing at an earlier age

The number of races each horse takes part in can be viewed as a reflection of the horse's physical soundness in that it can compete more frequently without issue (Wylie and Newton, 2018). It must be considered that there are other variables associated with the frequency of runs such as the suitability of races on offer and ground conditions to suit the individual horse

(Sheridan and Sweeny, 2001), however, it does offer helpful insight when investigating career longevity. Gramm and Marksteiner (2010) investigated the effect of age on racing performance and found that 4.45 years was the typical peak of a flat horse's career. Findings suggested a quantifiable ten length (8ft.) improvement for sprint horses between the age of two and four and a half years. This advocates that if a horse does not race until three years old it limits the ability to reach peak performance by 4.45 years and therefore may negatively impact career earning capacity. Hence, career longevity is a measure that must be considered when establishing economic returns to racehorse owners.

There have been a small number of studies that have investigated longevity in allied equine disciplines. Ricard and Fournet-Hanocq (1997) analysed factors affecting long term performance in show-jumping horses by comparing horses that commenced competition at four years compared to older competitors. Again, results suggested a successful long-term career was achieved in horses that started at a younger age (Figure 3). The findings of this section have provided information to suggest that monitored exercise at an early age can be beneficial to the musculoskeletal health of the thoroughbred. Thus, providing a sound rationale for racing horses at a younger age which could be beneficial in the debate against perceived welfare concerns in the preparation of breeze-up horses. A summary of the welfare findings from this section can be observed in Figure 4.



Source: Ricard and Fournet-Hanocq, 1997

Fig 3: Number of years in competition compared to age of first start

2.5: Summary of Welfare Findings

Given the media attention horseracing receives- the industry must keep welfare at the forefront of decision making to ensure the sustainability of the sport. Although two-year-old racing is a contentious issue for the general public, highlighting empirical evidence found here could help educate and improve perception.

DMD is thought to be a condition that can be a threat in the preparation of a young thoroughbred. Studies alluded to suggest that once a carefully monitored training plan is implemented- early loading on the musculoskeletal system can have long term benefits to equine health.

Gramm and Marksteiner (2010) found that the peak age of performance to be between 4-5 years in the flat racehorse. This highlights the benefits of racing at two years in order to have adequate racecourse experience to reach peak ability by 4-5 years.

There have been a small number of studies in racing and allied equine disciplines which suggest that if appropriate management is maintained- an early career start should not have negative effects on long term career longevity and in many cases has presented advantages.

Fig 4: Schematic diagram of welfare findings (Author's own, 2019)

2.6 Economics: Introduction

This section will examine the literature concerning the selling environment of yearling and breeze-up horses with application to subsequent return to the investor.

2.7 Economics: The Thoroughbred Marketplace

Rogers (2011) and Thresher (1996) refer to the bloodstock market as a market that is characterised by supply and demand with purchasers facing little in the way of tangible barriers to entry. As sales prices can differ vastly depending on intrinsic and extrinsic market factors, the 'Price Elasticities of Demand' or PED model can be a relevant theory to help understand price fluctuations and can be applied to any market supplying products or services (Goodwin, 1992; Tellis, 1988). As depicted in Figure 5, inelastic demand can be categorised by a definite alteration in price (p) despite little movement in demand, this can be the case when referring to everyday necessities such as petrol where buyers have few alternatives (Dahl and Sterner, 1991). Thoroughbreds can be deemed a luxury item rather than a necessity, thus, both yearling and breeze-up sale environments can be observed to suffer from elastic demand with macro-economic factors having the ability to distort the requirement of demand (Buzby and Jessup, 1994; Robbins and Kennedy, 2001; Rogers, 2011).

Source: Economics Institution (2019)

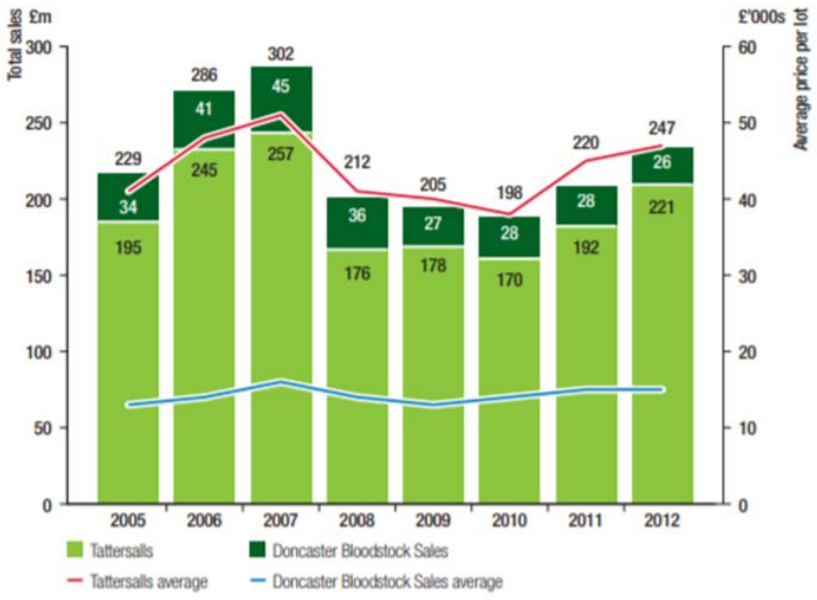
Fig 5: The Price Elasticities of Demand Model

When supply outweighs demand market saturation occurs and therefore the marginal profit of that industry is recorded as negative (Lord, 2000; Rodgers, 2011). The airline industry is a good example of an industry that frequently suffers from market saturation due to the

fragmented nature of this market. In Europe, an increasing number of low-cost carriers has resulted in a number of companies being left with no option but to sink into administration as they struggle to balance low-cost fares with rising operating costs in an aggressively competitive marketplace (Warnock-Smith and Potter, 2005).

During Ireland's Celtic Tiger era of the mid 90's, Ireland experienced a surge in financial growth (Ferreira and Vanhoudt, 2004; Kirby, 2010). With little barriers to entry in becoming a thoroughbred owner and a sizable increase in disposable income, new breeders and owners were emerging at a rapid rate which resulted in market saturation of thoroughbreds (Blake, 2017). However, following the saturation, macro-environmental factors again reminded the thoroughbred industry that they are not immune to changes in the economic climate at large when the 2008 global recession presented itself. Although largely disturbing to the horse racing industry, one benefit was that levels of production drastically reduced creating some level of correction to the supply-demand cycle - albeit in a harsh manner due to the number of abandoned horses reported (O'Connor and Power, 2019).

Decreased levels of buyer demand had a knock-on effect to thoroughbred sales companies. McCormick (2018) reported how 2009 represented a 65% decrease in sales volumes and the recession certainly added to the volatility of the bloodstock sales arena. Figure 6 (below) depicts a sharp reduction in sales prices for 2008 which signifies the beginning of the economic recession.



Source: Deloitte, 2013

Fig 6: Average price of horses sold at Tattersalls and Doncaster Bloodstock Sales: 2005-2012

Despite many breeders having their 'fingers burnt' during uncertain times, foal numbers have been escalating again more recently. Blake (2017) highlights that Irish foal births have increased from 7,546 in 2012 to 9,381 in 2016 (+24%). Correspondingly, Thomas (2018) alludes to clearance rates (rate of un-sold sales entries) at the 2018 Tattersalls yearling sales, one of the opening yearling sales of the year, declining from 90% in 2017 to 78% in 2018 (-12%). Furthermore, breeze-up vendors rated 2018 as a particularly difficult year reporting overall losses in the sector of approximately £2m (Eves, 2019). It becomes evident how the bloodstock sales industry can be acknowledged as a self-perpetuating cycle - if one sector suffers during the season it is unlikely that the subsequent sectors will not go unscathed.

Eves (2019) highlights how 2019 has been a more optimistic year at breeze-up sales. Results on the racetrack are exhibiting results to suggest that breeze-up graduates are performing to a higher level which aligns with the aim of this study, assessing the value at breeze-up sales. In 2019, sales companies made decisions to reduce sales entries in an effort to align catalogue sizes to industry requirements which has already reflected positivity as clearance rates have evidently improved (Table 1)(Eves, 2019). This suggests that monitoring sales entries with industry is a trend that should be followed in future years to avoid market saturation.

Table 1: Clearance Rates at Breeze-up Sales 2018/2019

Sale 2018/19	2018 no. sold/no. offered	2018 clearance rates	2019 no. sold/no. offered	2019 clearance rates
Tattersalls Ascot	59/118	**50%**	67/78	**78% (+28%)**
Tattersalls Craven	94/142	**66%**	85/109	**78% (+12%)**
Goffs Doncaster	138/182	**76%**	130/160	**81% (+5%)**
Tattersalls Guineas	143/194	**74%**	121/144	**84% (+10%)**
Tattersalls Gorsebridge	188/204	**92%**	179/196	**91% (-1%)**

Adapted from: Goffs, Tattersalls and Gorsebridge Data (2018/19)

Sales companies also made efforts in 2019 to boost incentive schemes which have provided favourable outcomes (TBA, 2018) (Appendix B). Prize money remains a fractious problem in the UK which can be aligned to a reduction in racehorse ownership (TBA, 2018). Incentives schemes from industry can be considered a positive response to encourage growth in racehorse ownership as a means of investing in leisure income (Riley, 2018). However, the industry must be vigilant in efforts to increase the attractiveness of ownership as any further reductions will be of consequence to both breeze-up and yearling markets. Through value assessment, this project will aim to assess where the best value can be obtained and therefore provide transparency to the racehorse owner.

2.8 Market Efficiency:

Market efficiency can be defined as a measure of utilising information to create a more streamlined transaction environment (Jegadeesh and Titman, 1993). This can be observed in Fig. 7 where the purchaser will encompass three areas of information to forecast an actual purchasing price.

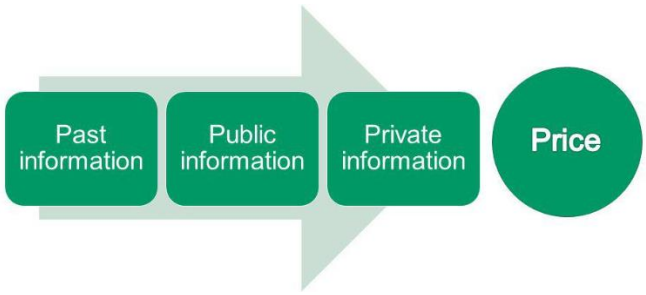


Fig 7: Market Efficiency Source: CFA Institute, 2019

There have been many studies in specialised industries that evaluate market efficiency at public auction including fine art and antique markets (Munteanu and Pece, 2015; Worthington and Higgs, 2004). From a bloodstock sales perspective, Butler (ongoing), Gamrat and Sauer (2000), Heckerman (1996) and Jackson et al. (2011) identify how the majority of purchasers are aware that they will not recoup the net value of the purchases which highlights the in-efficiency of the thoroughbred market.

Jackson et al. (2011) compared sales price to subsequent two and three-year-old earnings from a 2003 cohort of Australian yearling purchases. Results suggested a positive association

for horses earning prize money greater than sales price from purchases less than $40k, whilst for those above this price, a negative association is represented. Butler (ongoing) assessed return on investment to purchasers in the foal market and found that for purchases over £20k losses were incurred. Heckerman (1996) supports this theory, in his work assessing the American yearling market, reporting that for horses purchased over $100,000, only 6% recouped their initial purchase price. However, an interesting finding in this study (Table 2) is that purchasing from the higher brackets signalled a better chance of gaining stakes or black-type earnings. This suggests that although net sales price is better returned from a lower purchase price, the higher purchase price paid - the higher the chance of a better performer which can be seen to increase the residual value of the horse (Butler, ongoing; Heckerman, 1996).

Table 2: Earnings of North American auction yearlings by sales price

Price Range	*Number Sold*	*Average Price*	*Average Earnings*	*Earnings > Price*		*Stakes Winners*	
				N	*Percentage*	*N*	*Percentage*
< 5,000	46,105	2,193	14,420	22,209	48.0	1,067	2.0
5,000 - 9,999	20,060	6,881	25,472	9,921	49.0	877	4.0
10,000 - 19,999	17,560	13,791	32,986	7,630	43.0	949	5.0
20,000 - 29,000	9,647	23,545	41,010	3,420	35.0	667	7.0
30,000 - 39,000	5,818	33,404	46,182	1,770	30.0	449	8.0
40,000 - 49,000	3,610	43,032	53,237	957	26.5	309	9.0
50,000 - 74,999	5,171	58,397	49,697	1,068	21.0	459	9.0
75,000 - 99,000	2,461	83,312	54,028	357	14.5	247	10.0
100,000 - 149,999	2,540	116,071	56,028	265	10.0	278	11.0
150,000 - 199,999	1,447	166,336	69,277	96	7.0	152	11.0
200,000 - 299,999	1,544	232,637	55,686	57	4.0	193	13.0
300,000 - 499,999	1,202	365,983	64,925	30	2.5	163	14.0
500,000 - 749,000	599	588,698	101,158	21	3.5	109	18.0
750,000 - 999,999	191	832,827	112,980	5	3.0	40	21.0
1 million and up	250	1,870,065	101,507	2	1.0	67	27.0
All	118,205	32,839	30,566	47,808	40.4	6,026	5.1

Source: Heckerman, 1996

A study by Bock (2016) suggested that if investors applied economic theory to purchasing decisions a more efficient marketplace would be created. Similar requirements were voiced by Hon, who suggested that if the bloodstock market was regulated in the same manner as the investment market, greater transparency would be achieved. This, in turn, could help encourage foreign direct investment particularly from emerging racing jurisdictions such as China (Humpleby, 2019). Just a few months after this article was published the BHA raised concerns surrounding malpractice at bloodstock sales, particularly due to "*improper*

inducements and payments" as well as an increasing amount of owners and prospective owners reporting unsatisfactory experiences (Mottershead, 2019). Although the bloodstock sector is currently self-regulated, operating in such a way seems to be on borrowed time and the sector will possibly face jurisdiction from the sport's governing body in the not too distant future.

Chezum and Wimmer (1997) and Parsons and Smith (2008) highlight that at public sales, breeders and vendors can be termed to have asymmetric information. This is where one party knows more than another and at bloodstock sales, the consignor will have far more information regarding the temperament, conformation and individual attributes of the horse compared to the prospective purchaser (Chezum and Wimmer, 1997). Vickner and Koch (2001) believe thoroughbred purchasers are well aware of the benefits of information and regarding this will return to reliable consignors. This is of stark contrast to anecdotal opinions from those mentioned earlier such as Miller (2017) who felt that consignors were only in the game to make a quick profit and "*take a short term view*". Rzepka (2009) outlined how purchasers will often take into account the consignor as an indicator of the quality of the racehorse and as pointed out by Harvey (2019) "*A consignor's reputation is very much based on the ability to produce and sell good horses on a regular basis*". Perhaps some of the biases towards breeze-up horses have taken the view that the consignors are only in the game to make a quick profit, yet, one of the main aims of The Breeze-up Consignors Association is to exhibit the successes of breeze-up horses on the racetrack thus, consignors are not immune to the fact that a solid reputation will bring buyers back (Harvey, 2019).

2.9 Price prediction

Industry publications in the last decade commonly refer to the thoroughbred sales environment as a three-tiered market. While trade at the top and middle remains arguably strong, the bottom end continues to struggle (Blake, 2018). This can be viewed positively as the top tier presents a highly competitive environment that rewards breeders and consignors for their hard work. Alternatively, there is a sense that the industry can operate to an unrealistic level which creates ambiguity in price prediction (Parsons and Smith, 2008; Waxman, 2007). Although the bottom tier of the market is a place to try and avoid, as "*it costs*

the same to feed a cheap horse as an expensive horse" Mitchell (2017), sometimes the industry has pigeonholed breeders and vendors into the lower tiers.

Studies investigating price prediction in yearling markets have found common trends such as; sire influence, month of birth and reliability of the consignor, affect overall sales prices (Buzby and Jessup, 1994; Chezum and Wimmer, 1997; Neilbergs and Thalheimer, 1997; Robbins and Kennedy, 2001; Vickner and Koch, 2001). Pioneering research carried out by Buzby and Jessup (1994) found that the sire fee at the time of sale was the most influential yearling specific variable at the time of sale, although one limitation of this study is that analysis only investigated the premier end of the North American yearling market. Neilbergs and Thalheimer (1997) found sales prices at Kentucky and Saratoga USA select yearling sales to reflect prices which are sixteen times above the industry average for auctioned thoroughbred yearlings, therefore highlighting how Buzby and Jessup's study fails to capture an industry-wide representation.

Racing performance in the pedigree has also been found to be a contributing factor in achieving a higher sales price (Buzby and Jessup, 1994; Commer et al., 1991; Hansen and Stowe, 2018; Robbins and Kennedy, 2001; Robert and Stowe, 2016). There are a number of variables which can be examined here to suggest perceived economic output for the owner including but not limited to; career earnings, number of wins and placings and whether a horse has earned any black-type status (which considers any wins and placings at group or listed level) (Robert and Stowe, 2016). Whilst Buzby and Jessup (1994) suggest that the dam's racing career is highly influential in a buyer's willingness to pay a higher sales price, Robbins and Kennedy (2001) disagree with this theory and focus on the performance of prior progeny as a better indicator in price prediction. That being said, the majority of bloodstock agents in the UK and Ireland will consider both the dam and progeny performance as influential price indicators (Hansen and Stowe, 2018).

Robert and Stowe (2016) found that in USA breeze-up sales, official times which were recorded were a significant predictor of sales price. From an industry perspective, the subject of official timings has provided an interesting topic for debate. While the justification of a 'good breeze' in the USA is very much based on the time the horse achieved, European purchasers appear to be aware of the limitations involved in making decisions independently based on the time a horse can clock (Rowlands, 2019). Although many prospective purchasers

have been seen to use stopwatches, in the UK and Ireland reporting official times has not become commonplace. In 2018, breeze-up sales such as Ascot and the Craven sales were adversely impacted by incremental weather conditions which as outlined by Thomas (2018) led to one prospective buyer observing how "*the ground conditions makes all the fast one's look slow*". Although the clock can be considered a useful component in price justification, this doesn't seem to be the main objective in buyer decision making.

2.10 Buyer Behaviour

The majority of purchasers involved in the thoroughbred industry can be described as risk-tolerant as they are making substantial investments despite being aware of the high chance of loss (Butler, ongoing; Heckerman, 1996; Jackson et al., 2011; Vinzant and Neibergs, 1999). This adds to the peculiarity of thoroughbred ownership as no rational investor would be prepared to pay more than a racing prospect could return in net earnings (Bock, 2016). However, Gamrat and Sauer (2000) point out that a greater number of people participate in sporting events for the enjoyment rather than remunerative return. The same concept can be associated with the luxury car industry. Kaur and Sandhu (2004) suggest that buyers seeking luxury cars have completely different motives to those seeking everyday vehicles with some of the high-end purchases associated with tax evasion purposes (Rogoff, 2017). This can be compared to buyers purchasing yearlings and breeze-up horses who want to enjoy the prestige of ownership from disposable income (Gamrat and Sauer, 2000). Nevertheless, when making investments, purchasers require transparency and this project will provide guidance on purchasing.

The bidding environment at thoroughbred sales can be observed to be a competitive and unrestricted event which can frequently be seen to suffer from the 'overpayment phenomenon' (Gamrat and Sauer, 2000). Babu (2018) explains how 'Game Theory' can be applied to bidding negotiations as it encompasses decision making by two or more competing actors in a strategic setting. Bidding at thoroughbred sales can be compared to the purchase of footballers where extortionate payments are sometimes based on an exhibition of power rather than accurate value (Bergin and Bryan-Low, 2018). A prime example of this was seen during the purchase of breeze-up graduate 'The Green Monkey' in 2006 in the USA. The colt

was purchased for an extravagant $16m after a bidding war between two of racing's superpowers-Godolphin and Coolmore, the sale attributed to a display of power eclipsing any other purchasing motives (Finley, 2018). Examples that can be seen in both bloodstock and football purchasing situations confirm the theory highlighted by Butler (ongoing) and Gamrat and Sauer (2000) that suggests that bidding power can be aligned to status, with risk aversion decreasing with wealth.

In recent years, there has been increased demand for owners to seek out precocious thoroughbreds that will advance to the track quicker. This can be associated with increased investment in prizemoney for two-year-old events as well as lucrative incentive schemes such as the Plus 10 scheme (Grubb, 1997; TBA, 2015) (Appendix B). This drive was reflected in the 2017 BHA racing programme where the number of two-year-old contests was significantly enhanced (BHA, 2017). With the commencement of the flat season in late March, this has had a knock-on effect to the market as purchasers are often reluctant to spend excessively for a middle-distance horse that is unlikely to run until it turns three whilst horses by two-year-old 'speedy' stallions are highly sought after (TBA, 2015). With this increased demand, again the cyclical nature of bloodstock becomes evident as breeders and consignors are encouraged to breed and produce early maturing two-year-olds, creating another example of how the market can be seen to dictate to the industry. With this increased demand in buyer behaviour to seek out precocious thoroughbreds that will race early, this project will investigate if the breeze-up market is efficient in producing two-year-old runners.

2.11 Owner Output

Deciding on variables that define the successful performance of a racehorse can be a difficult task due to the wide range of variables available (Wylie and Newton, 2018). The majority of studies assessing the yearling and breeze-up market have predominantly focussed on career earnings and this is widely seen to be used in the industry as the fundamental measure of ability (Butler, ongoing; Waldron, 2011). Wylie and Newton (2018) argue that this is not always the most comprehensive measure of success due to different drivers displayed by individual owners. While some owners are purely investing for monetary purposes, some are simply happy to enjoy days out at the races and for that reason, career longevity and the

number of times a horse runs can also be classified as a marker of success (Wylie and Newton, 2018). Although the number of runs can be seen as a measure of soundness, Butler (ongoing) argues that elite horses will be more strategically placed in races during their careers and therefore will run less in an effort to be competitive in the upper levels of racecourse events.

Analysis undertaken by Two Circles investigating the motives of racehorse owners in 2016 displayed interesting results (Figure 8), with only 8% of participants feeling that "*winning is everything*" (ROA, 2016). Although this may be true when interviewing the lay owner or syndicate member, a different set of motives would be likely to be represented by those more heavily involved in the industry. Take for example leading industry player Godolphin that operates thirteen different racing and breeding operations in five global jurisdictions (Godolphin, 2019). Godolphin rely heavily on profit from the breeding sector of their operations and as put by Wood (2018);

"*Breeding is the part of the iceberg that most racegoers never see or consider but it keeps the racing side of the operation afloat*".

For this reason, operations such as Godolphin rely on progeny performance to command higher sire fees and in turn more profitable results in the sales ring, therefore if industry players rather than lay owners were questioned a different set of answers would be likely. This also attributes some accountability to the higher prices paid at yearling sales as these can be purchased with the intent of being both racing and commercial breeding prospects compared to breeze-up purchases which are predominantly purchased with the intent of being racehorses (Riley, 2019; Willoughby, 2016). However, this is not to say that breeze-up purchases are not capable of achieving the same results on the racetrack and in some cases may represent better value to the purchaser-this will be explored in the forthcoming sections. A summary of economic findings from the literature review can be observed in Figure 9.

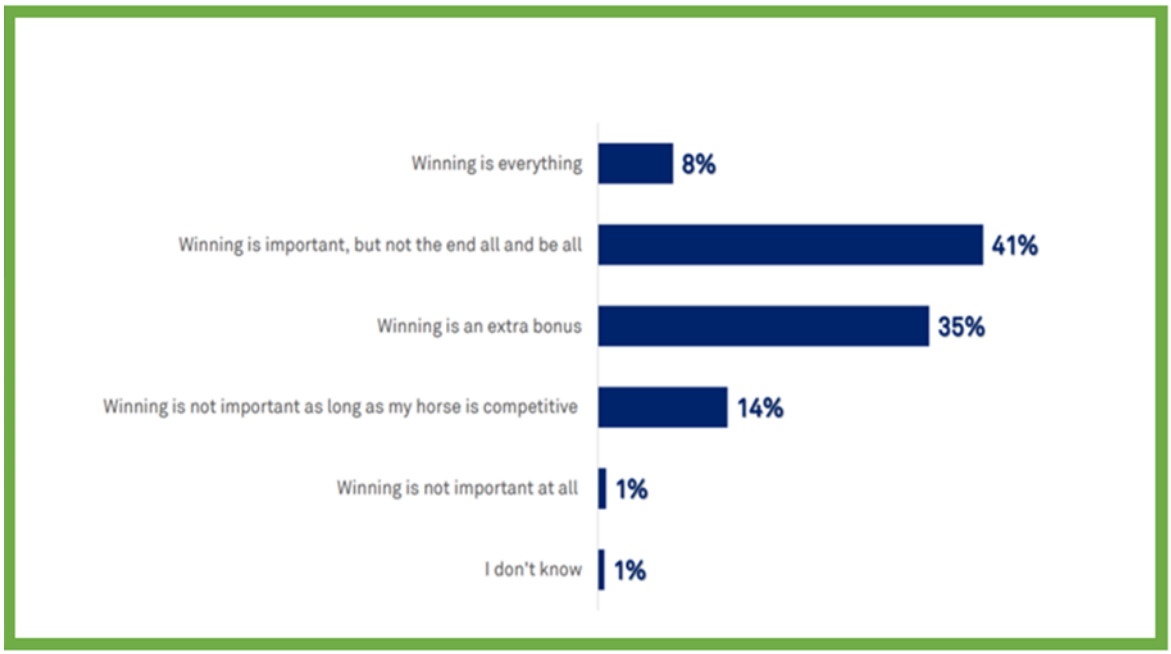


Fig 8: Owners perception on the importance of winning races Source: ROA (2016)

2.12 *Summary of Economic Findings*

Market saturation is an issue that has negatively impacted the industry creating both economic and welfare concerns in the past. Increased regulation and transparency at bloodstock sales may help prevent such problems in the future and encourage increased foreign investment into the marketplace.

Price prediction at both yearling and breeze-up levels has caused ambiguity due to the elasticity of the marketplace. This has resulted in problems for purchasers when forecasting.

There is a well-acknowledged assumption that racehorse ownership does not eventuate in positive returns to the owner. However it is clear that not all owners strive for monetary return. For some it's the prestige of ownership and ability to attend the races. While others strive for increasing the residual value of the horse which can pay dividends in the form of commercial breeding returns.

Several studies have investigated buyer behaviour and trends at yearling sales however, studies are predominantly concentrating on North America. There is an evident lack of literature which focuses on the two-year-old breeze-up market. This presents a knowledge gap for increased hedonic research towards the breeze-up environment and European bloodstock markets.

Fig 9: Schematic diagram of Economic findings (Author's own, 2019)

3.0 Methodology

This study used a quantitative method for the results to be presented as practical statistics. Over the past few years, the horseracing industry has recognised a lack of quantitative research and therefore there has been an increased drive to promote research inquiry of this nature (University of Liverpool, 2019). The majority of professionals from the horseracing industry consider quantitative research to be highly valuable when analysing industry issues (Osborne, 2018). This can be associated with success in the sport being quantitatively measured through variables such as prize money (Wylie and Newton, 2017). Therefore, as this study was evaluating numerical data, a quantitative approach was considered the most effective method for meeting the aims of the study and providing value to both the client and industry.

Secondary data were utilised to examine sales prices of horses in relation to earnings and to be able to investigate a sample of racing years that was large enough to understand if career longevity had been affected. The study used a deductive approach that works by extracting conclusions from existing theories in order to confirm or reject the original concept (Figure 10) (Creswell and Creswell, 2017; Dudovskiy, 2016). The advantages of deductive research include being able to measure concepts quantitatively and explore causal relationships between variables to generalise findings (David, 2016; Gratton and Jones, 2009). As this study involved a large sample size it was essential to be able to generalise results to convey a realistic industry representation. A critique of this approach is that it can discourage divergent thinking (Blackstone, 2012). However, due to the availability of secondary data available for this project, this approach was considered the appropriate choice.

Fig 10: The Deductive Approach (Source: Blackstone, 2012)

3.1 Sample Size

The data included horses that were sold at public auction from UK and Irish flat yearling and breeze-up sales (Table 3). Selling prices were recorded for yearlings sold in: 2012, 2013 and 2014 and breeze-up's: 2013, 2014 and 2015 to allow data to be collected from the start of the same two-year-old racing year. The sample size (total *n*=10,107) consisted of yearlings (*n*= 8,634, 85%) and breeze-up horses (*n*= 1,473, 15%). The smaller breeze-up sample can be aligned to fewer breeze-up sales annually and smaller catalogue sizes (Riley, 2019). Although this could be considered bias in sample size, the horseracing industry acknowledges that breeze-up sales represent smaller catalogued entries (Riley, 2019). The majority of quantitative research includes some level of bias and outlining any potential elements of bias can enable greater critical evaluation when applied to the findings (Smith and Noble, 2017).

Table 3: Sample Size

SAMPLE SIZE		
Racing year	**Breeze-up**	**Yearling**
2013	437	2,713
2014	496	2,810
2015	540	3,111
Grand Total	**1473**	**8634**

3.2 Data Collection

Sales results and race form for horses included in the study were obtained from an industry source with approval obtained by the data provider, study supervisors and the client for this study. All data used were secondary data that were collected and pre-recorded for primary purposes (Johnston, 2017; Vartanian, 2010). The fundamental advantage of utilising secondary data is the time benefits to the researcher (Foley, 2018; Ghauri and Grønhaug, 2005. A disadvantage of using secondary data is the concern of reliability of the data, particularly when importing large data sets (Cheng and Phillips, 2014). For this reason, data validation and verification checks were administered on one in every 100 horses in the sample

size using both the Racing Post website and the UK and Irish auction house websites (Table 4 and 5) to avoid any concerns surrounding reliability (Winter, 2000).

Table 4: Secondary data sources

Site:	Purpose:	Site Address:
Racing Post	Racing Form	https://www.racingpost.com/
Tattersalls UK	Selling price	http://www.tattersalls.com/
Tattersalls Ascot	Selling price	http://www.tattersallsascot.com/
Tattersalls IRE	Selling Price	http://www.tattersalls.ie/
Goffs UK	Selling price	https://www.goffsuk.com/
Goffs IRE	Selling price	https://www.goffs.com/

*(*Brightwells Ascot was purchased by Tattersalls Ltd. in 2015 and now operates under Tattersalls Ireland therefore sales data for this sale was validated via the Racing Post website)*

Table 5: Sales which data were obtained from

Sale:	Type of Sale:	Month:	Years Collected:	Country of Sale:
Doncaster Premier sale	Yearling	August	2012, 2013, 2014	UK
Tattersalls Yearling sale	Yearling	September	2012, 2013, 2014	IRE
Doncaster St. Ledger sale	Yearling	September	2012, 2013, 2014	UK
Goffs Orby sale	Yearling	October	2012, 2013, 2014	IRE
Goffs Sportsman sale	Yearling	October	2012, 2013, 2014	IRE
Tattersalls Book 1	Yearling	October	2012, 2013, 2014	UK
Tattersalls Book 2	Yearling	October	2012, 2013, 2014	UK
Tattersalls Book 3	Yearling	October	2012, 2013, 2014	UK
Tattersalls Book 4	Yearling	October	2013, 2014	UK
Brightwells Ascot	Breeze-up	April	2013, 2014, 2015	UK
Tattersalls Craven	Breeze-up	April	2013, 2014, 2015	UK
Doncaster	Breeze-up	April	2013, 2014, 2015	UK
Tattersalls Guineas	Breeze-up	May	2013, 2014, 2015	UK
Goresbridge	Breeze-up	May	2013, 2014, 2015	IRE

*(**There was no Tattersalls Book 4 yearling sale in 2012)*

Justifications for data selection are explained below;

○ Racing discipline selection

Horseracing can be separated into two distinct disciplines; flat racing and national hunt or jumps racing (Racing Post, 2019; Williams et al., 2013). This study focussed on flat sales as the study aim was an assessment of two-year-old's sold with the intent of running in flat races. Thus, any national hunt form achieved by horses sold in this study was omitted from analysis.

○ Number of horses for selection

Both yearling and breeze-up sale samples included all horses sold from the selected sales. This method was chosen to avoid bias as there are many influencing variables to consider when comparing yearlings to breeze-up horses such as the name and location of sale, sex, sire and dam influence, sales price, foal crop, month of birth and consignor reputation (Buzby and Jessup, 1994; Jackson et al., 2011; Robbins and Kennedy, 2001; Rogers, 2011).

As the majority of horses intended for resale at breeze-up sales are originally purchased at yearling sales (Knight, 2019), any breeze-up horse sold that had a yearling sales price recorded in the data had this record omitted to avoid a horse showing twice and therefore distorting the results. It would not be possible to fully eradicate horses that had been through both sales in the data as it would leave a breeze-up sample size which would be too small to analyse and the majority of breeze-up horses are purchased from yearling sales.

○ Racing years investigated

Race data from each group were collected from the potential start of their two-year-old racing career until May 2019 (Table 6). Although this does present a limitation in that there is a different time frame for each of the three groups, the length of time investigated does allow sufficient time for a horse from each group to demonstrate ability as the accepted age of peak performance has been found to be between four and five years for a flat horse (Butler, 2019; Gramm, 2010). As yearlings are sold the year previous to two-year-old breeze-up horses, yearling sales data were collected from a year previous to the breeze-up cohort. This enabled the groups to be comparable from the point at which the horses had the potential opportunity to start racing at two years old.

Table 6: Racing years investigated

Category	Year Sold	First Year Racing
Yearling	2012	2013
Yearling	2013	2014
Yearling	2014	2015
Breeze-up	2013	2013
Breeze-up	2014	2014
Breeze-up	2015	2015

○ Timeform Rating

To evaluate the racing performance of horses sold from breeze-up and yearling sales, the generic Irish and UK performance indicator of 'Timeform rating' was used. The Timeform figure is graded differently for national hunt and flat horses which provided another reason to focus on flat racing only for the purpose of this study (Timeform, 2014). Further details on Timeform ratings can be found in Appendix C.

○ Countries included

The data were refined to UK and Irish sales only because these countries are highly reliant on each other in terms of a supply and demand relationship, therefore, it is difficult to assess one without the other (Parsons and Smith, 2008; TBA, 2018). Since assessing these two countries meant analysing sales prices in both euro and sterling, all sales prices and recorded earnings were converted to (£) sterling at the time of sale/earning. Timeform is used generically across Ireland and the UK which led to other countries being eliminated from the study due to the difficulty in cross comparing performance indicators from other racing jurisdictions (Timeform, 2014).

3.3 Measures:

The original data contained many fields, some of these were omitted from the study. Inclusion and exclusion decisions are important to justify the correct procedure to enable the researcher to reach the study's aims and objectives (Garg, 2016). Clearly defined inclusion

characteristics can assist in maximising both the external and internal validity of the study (Salkind, 2010). Fields used for inclusion and exclusion in this study are explained below (Tables 7, 8 and 9).

Table 7: Inclusion justifications from original data

Inclusion Variable:	Reason for Inclusion:
Sale name	For the ability to trace horses and differentiate
Year of sale	Grouping yearlings and breeze-up horses
Lot number	Validation purposes on sales websites
Horse name	Validation purposes on Racing Post website
Year of birth	Grouping yearlings and breeze-up horses
Sales price	Aim two
Date of first start	Aim one
Total number of two-year-old starts	Aim one
Total starts	Aim one and two
Total wins	Aim one and two
Total earnings	Aim two
Date of last start (* data until May 2019)	Aim one and two
Any Black-type form	Aim two
Time form rating	Aim two

Table 8: Exclusion variables from original data

Exclusion Variable:
Gender
Sire
Dam
Broodmare Sire
Crop
Vendor
Purchaser Name

Table 9: Measures for data analysis

Measure:	Associated Aim:	Justification:
Average age of first start	1 & 2	This can be considered from a welfare perspective because if the breeze-up preparation has negatively impacted the horse, it is unlikely that they will be able to make the track to race in the early two-year-old races. From an economic perspective, an earlier age of first start means that a higher-earning capability for that horse at an earlier stage (Velie et al., 2013).
Median sales date	1&2	The median sales date was used to find a date that was in the middle of the breeze-up and yearling sales season. This median date was then used with the average date of first start for the training cost analysis.
% chance of two-year-old runner from both category	1 & 2	A measure of soundness as if the horse has been negatively impacted by the breeze-up sale this will inhibit them in reaching the track at two years old. This also has economic significance as a horse that can run at two years will give the possibility of a faster return to the purchaser (Butler, 2019; Velie et al., 2013)
Number of starts at two years old	1	A measure of soundness and will reflect if the breeze-up process has negatively impacted the horse
% chance of two-year-old wins	1 & 2	A measure of soundness to have the ability to perform as a two-year-old and economically faster return to the owner (Velie et al., 2013)
Attrition rate	1	Attrition rate is a measure of inability to reach the racetrack following sale and is viewed as a measure of physical soundness (Waldron, 2011)
Number of career starts	1 & 2	A measure of soundness and for many owners, a requirement is days out at the races rather than just winning prize money (Lunn, 2019)

Number of career wins	2	A measure of economic output to the owner and an industry ranking measure of performance (Wylie and Newton, 2018)
Total earnings based on different sales price brackets	2	A measure of economic output to the owner and an industry ranking measure of performance (Butler, ongoing; Wylie and Newton, 2018). Different price brackets were used to represent the industry regarded the three-tiered market. Price brackets were used to represent the three tiers; Sales Prices: <£30K, £30K-£80K and £80K+ (Blake, 2019)
Average return on investment with training fees applied	2	Using ROA 2015 average cost of having a flat horse in training in the UK at £22,595 per annum (ROA, 2015). This finding was applied to both breeze-up and yearling samples. One month of training fees was applied to the breeze-up cohort and eight months fees applied to the yearling cohort based on the assumption that both groups have a first start at two and a half years based on the result of the age of first start.
Highest Timeform rating	2	A definitive industry measure of performance (Timeform, 2019; Waldron, 2011) (Appendix C).
Black-type recorded wins/placings	2	Key performance indicator of ability and an industry measure (Hansen and Stowe, 2018)

3.4 Data Analysis:

○ Descriptive statistics

Descriptive statistics were used to analyse the data using pivot tables in Microsoft Excel Version 2016 (Microsoft, Washington, USA). Pivot tables allowed the user to extract and synthesise averages from large amounts of data which applied to this project (Chester and Alden, 1997). They were also beneficial in terms of providing percentage averages when comparing different sample sizes which was necessary in this case due to the difference in

size between the two cohorts (Field, 2013). A criticism of pivot tables is that understanding how to use them can be time-consuming (Palocsay, Markham and Markham, 2010). A limitation of using averages or means in descriptive statistics is that outliers in the data can skew results and provide figures which are not a true representation. To avoid this issue, standard deviation figures (±) were provided in a number of tests to show how far the responses deviated from the mean (Salkind, 2010).

○ Statistical analysis

Statistical analysis was undertaken using GraphPad Prism version 8 computer software (GraphPad Ltd., California, U.S.A).

Pearson's Correlation Test

The data was found to be continuous parametric data and therefore a Pearson's correlation test was utilised (Van Buuren, 2007). The correlation coefficient, r, assuming any value between +1 and -1, determined how associated the two variables of sales price and earnings were between one another (Ko and Li, 2016). Significance was set at $P < 0.05$. This test is beneficial for large data sets which can be displayed graphically for interpretation (Bonett and Wright, 2000). A precaution to consider when using this test is that outliers in the data can cause skewed results (Banker and Chang, 2006).

4.0 Results

This section will provide a summary of the results which were found aligned with the aims of this project.

4.1 Opportunity to reach the racetrack:

Average age of first start:

Figure 11 represents the results for the overall average age of first start. This was calculated from horses in the sample that appeared on the racetrack, breeze-up's (*n*=1,351) and yearling's (*n*=7,495). Results suggested an average start age of 2.45 years for breeze-up horses and 2.46 years for yearlings which was calculated to be a start month of June for each group during their two-year-old racing season based on the fact that in the racing industry all thoroughbreds have a January 1st birthday (Gramm and Marksteiner, 2010).

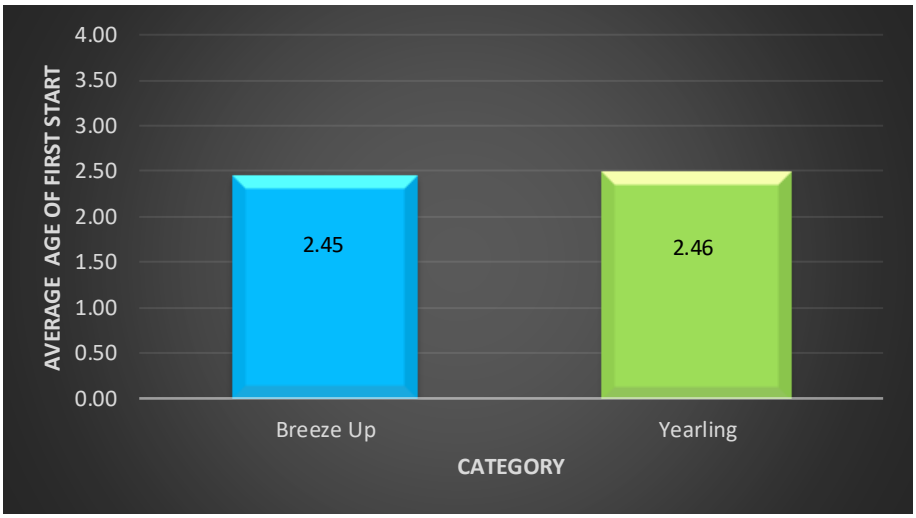


Fig 11: Average age of first start

Chance of having a two-year-old runner:

Table 10 demonstrates the percentage chance of having a two-year-old runner when purchasing from the two categories. Breeze-ups which had a two-year-old start (n=1,062) were compared to yearlings that had a two-year-old start (n=5,619). Results suggested horses sold at breeze-up sales had a 72% (+7%) chance of running during their two-year-old career compared to 65% of two-year-old runners from the yearling category. The breeze-up market

exhibited a trend year on year of having a higher number of runners reaching the racecourse at two years old.

Table 10: Chance of having a two-year-old runner from breeze-up and yearling markets (%)

Year	Breeze Up's that raced at 2yo	Total number (Breeze-Up)	% Chance of 2yo run	Yearlings that raced at 2yo	Total number (Yearlings)	% Chance of 2yo run
2013	296	437	68%	1795	2713	66%
2014	364	496	73%	1827	2810	65%
2015	402	540	74%	1997	3111	64%
Overall	1062	1473	72%	5619	8634	65%

Attrition rate from sale to racecourse:

Figure 12 depicts the average percentage of horses that were sold from breeze-up and yearling sales that never raced during the years investigated. Overall for the three years, this was found to be 8.3% for horses sold at breeze-up sales (n=122) compared to 13.2% for horses sold from yearling sales (n=1,139). This suggests a higher percentage attrition rate for horses sold from yearling sales. A linear trend line for graphical purposes represents a decreasing attrition rate annually for breeze-up horses opposed to a slightly increased rate for the yearling cohort.

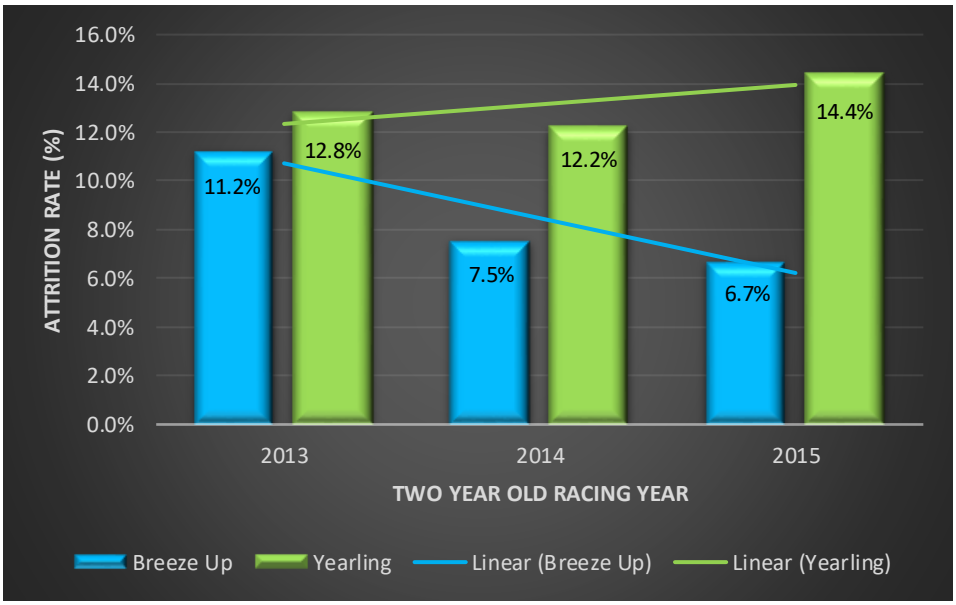


Fig 12: Attrition rate from sales to racecourse

4.2 Number of starts:

Two-year-old starts:

The average number of two-year-old starts on the racecourse by each category can be observed in Figure 13. Results suggested that horses sold at breeze-up sales that raced at two years of age (n=1,062) appeared on the racecourse an average of 3.95 times (± 2.36). This was compared to the yearling cohort (n=5,619) that appeared an average of 4.06 times (±2.71) at the age of two. Therefore, little difference was found between the two categories.

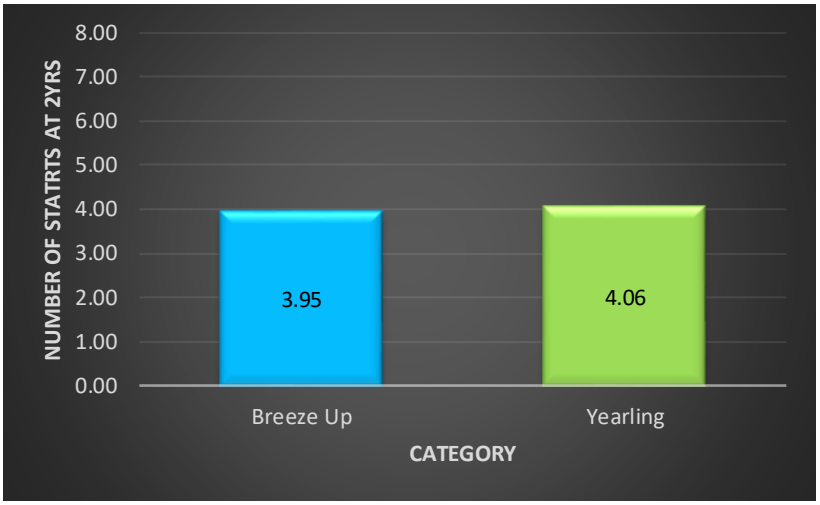


Fig 13: Average number of starts at two years

Number of starts in the time period analysed:

Figure 14 represents a slightly higher number of starts for breeze-up horses, 18.89 (±15.33) (n=1,351) in relation to those that raced from the yearling category 17.32 (±14.45) (n=7,495). The result here does suggest that horses from breeze-up sales are displaying career longevity comparable to those sold from yearling sales.

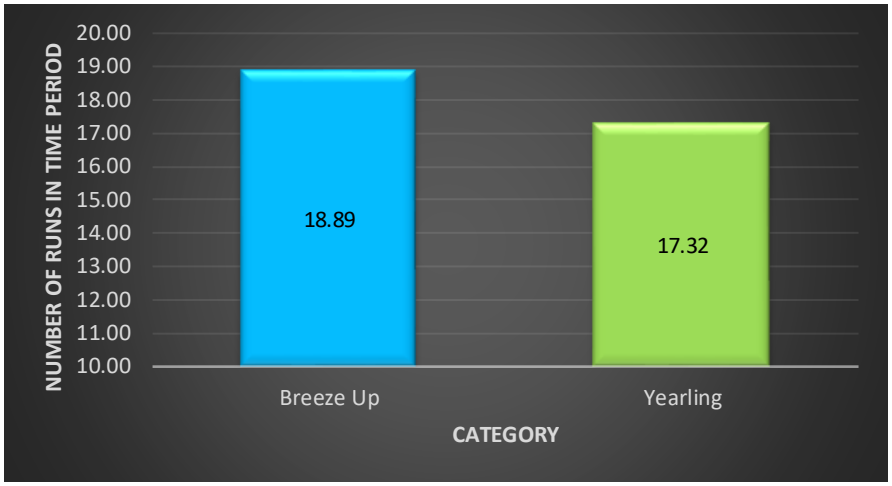


Fig 14: Number of starts in time period analysed

4.3 Likelihood of race success:

Chance of two-year-old winner:

Figure 15 can be observed to show that both categories exhibited a similar chance of having two-year-old winners. The yearling category displaying a minimal advantage with an average of 11.50% (±19.9%) with the breeze-up category recording an average of 11.10% (±20.4%). This result was obtained by analysing horses sold from breeze-up sales that ran at two years old (n=1,062) compared to yearlings sold that ran at two years (n=5,619).

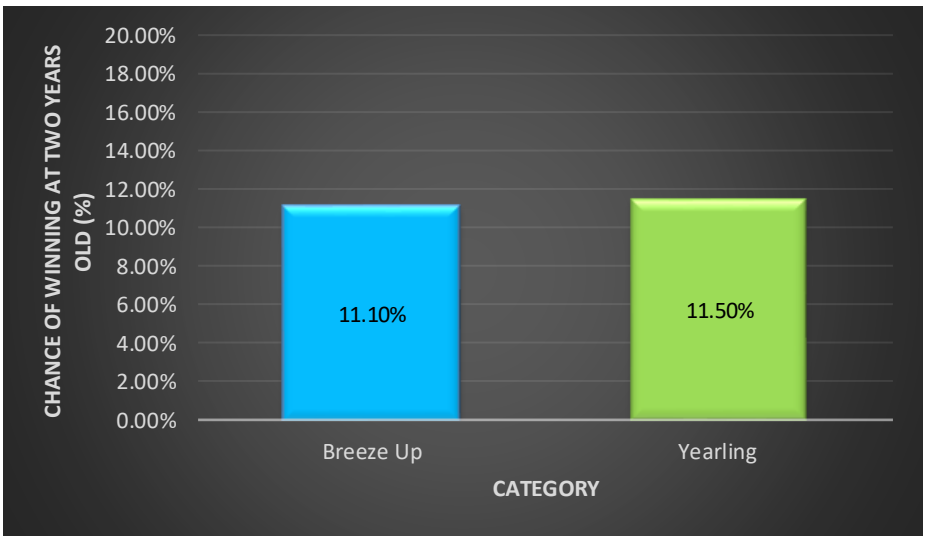


Figure 15: Chance of two-year-old winner (%)

Average number of wins from total runs:

Figure 16 (below) represents the average number of wins from total runs analysed. This was calculated by taking all the horses that raced from the breeze-up cohort (n=1,351) and all horses that raced from the yearling cohort of (n=7,495). The yearling cohort achieved a slight advantage here at 10.20% (±11.5%) compared to breeze-up horses 9.10% (±10.4%).

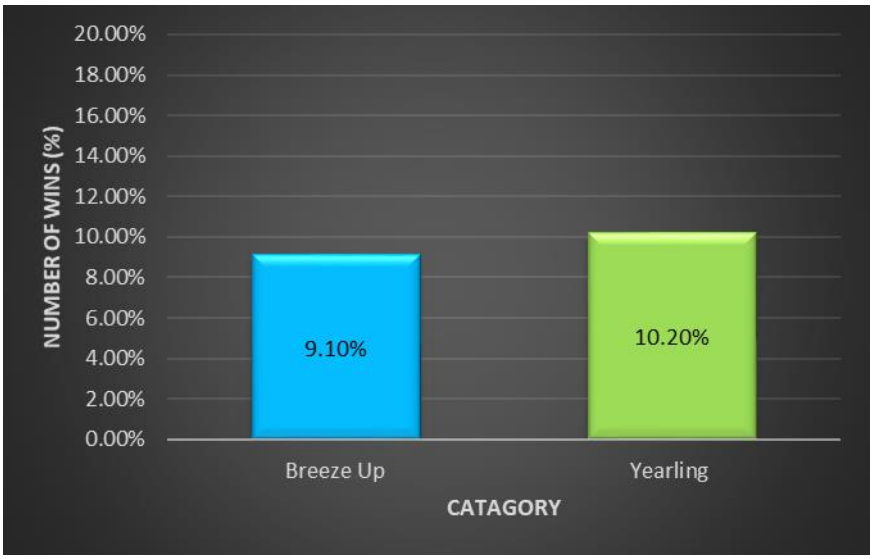


Figure 16: Average number of wins from total runs (%)

4.4 Return on investment:

ROI:

Table 11 can be observed to show the average return on investment to the purchaser. This was calculated by analysing the entire breeze-up sample (n=1,473) and the entire yearling sample (n=8,634). Results were found to show a positive return in both categories for purchases in the <£30K category, particularly in the yearling category (+42%), however as purchase price increased, return on investment decreased for both categories. Overall, the breeze-up market represented a better return on investment, with an average loss of 33%, compared to an average loss on yearling purchases of 42%.

Table 11: ROI (%)

Breeze Up				
Price Ranges	Total number	Total purchase cost	Total earnings	Average ROI(%)
<£30K	879	£11,454,261	£14,342,592	25%
£30-80K	418	£19,790,996	£15,139,382	-24%
>£80K	176	£28,989,955	£11,139,287	-62%
Overall	1,473	£60,235,212	£40,621,261	-33%

Yearling				
Price Ranges	Total number	Total purchase cost	Total earnings	Average ROI(%)
<£30K	4,682	£60,365,097	£100,950,248	67%
£30-80K	2,437	£120,214,097	£93,919,325	-22%
>£80K	1,515	£324,616,875	£99,677,493	-69%
Overall	8,634	£505,196,069	£294,547,066	-42%

Correlation tests:

Figure 17 can be observed to show the results of a correlation test looking at the significance between sales price and earnings. Results suggest that horses bought from the <£30K in the breeze-up category provided the best return on investment and as purchase price increased so did the loss on investment. Significant positive association was found between sales price and earnings in the <£30K bracket ($p<0.0001$ and $r= 0.16$). The £30-80K was found to have no real significance ($p=0.5362$ and $r=0.03034$). The >£80K price bracket was also found to show no significance ($p=0.7299$ and $r=-0.02621$). The result from the correlation can be identified with the return on investment identified in Table 11.

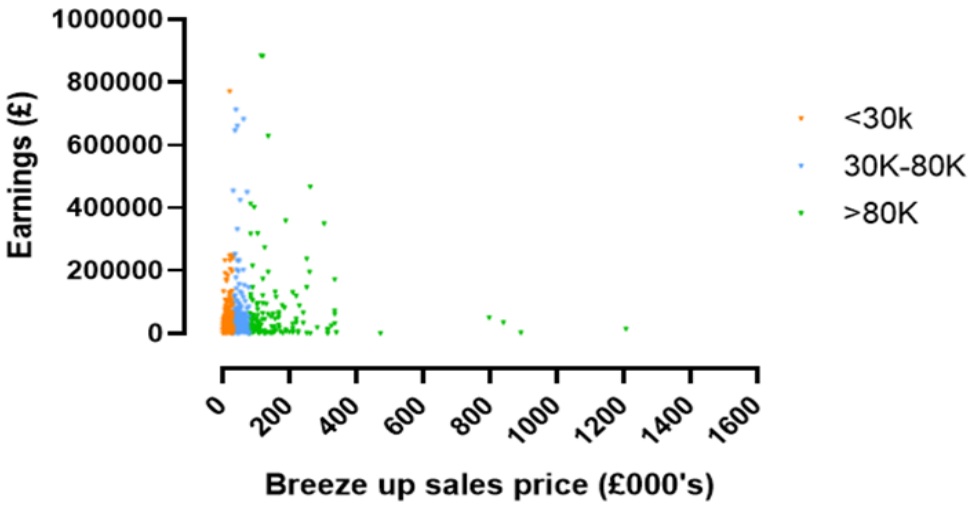


Fig 17: Correlation test to show earnings in relation to sales price from breeze-up category

Figure 18 (below) used a correlation test to find if there was significance between sales price and earnings in the yearling category. Results found a positive association between sales price and earnings in the <£30K price bracket (p=<0.0001 and r=0.08324). No significance was found in the £30-80K price range (p=0.2618 and r=0.02513). A very minor association was established in the >£80K price category (p=0.0442 and r=0.05802). Comparable to the breeze-up cohort, the strongest association was established from purchasing from the <£30k price range.

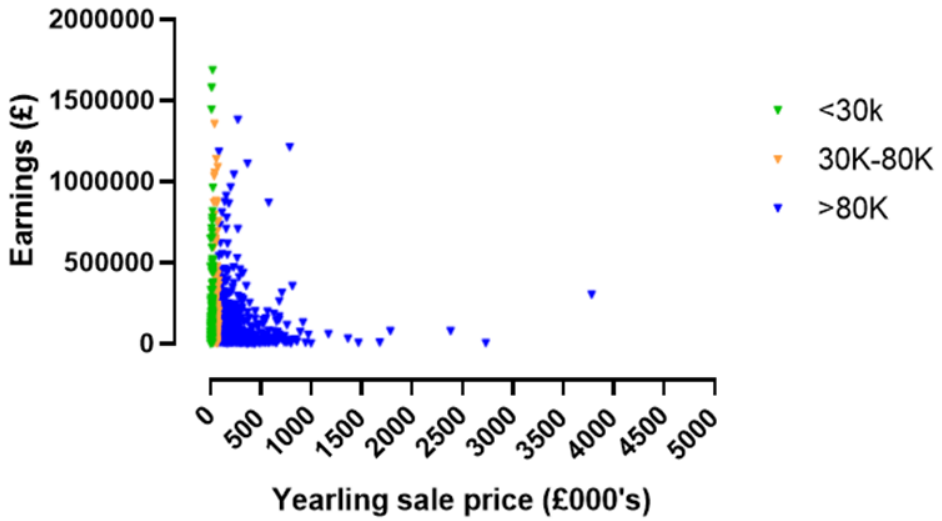


Fig 18: Correlation test to show earnings in relation to sales price from yearling category

ROI with training costs applied:

Table 12 (below) depicts the return on investment when training fees have been applied to the ROI scenario. This estimation was calculated using the entire sample size of horses sold; breeze-up sample (n=1,473) and yearling sample (n=8,634) with training costs applied at one month for breeze-up horses and eight months for yearlings based on the median sales date and the result from the age at first start.

Results here suggest that the <£30K price bracket for the breeze-up market represented the only positive return on investment. As purchase price increases so does loss on return to the investor. Overall, purchasing from the breeze-up market depicts an 18% saving which would be significant in any industry and suggests that the market can be seen to operate in a more efficient way.

Table 12: ROI (%) with training cost applied from point of sale to first run

Breeze up						
Price range	Purchase price	Training costs*	Total cost	Earnings	Number	Average ROI (%)
<30k	11,454,261	1,655,083.75	13,109,345	14,342,592	879	9%
30-80k	19,790,996	787,059	20,578,055	15,139,382	418	-26%
>80k	28,989,955	331,393	29,321,348	11,139,287	176	-62%
Overall	60,235,212	2,773,536	63,008,748	40,621,261	1,473	-36%

Yearling						
Price range	Purchase price	Training costs*	Total cost	Earnings	Number	Average ROI (%)
<30k	60,365,097	70,526,526.67	130,891,624	100,950,248	4,682	-23%
30-80k	120,214,097	36,709,343	156,923,440	93,919,325	2,437	-40%
>80k	324,616,875	22,820,950	347,437,825	99,677,493	1,515	-71%
Overall	505,196,069	130,056,820	635,252,889	294,547,066	8,634	-54%

***Training costs are based on the 2015 Average cost of a flat horse in training in the UK at £22,595 per annum/£1,883 per month (ROA, 2016).*

4.5 Performance Analysis

Wins per price category:

Figure 19 can be observed to show the number of wins per horse by purchase price category which was taken from the entire sample size, breeze-up's (n=1,473) and yearlings (n=8,634). Results from the breeze-up category highlight that the higher the premium paid the increased chance of racecourse wins. The results from the yearling category appear to be fairly static with only a slight increased number of wins per horse when a higher purchase price is paid.

Figure 19: Average wins per horse

Timeform rating:

Table 13 depicts the average Timeform rating achieved by each price category. This result was achieved by calculating the average rating per category from every horse that had raced in the UK and Ireland that received a Timeform rating; breeze-up's (n=996) and yearlings (n=5,750). The result suggests that the higher the purchase price paid, the higher the Timeform rating achieved which advocates that more expensive horses performed to a better level. The results were found to be similar between the two categories, but slightly higher for those purchased at yearling sales.

Table 13: Timeform Rating

TFR average		
Price range	Breeze ups	Yearlings
<30k	72.1	74.4
30-80k	81.3	82.1
>80k	86.8	88.2
Overall	77.9	79.7

Opportunity of recording black-type status:

The percentage opportunity of recording black-type or stakes status can be observed in Table 14 (below). The result was calculated from comparing the number of horses that had recorded any wins of places in black-type races; breeze-ups (n= 104) and yearlings (n=765) in relation to the entire sample size. Results here are consistent with the Timeform rating result in suggesting that the higher the purchase price, the better the chance of buying a better performing horse. The yearling cohort presented a slight advantage in providing black-type successes by a minimal margin.

Table 14: Opportunity of recording Black-type success

Breeze-Up				Yearling			
Price range	Number	Black type no.	% Black type	Price range	Number	Black type no.	% Black type
<30k	879	33	4%	<30k	4682	250	5%
30-80k	418	42	10%	30-80k	2437	270	11%
>80k	176	29	16%	>80k	1515	245	16%
Overall	1473	104	7%	Overall	8634	765	9%

5.0 Discussion

This section will reiterate how the results of this project have come to conclusions by aligning findings with previously published literature and establishing any trends which became apparent.

5.1 Ability to race

First start Date:

Results suggested that breeze up and yearling sales graduates were the same age at first start. Evans (2007) and Nunmaker (2002) cited the musculoskeletal condition- Dorsal Metacarpal Disorder to be one of the main concerns in the early stages of training that can inhibit a horse from making an early racecourse debut. The majority of breeze-up sales are held between April and May, therefore it would be highly unlikely that a horse that was suffering from a musculoskeletal injury would have the ability to make a debut within a month of purchase. This is contrary to the anecdotal opinions that Skelly (2017) outlined in articles which suggested that breeze-up horses would be hindered on the racecourse from the breeze-up preparation.

Urken (2017) highlighted the cost-saving advantages of buying from breeze-up sale due to racecourse preparation being minimised. The flat season commences around the end of March with the 'Brocklesby Stakes' held at Doncaster racecourse (Ingles, 2019). This race attracts the precocious thoroughbreds who are capable of making their debut shortly after turning two years old. Given that the breeze-up sales season spans between April and May, this means that the yearling cohort have an advantage in the ability to make a racecourse debut on an earlier date whilst the breeze-up cohort are unable to start until at least April due to sales dates. However, findings here show that the breeze-up cohort start at the same time as yearlings - if not slightly earlier. The findings from data here should be of relevance to prospective purchasers of two-year-old thoroughbreds when assessing both markets.

Chance of having a two-year-old runner:

The market which provides the best chance of having a two-year-old runner provided interesting results (Table 10). The difference between the two groups was found to be 7% with results from individual years observed to be fairly static. Notably, horses sold from the breeze-up sale appear to be continually showing a trend annually of having a slight advantage in higher numbers making the track as two-year-old runners. Grubb (1997) and the TBA (2015) pointed out that there has been increasing demand at sales for precocious two-year-old type horses due to increased prize money for two-year-old contests. This has increased the drive for owners seeking horses that have the ability to make an early racecourse debut (Urken, 2017). The result here suggests that the breeze-up market is a valid environment for owners seeking a two-year-old runner and also provides additional strength to the theory that breeze-up graduates have not been disadvantaged by the breeze-up preparation. This result could be beneficial to purchasers such as bloodstock agents and trainers buying on behalf of clients with the motive to have a two-year-old runner as the result provides empirical evidence for purchasing decisions and therefore could factor into maximising client satisfaction.

Number of runs and wins at two years:

Little difference was found between the two cohorts in the number of runs at two years which was found to be an average of four races for each group. Studies such as Gramm and Marksteiner (2010) and Velie et al. (2013) support the hypothesis that starting horses on the racetrack at an early age can increase career longevity, whilst also increasing the horse's ability to reach peak performance between four and five years old as long as a suitable management regimen is implemented. Similar results were also displayed between the two cohorts' ability to win at two years which was found on average to be 11%. Whilst standard deviation figures represented a slightly higher percentage of around 20% for both groups. Although, it cannot be expected that every flat horse sold will be suitable for racing at two years of age, if horses from a breeze-up cohort had been hindered from the sale preparation it would be unlikely that they would be able to perform to a high enough level to record successes during their two-year-old season (Gramm and Marksteiner, 2010). Overall, results suggest both markets provide horses with the potential to have a similar number of two-year-old racecourse appearances and successes.

Attrition Rate:

The mutual aim among purchasers is to buy a horse that will race therefore, having a view of how many do not reach the racecourse is vital information for prospective owners. The result found that overall 8.3% of breeze-up horses failed to make the racecourse compared to 13.2% from the yearling cohort. This is particularly insightful in dispelling the myth that breeze-up horses "*don't train on*" after being sold which was highlighted in Willoughby's (2016) article promoting the benefits of buying a breeze-up horse. Ironically, results here highlighted that there was found to be a higher number of yearlings that do not reach the racecourse. As breeze-up horses are sold with the intention of being ready to run, there is less risk in getting a breeze-up horse to the track compared to a yearling who still must go through the demands of being introduced to ridden exercise (Hernandez and Hawkins, 2001). For this reason, the breeze-up market can be seen to display a lower attrition rate which resembles less risk to the purchaser.

Although finding information on why horses fail to make the racecourse would be difficult as this information is not publically disclosed, this result does again suggest that breeze-up horses have not been affected by a breeze-up preparation. Another aspect of this result which was encouraging was the year on year declining rate of attrition for horses sold at breeze-up sales which has decreased by nearly 50% over just a three-year period. This trend is significant in providing empirical evidence to strengthen comments made by Eves (2019), Harvey (2019), McGrath (2019) and Willoughby (2016) stating that the breeze-up market has increased in professionalism. Results here are a reflection of the ability of breeze-up consignors to prepare sound horses that will be competitive on the racecourse.

5.2 Career Longevity

Number of starts:

The number of times a racehorse appears on the racetrack can be valuable for welfare and economic purposes. Results suggested a similar number of starts from horses within the two categories (Figure 14). A limitation here was that data were only available until May 2019 so this may not be conclusive of lifetime starts due to the fact that some horses in the study may continue to race following this project. Butler et al. (2019) and Horseman et al. (2016)

highlighted concerns for the welfare of thoroughbreds as they are prepared for racing at such a young age. From a welfare perspective, the result supports the work of Gramm and Marksteiner (2010) and Velie et al. (2013) to suggest that horses in the sample displayed career longevity seen by the number of runs. This result could prove to be practical knowledge to not only purchasers but also more widely to help improve the public perception of racing as the benefits of an early start could be communicated to those against the idea of juvenile racing (Butler et al., 2019; Horseman et al., 2016).

Butler (ongoing), Gamrat and Sauer (2000), Lynn (2019) and Wylie and Newton (2018) expressed the notion that not all owners are involved in horseracing for monetary return and that an increased number of starts presents the opportunity for owners to attend the racecourse more frequently and be involved in the prestige of ownership. However, the number of times a horse runs is a measure that can be argued due to different motives. For example, the owner of a gelding (castrated male horse) may be happy for the horse to race more frequently than the owner of a filly, in an effort to safeguard her racing form for commercial pedigree purposes (Wylie and Newton, 2018). On the other hand, an important driver for a syndicate may be the number of days out at the races that they can experience on behalf of their investment. Although different motives is an area that requires further study, the number of starts here provides evidence to suggest that both cohorts provided owners with a substantial number of racecourse starts whilst also providing additional evidence that horses from breeze-up sales had not been negatively affected by the early preparation.

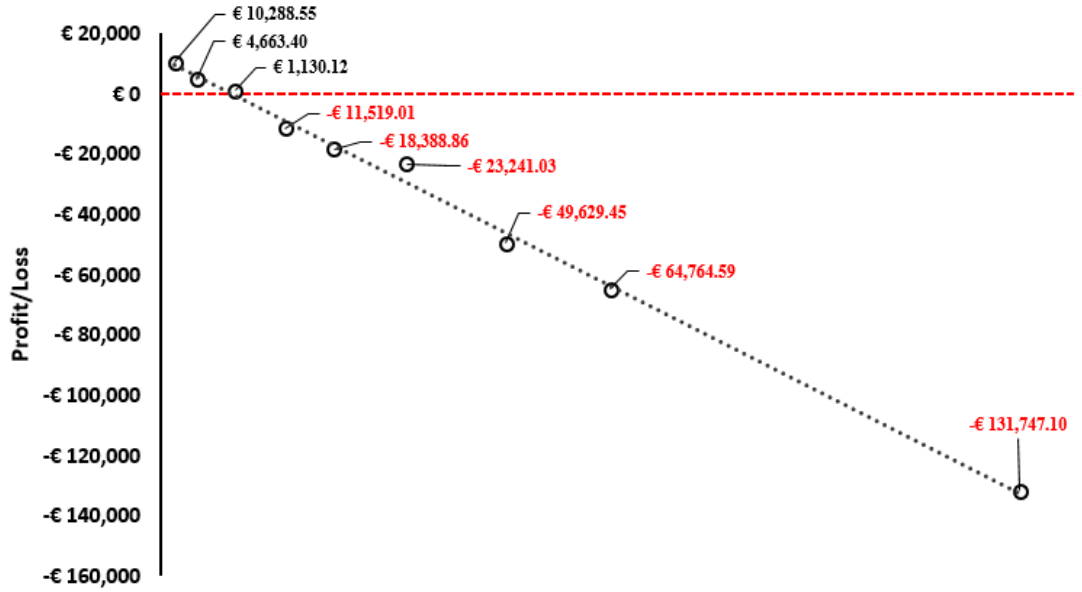
5.3 Cost Analysis

Return on Investment:

The result for the return on investment advocated that the breeze-up market provides a 9% reduction in loss to the purchaser when compared with the yearling market. Both markets resulted in a loss to the purchaser but racehorse ownership is widely acknowledged not to be a "*traditional method of investment*" (Urken, 2017). In an article by Urken (2019), well-renowned bloodstock agent Charlie Gordon-Watson remarked on the risk involved in thoroughbred investment "*Unless the client can afford to burn the check and accept any return as a bonus- find another hobby*." This comment supports the 2016 ROA study where

only 8% of owners felt that "*winning was everything*" and it becomes clear that the majority of owners are in racing for the prestige and sense of enjoyment rather than the monetary return.

Additionally, it became evident in this result that purchasing from the lower end of the market (<£30K) appeared the best opportunity for making a return on investment from prize money, particularly in the yearling market with results highlighting a 67% chance of return. However, it is important to consider that the ability to recoup the purchase price is far easier when a lower purchase price is paid. This result is supported by the work of Butler (ongoing), Gamrat and Sauer (2000), Heckerman (1996) and Jackson et al. (2011) where findings highlighted that a lower purchase price was associated with a better chance of return on initial spend. Although currently ongoing, Butler's study assessing the Irish and UK foal market (Figure 20) has initially reported a relationship with lower bids at auction (<€20,000) achieving more positive returns in the form of racecourse earnings. The result is consistent with results from this project and again shows how what is happening at one level in the market (foal sales) can often be reflected in the subsequent stages (yearling and breeze-up sales).



(Butler, ongoing)

Fig 20: Net returns for alternative bidding ranges at Irish thoroughbred foal sales

It must be noted that results from the correlation tests also confirmed a minor association between sales price and earnings from the higher end of the yearling market. Bloodstock

agent-Charlie Gordon Watson highlighted the risk involved in racehorse ownership, consequently, he also suggested that "*unlike all other leisure pursuits, horseracing does have the unique ability to be staggeringly rewarding financially if you are lucky enough to hit it right*" (Urken, 2017). Although many owners becoming involved in horseracing are aware of the financial risk they can be driven by the rare chance to "*hit it right*" and therefore feel the risk is worth the excitement. This supports the results from the ROA (2016) racehorse owners' survey when owners were asked to describe racehorse ownership in one word. Figure 21 displays the results from a word cloud. The greater the number of times a word is repeated, the bigger the word appears in the image. The image suggests that in a large number of incidences, racehorse owners become more risk-tolerant because of the excitement involved and excitement can sometimes outweigh the expense.

Source: ROA (2016)

Fig 21: Word cloud result from the ROA study- Racehorse ownership described in one word

Training Cost Analysis:

Jackson et al. (2011) propose that the majority of studies in horseracing assessing returns fail to include costs when calculating a return on investment. Fundamentally, industries include customer costs when calculating returns on investment and in this case, training costs were used to provide an insight to the purchaser. Training fees can widely differ and therefore the cost analysis provided in this project should be considered an assumption rather than a

comprehensive conclusion. However, the accuracy of the result is helped by the average training costs implemented were 2015 figures which were relevant to the sample years used in this project. Furthermore, training figures used have included several additional costs to the owner that would be observed in an annual invoice including gallop fees and veterinary bills to give a representation that is as accurate as possible.

The application of training fees provided interesting results. Representing a 9% return, the <£30k price bracket for the breeze-up category was signposted as the only bracket where the purchaser will on average make a full return on investment while all other areas represented losses. When overall figures are observed, the breeze-up market exhibited 18% greater efficiency than the yearling market. Although losses are cited to be widely acknowledged when becoming involved in racehorse ownership (ROA, 2016), an 18% reduction in loss would be considered significant in any industry and is helpful in providing concrete evidence to suggest that there is better value in purchasing from the breeze-up market.

5.4 Performance Analysis

Number of wins per price bracket:

Earlier results of the number of wins displayed similar results (Figure 16). This result was further analysed by price purchase brackets and it became evident that the opportunity to record a greater number of wins increased when sales price increased particularly in the breeze-up category (Figure 19). When purchasing from the upper tier of the market (>£80K), breeze-up purchases appear to have a higher success rate than compared to yearling purchases at 2.6 vs 1.8 average wins per horse. Robert and Stowe (2016) explain how the number of wins a horse records can be viewed as a measure of soundness and consistency. The increased number of wins recorded also can earn dividends when considering the value of the horse especially in terms of breeding and commercial purposes which is particularly relevant to owners who are dependent on increasing residual value (Jackson et al., 2011).

For owners who are involved in racehorse ownership for enjoyment purposes, the ROA (2016) study outlined that for 35% of owners *"winning is an extra bonus".* The industry widely acknowledges depleting levels of racehorse ownership in the UK (ROA, 2016; TBA, 2018). Increased racecourse successes per horse can work towards maximising owner enjoyment

and therefore could help to increase the traction in becoming involved in racehorse ownership. The result here suggests that the higher end of the breeze-up market provides a favourable market for owners wishing to increase levels of enjoyment and improve the residual value of their purchases.

Timeform Rating:

Wylie and Newton (2017) highlight how the majority of studies assessing racehorse performance fail to utilise performance indices in analysis and rely on earnings as the fundamental measure of ability. Earnings can present skewed results due to outliers in the data, whilst performance indices can provide a more objective measure (Wylie and Newton, 2017). Timeform ratings used in the UK and Ireland not only indicate ability but also can be beneficial in benchmarking horses against one another which can be advantageous when assessing competition (Timeform, 2019).

Results, in this case, suggested little difference in Timeform rating between the two categories. The yearling category recorded a slightly higher mark overall but this was by a minimal margin. What was evident was that the higher the purchase price, the higher the overall rating achieved in both categories. Purchases from the <£30k category displayed an average Timeform rating of between 72 (breeze-up) to 74 (yearling). Personal communication with Dominic Gardiner-Hill (BHA Head of Handicapping) explained that this mark would be associated with an average handicapper, as the median rating on the BHA handicapping system fluctuates around the low 70's. On the contrary, for the higher price bracket of >£80k, average time form ratings recorded were 87 (breeze-up) and 88 (yearling). Gardiner-Hill (2019) suggested how this mark would be associated with a decent handicapper and around 10-12lbs off what is considered top class (Appendix C). Further explanation of the scale can be observed in Figure 22. As a horse's Timeform rating or handicap mark improves, this brings the prospect to contest for greater prize money and compete at a more prestigious level. This has a perpetuating effect in the ability to increase the residual value of the horse for commercial and reproductive purposes that promotes the opportunity to return dividends to the owner in the long-term.

Flat category	Rating
Top class	130+
High class	125-129
Very smart	120-124
Smart	110-119
Useful	95-109
Fairly useful	80-94
Fair	65-79
Modest	50-64
Poor	Up to 49

Source: Timeform (2019)

Fig 22: Current Explanation of Timeform Rankings

Black-Type Earnings:

Similarly to Timeform rating, the chance of recording wins and places at black-type level increased as purchase price increased (Table 14), with again very little difference between the two categories. This proposes than on average breeze-up horses are capable of producing ability to the same level as yearling purchases. This result is consistent with the work of Gamrat and Sauer (2000) and Heckerman (1996) (Table 2), who reported an increased chance of black-type form when a higher purchase price was paid. Robert and Stowe (2016) explained the importance of black-type in a pedigree as it has the opportunity to increase the residual value of the horse for reproductive purposes. In fact, Irwin (CEO, Team Valor- a USA based racing syndicate) advised purchasers to pay higher premiums in the sales ring, stating that if a horse with a decent pedigrees goes on to be successful on the racetrack there is a greater chance in achieving the "*residual jackpot"* from commercial breeding (Urken, 2017). Irwin also points out that a well-bred filly which proves race ability has the potential to return between 40-100% on residual value and therefore suggests that owners looking to mitigate risk should look towards female purchases (Urken, 2017). Although earlier analysis suggests that the cheaper purchases exhibit a higher chance of regaining initial spend, for the owner that is seeking long term value, the higher end of the market can also represent value. Whilst the yearling market has always been the market of choice for high-end performers, Figure 23 reflects the professionalism of the breeze-up market and suggests that it is a market that can no longer be ignored (Rowlands, 2019).

BREEZE-UP GRADUATES IN GROUP 1S

Run year	Winners	Wins	Placed	Places
2009	1	1	4	5
2010	1	1	4	7
2011	2	6	4	4
2012	2	2	6	8
2013	0	0	4	4
2014	2	2	5	7
2015	3	5	5	10
2016	4	6	9	11
2017	2	2	7	10
2018	5	7	12	23
Total	**22**	**32**	**60**	**89**

Source: Rowlands, 2019

Fig 23: Success of Breeze-Up graduates in Group 1 races

5.5 Limitations:

Based on the results of this study a number of limitations were evident. Firstly the time restraint proved problematic. Having the individual date of the race and subsequent performance record for each horse would have provided the author with the ability to study the frequency of runs. This would give a greater understanding of how long it took each horse to retrain to physical normality after a race and return to the racetrack, therefore giving a better indication of soundness and longevity presented by the two cohorts. Although the years investigated provided a timeframe which established longevity, the data analysed was up until May 2019. This means that further runs after this date were not captured in the data and therefore the result cannot be termed as lifetime starts.

As a large data set was aggregated, this made detecting small changes in the data a difficult task. One of the limitations in using averages for different sized cohorts is that there is no accountability for outliers in the data and horseracing data has traditionally been known to contain a large number of outliers which leads to results which are not a true representation of normal.

5.6 Recommendations

Client Recommendations:

- Results found in this project can be used by the Breeze up Consignors Association to provide empirical evidence to support the fact that breeze-up sales present a valid market for those looking to purchase a flat racehorse and particularly those seeking a precocious two-year-old runner.

- The client can use the results to represent that horses sold from breeze-up sales have not been negatively impacted from going through a breeze-up sale and performed to a similar level to horses that were sold from yearling sales. A result that should help to promote the attractiveness of buying from breeze-up sales and can be used to discourage negative biases which have been associated with breeze-up purchases.

- The Breeze-Up Consignors Association can highlight the cost-saving advantages which were established in this project. This should be of relevance to owners, bloodstock agents and trainers signifying that the breeze-up market operates in an economically efficient manner with the purchaser incurring less initial spend from point of purchase to racecourse debut.

- Results from this study can be used by the client to provide evidence that breeze-up horses are performing to a high-level comparable with horses sold as yearlings. Results here are also reflecting the increased professionalism of the breeze-up environment and this is an area that should be monitored in future years as trends should continue to grow.

Industry Recommendations:

- As recent industry articles have heightened the need for increased transparency at bloodstock sales, stakeholders could try and work together to better regulate the industry. This could bring benefits such as safeguarding breeders and consignors,

improving the attraction of racehorse ownership and encouraging foreign direct investment.

- As the majority of studies found for this project were North American, greater investigation into both the foal, yearling and breeze-up markets in the UK and Ireland would benefit the bloodstock and flat racing industry.

- Welfare concerns highlighted towards the preparation and racing of young racehorses are of concern to the industry. Results from this project as well as results from the literature review could be used in the welfare debate to evidence the benefits of early exercise to the young thoroughbred.

- Sales companies made a conscious effort in 2019 to restrict catalogue sizes which reflected positively in clearance rates. This trend should be followed in future years to reduce the risk of market saturation reoccurring and promote the production of better quality thoroughbreds.

- Increased funding from the horseracing levy could also work towards allowing breeders and consignors to breed and purchase higher quality individuals and help lessen the polarisation which has affected the thoroughbred marketplace.

5.7 Future Research

In the first instance and considering the limitations which have been mentioned, this study could be expanded to include individual runs by each horse included in the data. Although this would be time-consuming, it would provide a more comprehensive view of longevity and the ability to return to the racetrack between runs. As the breeze-up market is evidently becoming a more professional environment to source racehorses, it would be interesting to carry out further research in future years as data becomes available. This could assist in finding out whether the increased professionalism is reflected in the results on the racecourse.

Although the study investigating the foal market is currently ongoing, further investigation into the motives of racehorse owners could provide a heightened understanding of buyer behaviour and price prediction at bloodstock sales. Studies in these areas could help to increase transparency which is cited to be required as the industry moves forward.

6.0 Conclusion

This project aimed to explore the biases associated with breeze-up horses which have suggested that the sales preparation would be detrimental to their long term career and ability to perform on the racecourse. Although the lack of empirical literature surrounding this area of research became evident rather quickly, it was also observed that perceptions were based purely on anecdotal opinion which presented a knowledge gap for research of this nature. Further investigation into the literature suggested that the majority of studies focussed on the North American market, with little inquiry into Britain and Ireland despite these countries being hailed as leading producers of quality thoroughbreds.

The welfare of thoroughbreds is an area that must be kept at the forefront of decision making by horseracing's regulatory body as animal activists are gaining traction from an increasing number of supporters. Two-year-old racing can be considered a contentious issue for the public, it was relevant to explore the longevity of racehorses that had commenced their career at two years to investigate if this had any long term negative effects. Although it cannot be said that every racehorse will make a track debut at an early stage due to slow maturing types requiring additional time for development. Scientific evidence supports the theory that flat racehorses that have begun their careers at two years can be seen to compete for just as long, if not longer than those who commence later in life. Ironically, any literature which argued this failed to be represented by empirical findings.

There have been several perceptions that suggest that the breeze-up preparation will be detrimental to the long term performance of the racehorse. Results from this research can provide evidence to suggest that this is not the case and the increasing professionalism of breeze-up consignors is a reflection of their ability to produce horses who are exhibiting career longevity as well as results to advocate that they are capable of performing to a high level. One of the most significant findings to support this theory was the decreasing attrition rate exhibited by breeze-up graduates and it would be interesting to explore this trend in future years as data becomes available.

Traditionally, studies have used earnings as a fundamental measure of return to the owner. Albeit, this does merit some level of understanding, it makes it difficult to establish the true

cost as training expenses failed to be applied. When training costs were administered to analysis in this research, the only profitable area to purchase was signposted to be the lower end of the breeze-up market. Although this does indicate the lower end of the market is the best opportunity to regain investment through prize money, the motives of owners must be considered in what is classified as owner return. For many owners such as those involved in a syndicate, the main driver may be the ability to attend the races numerous times a year and enjoy the prestige of ownership with any earnings considered a bonus. However, for those dependant on the industry to earn a living, motives such as black-type earnings and performance ratings can be crucial to increase the residual value and subsequent reproductive value of purchases. The results of this project highlighted increased performance ratings and black-type status when higher premiums were paid, this suggests that perhaps the better long-term value can be achieved by purchasing from the higher end of the market.

Furthermore, the breeze-up market was found to operate more efficiently due to the overall cost-saving advantages. Despite the poor reputation associated with breeze-up graduates which has created an apprehensive selling ground for consignors, the results provide concrete empirical findings to suggest that there is value to be gained from buying at breeze-up sales and this environment should be strongly considered when sourcing quality racehorses. Who knows which market the next champion will emerge from but the results suggest that it's a pretty even playing field.

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8.0 Appendices

Appendix A:

ROA OWNERSHIP COSTS SURVEY RESULT

The average cost of owning and running a racehorse in 2015 was:

For a Flat horse £22,595 (£16.491)

For a Jumps horse £16,325 (£11,847)

These costs include all training and racing costs - i.e. training fees, gallops, farrier, transport, vets, entries, jockeys,

Registration fees, pre/out of training costs etc. The average cost for Flat and Jumps horses combined is £20,444

Survey and analysis conducted by Ian Murray. March 2017

https://www.roa.co.uk/resource/journey/cost/how-much-does-it-cost-to-be-an-owner.html

Appendix B:

Sales Incentives

The following purchase incentive schemes are available in the UK at flat yearling and breeze-up sales;

The Plus 10 Bonus (breeze-up and yearling):

The Plus 10 incentive is an industry-funded bonus scheme for British and Irish Flat thoroughbred owners and breeders. This benefits registered horses a £10,000 (€12,500) bonus in addition to prize money. The bonus is shared between the registered owner/s and the payer of the two registration stages which typically includes the breeder, consignor and in some cases the trainer. Qualified two and three-year-old horses are eligible for the scheme with over £7.5 million in bonus prize money paid out annually. Further details can be obtained from: https://www.plus10bonus.com/.

The Ascot £100k Bonus (breeze-up):

This is a new incentive scheme which commenced in 2019 with the aim of encouraging both vendors and purchasers to support the Ascot breeze-up sale, which is the opening breeze-up sale of the season. The scheme rewards an owner that is successful at Royal Ascot in the same season by applying an additional £100,000 to the prize money received. Further information can be found at: http://www.tattersallsascot.com/sales/ascot-breeze-up-sale/overview.

The Craven £15k Bonus (breeze-up):

Another 2019 incentive scheme offered by Tattersalls to benefit purchasers at the Craven breeze-up sale in Newmarket. The scheme works by awarding participating owners a £15,000 reward if their purchase wins a Class 2, 3 or 4 two-year-old maiden or novice race in Britain or a two-year-old maiden in Ireland. Tattersalls remarked on the incentive as a "*commitment at Tattersalls to encourage racehorse ownership by boosting prize-money*". Further information can be found at: https://www.racingpost.com/bloodstock/tattersalls-launches-bonus-scheme-for-craven-breeze-up-sale/360853.

Tattersalls Book 1 Bonus (yearling):

The scheme was brought in to replace the Tattersalls Millions Race Series. It offers a £25,000 bonus to any horse bought from Tattersalls October Yearling Book 1 sale which wins a Class 2, 3 or 4 Maiden race. Further information can be found at: http://www.tattersalls.com/bonus-books/about/OC1.

Tattersalls October Auction Stakes (yearling):

A £150,000, 6-furlong race held at Newmarket's Rowley mile course on the 7th October. The race is open to two-year-olds which were bought in Books 3 and 4 of the Tattersalls October Yearling Sale and the weights carried by each horse is determined by the price they sold for at the sale. (Information obtained via personal communication with Charlotte Lovatt at the Thoroughbred Breeders Association on the 30th August, 2019).

Appendix C:

Timeform Ratings Explained:

Timeform ratings can be defined as "*the merit of the horse expressed in pounds and is arrived at by careful examination of its running against other horses using a scale of weight for distance beaten which ranges from around 3 lb a length at five furlongs and 2 lb a length at a mile and a quarter to 1 lb a length at two miles*" (Timeform, 2019).

Timeform calculations are reached by examining variables such as track difference, distance, age of horse, weight carried, weight in terms of age, track surface and prevailing wind strength. The figures computed are then conveniently converted to a rating in pounds. This can then be utilised by form readers, pundits, trainers etc. for assessing performance of an individual horse. Further information can be found at: https://www.timeform.com/horse-racing/features/timefigures/timeform_computer_timefigures_explained.

Appendix D:

PERSONAL REFLECTION

The Thoroughbred Horseracing Industries' MBA has been an amazing journey for me; and working on this project has been the culmination of that journey – growing both professionally and personally along the way. As with all journeys, there are challenges, opportunities and rewards; and in this reflection, I will endeavour to present a summary of those which I encountered along that path.

My first challenge was choosing the work-based topic. Given that I had started working in the educational sector of the industry, something in this aspect seemed like the obvious choice. However, my real passion is the training and management of racehorses. Verba (2012) identifies the importance in picking a topic that you are really passionate about due to the amount of time and effort that will go into the project and in hindsight, I am glad that I picked this topic as I enjoyed the research.

In 2016, I purchased my own breeze-up filly to prepare and later sell at a 2017 breeze-up sale. Having a background working with two-year olds both in the UK and in Australia, it became

evident to me that the breeze-up market is one which faces much criticism-even from within the industry. A search for academically robust literature in this subject area, presented me with a knowledge gap. A knowledge gap can be defined as an area which has insufficient investigation that limits the ability to make a conclusion (Robinson, Saldanha and Mckoy, 2011). Having decided that this was an area that I wanted to peruse for research I set about asking for opinions on how I could carry out this type of research.

This was not always plain sailing- in fact, on my second year in the MBA I asked a poignant industry figure for his opinion on my project idea and he dismissed me very quickly saying that it was a far too controversial area and that he was adamant that I would not find good results. Although I was disappointed by this comment I got in touch with a number of leading breeze-up consignors who were very interested by the idea and suggested that I should get in touch with Brendan Holland of BUCA.

Overall, I had about four meetings with Brendan in Ireland. Brendan is a highly successful consignor so I was delighted to have his buy-in to the project particularly since he did not know me personally at the beginning. As Brendan said he would like to receive the whole document at the end of the project, one challenge that was always in my mind was trying to meet both client and academic expectations. Ruth (2018) explains how building a solid relationship with regular communication with your client can benefit the final outcome. I had about four face-to-face meetings with Brendan during the duration of the project as well as regular communication via phone calls and I feel that I have built a good working relationship with the client, one which will hopefully continue in the future. I hope that the empirical evidence which was found here, to be of use to BUCA and more widely applicable to the horseracing industry.

Commencing the project, feedback from Jo Osborne, Managing director of Godolphin suggested that my project topic would be best suited to research of a quantitative nature. I agreed with this and felt it beneficial due to the lack of this type of research in the horseracing industry. I was apprehensive at the thought of a data driven project but relished the challenge. It was something that allowed me to apply my learnings from previous course topics and reaffirmed strengths that I didn't realised I possessed. Having collected the data it became clear that there are certainly obvious time-saving advantages to the researcher when compared to a qualitative approach (Vanderstoep and Johnson, 2008). The data analysis

section of the project was a steep learning curve but one I addressed in a pragmatic way enhancing skillsets that I didn't previously possess such as my knowledge of formulas in Excel. One lesson I learnt here was to always seek advice and second opinions in such data type projects as they reaffirm your own beliefs and assertions.

Initial feedback from my primary supervisor Neil Coster suggested that my literature review had lost sight of the project title and after re-reading I could understand what he meant. A common mistake made by students is to become lost in the research and to wander off point (Ridley, 2012). Finalising my literature review, I found the best approach was to balance industry articles with academically robust literature. Although people may criticise the use of industry literature in this project, some of the reporters used here, such as Blake, McGrath and Willoughby, are highly acknowledged industry professionals and one could argue that they understand the industry better than many of the academic researchers assessing the bloodstock market. Completing this topic for the project allowed me scope to utilise business theory and literature which I had learnt during the duration of the MBA. The main theories implemented were from the welfare and economic modules and it was useful to be able to abstract how these theories had been used in other industries and apply them to the yearling and breeze-up market.

As I hand in my final submission, I can reflect with great positivity on how the MBA has influenced me. I am confident the skills and knowledge base developed throughout the course of this MBA will no doubt continue to build my self-confidence. During my time at Liverpool I have developed lifelong friends and invaluable industry associates. I would like to thank Neil Coster and all my tutors on the programme for the opportunity….I am now looking forward to using my MBA to help me with my next journey.