Report to Congress
on the

Depreciation of Horses

Department of the Treasury
March 1990

DEPARTMENT OF THE TREASURY
WASHINGTON

ASSISTANT SECRETARY

March 1990

The Honorable Lloyd Bentsen
Chairman
Committee on Finance
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

Section 201(a) of Public Law 99-514, the Tax Reform
Act of 1986, required the Treasury to establish an office to
study the depreciation of all depreciable assets, and when
appropriate, to assign or modify the existing class lives of
assets. Treasury's authority to promulgate changes in class
lives was repealed by Section 6253 of Public Law 100-647, the
Technical and Miscellaneous Revenue Act of 1988. Treasury was
instead requested to submit reports on the findings of its
studies to the Congress. This report discusses the depreciation
of horses. The legislative history of the Tax Reform Act of 1986
indicates that such study was to be among the first conducted by
Treasury.

I am sending a similar letter to Senator Bob Packwood.

Sincerely,

Kenneth W. Gideon
Assistant Secretary
(Tax Policy)

Enclosure

ASSISTANT SECRETARY

March 1990

The Honorable Dan Rostenkowski
Chairman
Committee on Ways and Means
House of Representatives
Washington, DC   20515

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Chapter I. Introduction and Principal Findings

A. Mandate for This Study

This study of the depreciation of horses has been prepared by the Depreciation Analysis Division of the Office of Tax Analysis as part of its Congressional mandate to study the depreciation of all assets. This mandate was incorporated in Section 168(i)(1)(B) of the Internal Revenue Code (IRC), as modified by the Tax Reform Act of 1986 (see Exhibit 1 of the Appendix). This provision directed the Secretary of the Treasury to establish an office that "shall monitor and analyze actual experience with respect to all depreciable assets", and granted the Secretary authority to change the classification and class lives of assets. The Depreciation Analysis Division was established to carry out this Congressional mandate. The Technical and Miscellaneous Revenue Act of 1988 (TAMRA) repealed Treasury's authority to alter asset classes or class lives, but the revised IRC Section 168(i) continued Treasury's responsibility to "monitor and analyze actual experience with respect to all depreciable assets" (see Exhibit 2 of the Appendix).

The *General Explanation of the Tax Reform Act of 1986* (the "Blue Book") indicates that, in choosing assets for study, the Treasury Department should give priority to those assets that do not have a class life. An Asset Depreciation Range (ADR) asset guideline class had existed for work and breeding horses (Asset Class 01.22, Horses, Breeding or Work), with an ADR guideline period of 10 years. Although Congress assigned in the Tax Reform Act a three-year Modified Accelerated Cost Recovery System (MACRS) recovery period to racehorses more than two years old when placed in service and to horses (other than racehorses) more than 12 years old when placed in service (IRC Section 168(e)(3)(A)), no class life exists for racehorses age two or younger, showhorses, and horses used for certain other business purposes.[1]

Moreover, under IRC Section 263A(e)(2) as promulgated in the 1986 Act, taxpayers electing to expense the pre-productive costs of raising certain animals (including horses) were required to use the Alternative Depreciation System, which calls for the use of straight-line depreciation over the asset's class life. Assets (such as racehorses) that do not have a class life are assigned a 12-year life for this purpose (IRC Section 168(g)(2)(C)). Believing that a 12 year recovery period is too long, the American Horse Council asked Treasury to study the depreciation of racehorses. In addition, the legislative history of the 1986 Act indicated a Congressional desire that Treasury give priority to a study of racehorses and older horses.[2]

In view of the priority required to be given to the study of assets not having class lives, the Depreciation Analysis Division responded to this request by announcing in the Federal Register its intent to study the depreciation of horses. It also held a public meeting at the Treasury Department on October 19, 1987 with interested parties (including representatives of the American Horse

Council) to determine the best way to collect the required information. While this study was being prepared, Congress repealed (in TAMRA) the uniform capitalization rules for certain producers of animals (including horses). Although this action appears to have addressed the primary concerns of the horse industry, the Depreciation Analysis Division has continued to carry out its Congressionally mandated responsibility to study the depreciation of horses.

The *General Explanation of the 1986 Act* indicates that the determination of the class lives of depreciable assets should be based on the anticipated decline in their value over time (after adjustment for inflation), and on their anticipated useful lives (see Exhibit 3 of the Appendix). Under current law, the *useful life* of an asset is taken to be its entire economic lifespan over all users combined, and not just the period it is retained by a single owner. For a group of assets, the Depreciation Analysis Division calculates the useful life as a weighted average of lives, with each weight set equal to the probability that members of the asset group will be retired upon attaining the corresponding life.

The *General Explanation* also indicates that, if the class life of an asset is derived from the decrease in market value as a function of its age, such life (which, to avoid confusion, is hereafter referred to as its *equivalent economic life*) should be set so that the present value of straight-line depreciation over the equivalent economic life equals the present value of the decline in value of the asset (both discounted at an appropriate real rate of interest). This formula must be modified in order to define a single depreciable life for a group of assets. Given that an asset group invariably possesses a distribution of retirements over several ages, a portion of the group will inevitably be retired before the group is fully depreciated for tax purposes. Under current tax law, such retirements result in loss deductions equal to the retired assets' remaining basis, less any salvage value. From the perspective of an investor recovering his or her capital costs, such loss deductions are equivalent to depreciation deductions. Therefore, the definition of an equivalent economic life should be modified to account for these deductions: the present value of all "cost recovery" deductions, determined by applying a straight-line formula to the equivalent economic life and by taking into account the probability of retirement of the asset at each age, must equal the present value of the average decline in economic value of the asset group.[3]

B. Principal Findings

The principal findings of this study are that the average useful life of all horses is 8.8 years, and their average equivalent economic life is 10.6 years. Both estimates assume that horses are first placed in service and begin depreciating at age two. These findings are primarily based on an analysis of thoroughbred horses acquired as yearlings. However, the available information regarding the level of investment in older horses, and an analysis of their equivalent economic lives, suggest

that the current class life of 10 years for workhorses and breeding stock might reasonably apply to all horses, regardless of their age when placed in service or the use to which they are put. Accordingly, the current law three-year recovery period for racehorses and older horses should be repealed.

Two general issues related to the analysis and estimation of economic depreciation arose during this study, and their resolution affected the principal findings reported above. First, for many depreciable assets that decline rapidly in value, the application of the equivalent economic life formula is relatively straightforward, and the resulting equivalent economic lives of such assets are often significantly shorter than their useful lives. For a number of assets, however, the application of the equivalent economic life formula is not as straightforward, and the resulting equivalent economic lives of these assets may be comparable to or even greatly exceed their useful lives. This is particularly true in the case of horses. Some horses are very successful, and may greatly appreciate in value for a good portion of their useful lives, while others may be quite unsuccessful and are retired very quickly. The early appreciation for the very successful horses is significant enough to cause their average present value of economic depreciation to be quite small, or even negative. Where this occurs, the economic equivalent life may not be computable.

The 10.6-year equivalent economic life quoted above was obtained by simply ignoring the appreciation of certain "highly successful" horses. An alternative estimate of 12.7 years is obtained when this appreciation is taken into account as "negative economic depreciation." The treatment of this situation is described in greater detail in Chapter III.

An additional complication arises from the fact that most horses used for breeding have initially been used for racing. Under current law, racehorses can generally be depreciated over a three year recovery period. Because salvage value is no longer a relevant concept for tax depreciation purposes, these horses can be fully depreciated within a few years after starting their racing career, even though their market value as a breeding horse can sometimes be many times greater than their initial acquisition cost. If all racehorses were customarily sold when their use changed from racing to breeding, the current law distinction between horses used for racing and those used for work or breeding purposes might still be maintained. The sale would result in the recognition of a market asset value, and any "excessive" or "deficient" depreciation previously claimed with respect to such horses would be recaptured or allowed as a loss at the time of sale.

Although sales of shares or interests in horses occur frequently, the Depreciation Analysis Division was unable to obtain adequate evidence that the complete (or nearly complete) transfer of the ownership interests in a racehorse at the time its use changes from racing to breeding is the

general industry practice.[4] Accordingly, the depreciation of horses over their entire careers was examined for this report; racing horses and breeding horses are thus not regarded as two distinct assets, in contrast to their classification under current law.

Despite repeated attempts to acquire more complete information from the American Horse Council, an umbrella organization representing the horse industry, and other industry representatives, the Depreciation Analysis Division was forced to rely on a limited set of publicly available information: (1) a 1972 article on the useful lives of thoroughbreds by Kent Hollingsworth, past editor of *The Blood Horse* (a journal published by the Thoroughbred Owners and Breeders Association), and (2) thoroughbred auction data for various years compiled and published in *The Blood Horse*. After a draft of this report was submitted for review to The American Horse Council, they provided some additional information, including information on other breeds of horses. In addition, they submitted a letter objecting to various aspects of the methodology used in this study.[5] The Depreciation Analysis Division believes that the additional information submitted does not alter the conclusions of the draft report. Nevertheless, where appropriate, notes have been added summarizing the views and data presented by the American Horse Council, so that Congress may judge for itself the extent to which this additional material might affect the principal findings of this report.

Chapter II. The Useful Life of Thoroughbreds

A. The Hollingsworth Study

In a very informative article entitled "So What is the Economic Useful Life of A Thoroughbred", which was published in *The Blood Horse* (March, 1972), Kent Hollingsworth reported the results of a very extensive study that traced the complete racing and breeding careers of all thoroughbred foals born in the years 1939-41 and registered with the Jockey Club. Because horses can live to 30 years of age, it was necessary for Hollingsworth to focus on such early vintages of foals. His study, which was performed with the assistance of the Jockey Club Statistical Bureau under the sponsorship of the Thoroughbred Owners and Breeders Association, provides statistical information based on the histories of 19,124 horses. In the absence of alternative data, the statistics obtained by Hollingsworth relating to the useful life of thoroughbreds are used in this study. Other data contained in the Hollingsworth study, such as the average lifetime earnings per horse, are likely to be no longer relevant, and are not used. Because of the growth in the number of horses (from approximately 6,500 thoroughbreds foaled and registered each year in the 1939-41 period to approximately 49,500 thoroughbreds foaled in 1988), and the potential impact of the Second World War on the Hollingsworth results, the useful life data may be somewhat out of date. Nevertheless, the Hollingsworth study was intended to provide helpful information to the Treasury Department in 1972 regarding the useful life of thoroughbreds, and should continue to be helpful today.

In obtaining the distribution of useful lives, Hollingsworth distinguished between racehorses and breeding stock. He also focused only on those racehorses that won race money. Since the useful life of an asset for tax depreciation purposes now refers to its economic lifespan over all users and uses, the separate useful life information for racehorses and breeding stock are combined in this study, as described in the following sections.

B. Determination of the Useful Life of Thoroughbreds

Because thoroughbred horses not trained for racing and those not raced for a full year before being sold or retired are not likely to be depreciated, such horses are excluded from this analysis. Although Hollingsworth did not publish statistics on those horses that were not trained for racing, or on those that did not "start" a race, the American Horse Council provided additional data indicating that between 30 and 40 percent of the 1939-41 crop of thoroughbred foals studied by Hollingsworth did not "start".

Based on the assumption that the fraction of "non-starters" applies equally to fillies, colts, and geldings, Hollingsworth's data imply that about 67 percent of "starting" fillies produce more than one foal, and thus may be assumed to be used for breeding. While some fillies that do not start are in fact used for breeding, it is believed that these constitute only a small percentage of all non-starters. In any event, the neglect of such horses should not significantly affect the results. Likewise, Hollingsworth's data indicate that 29 percent of all starting colts produce more than 5 foals in their lifetime, and thus may be assumed to be used for breeding.[6] The Hollingsworth data thus generally imply that a fair fraction of starting colts, and a large fraction of starting fillies, are subsequently used for breeding.[7]

The useful lives of those racehorses that are not subsequently used for breeding are determined from Hollingsworth's data on the ages at which racehorses earn their last race money. Since some horses may be unsuccessfully raced for a few years after the last race in which they earned race money, this approach tends to understate their useful lives.[8] On the other hand, it is also assumed that horses that start racing but do not earn any race money have the same distribution of useful lives as horses that do earn race money. Since horses that win no race money are more likely to have shorter useful lives, these two errors tend to offset each other.

In contrast to Hollingsworth's assumption that all racehorses begin racing in the year in which they win their first money, it is assumed in this study that all racehorses begin their racing careers at two years of age. Most thoroughbreds do start racing at this age, but more importantly, taxpayers generally claim that their racehorses are placed in service at this age, even if they do not actually enter a race until three years of age.

The useful lives of those racehorses that are subsequently used for breeding are determined from Hollingsworth's data on the ages at which broodmares produce their last foal, and the ages at which stallions sire their last foal. Because owners may attempt to use a horse for breeding after it has last been able to produce a live foal, this measure tends to understate the useful life of horses, and thus also offsets the assumption used in this study by applying the Hollingsworth statistics to racehorses that do not win any race money.

C. Distribution of Useful Lives

The following figures present useful life distributions for several types of horses. Figure 1 represents thoroughbred geldings, and is based entirely on the ages at which such horses last earn race money. The average useful life is 6.6 years. As expected, this exceeds the 5.1 "average number of seasons earned" noted by Hollingsworth, who considered the horse's useful life to begin when it won its first race money. The distribution of useful lives for colts/stallions is shown in Figure 2.

In this case, useful lives are determined either by the ages at which they last won race money (for the 71 percent of the starting colts that were not subsequently used for breeding), or by the ages when they sired their last foal. The average useful life is 7.9 years. Figure 3 shows the distribution of useful lives for thoroughbred fillies/mares Here also, useful lives are determined either by the ages at which they last won race money (for the 33 percent of the starting fillies that were not subsequently used for breeding), or by the ages when they produced their last foal. The average useful life is 11.0 years.
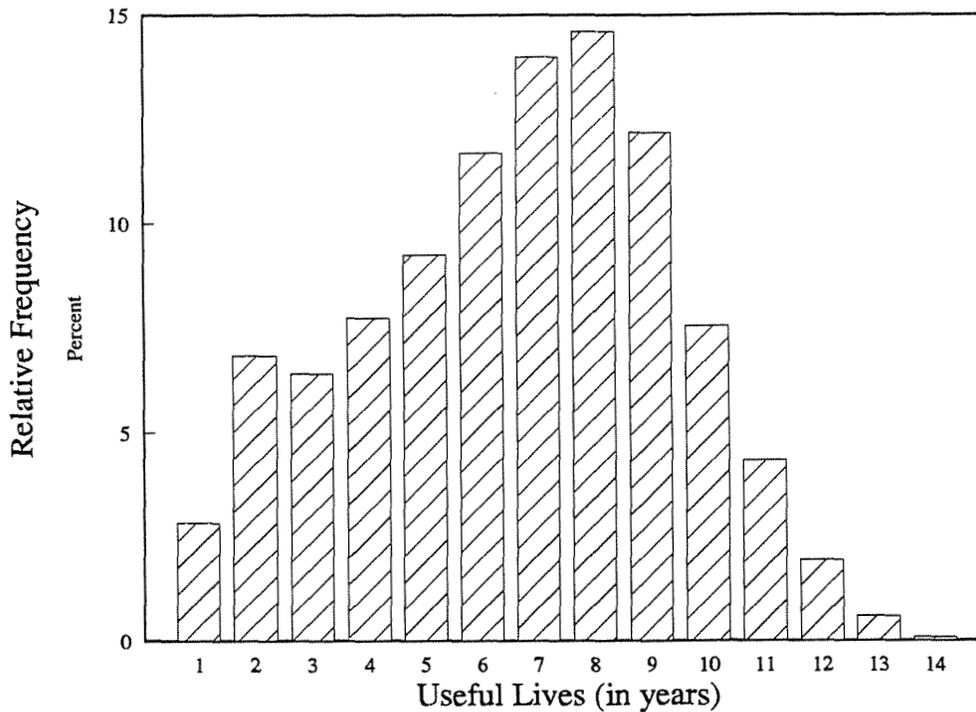
Figure 1. Distribution of the useful lives of starting thoroughbred geldings.

The auction data indicate that male yearlings cost about 16 percent more than female yearlings. Based on this statistic, and using distributions found in Hollingsworth, the following investment weights were derived: 39.5 percent for geldings, 14.0 percent for colts/stallions, and 46.5 percent for fillies/mares. The investment-weighted average useful life for all thoroughbred horses combined is 8.8 years.

Figure 2. Distribution of the useful lives of starting thoroughbred colts/stallions.

Figure 3. Distribution of the useful lives of starting thoroughbred fillies/mares.

Chapter III. The Economic Depreciation of Thoroughbreds

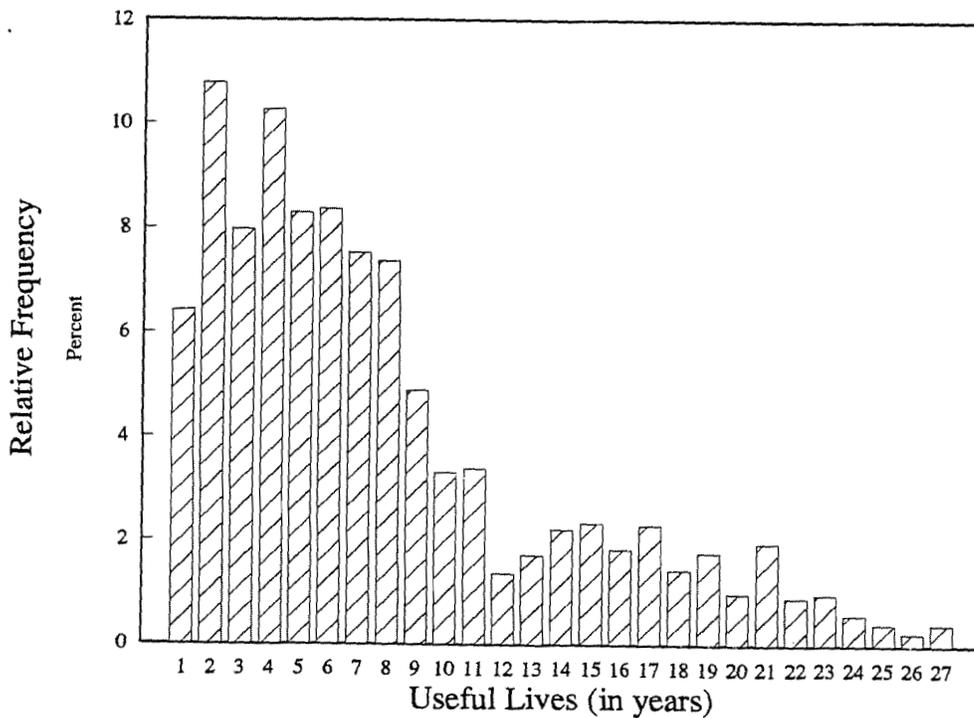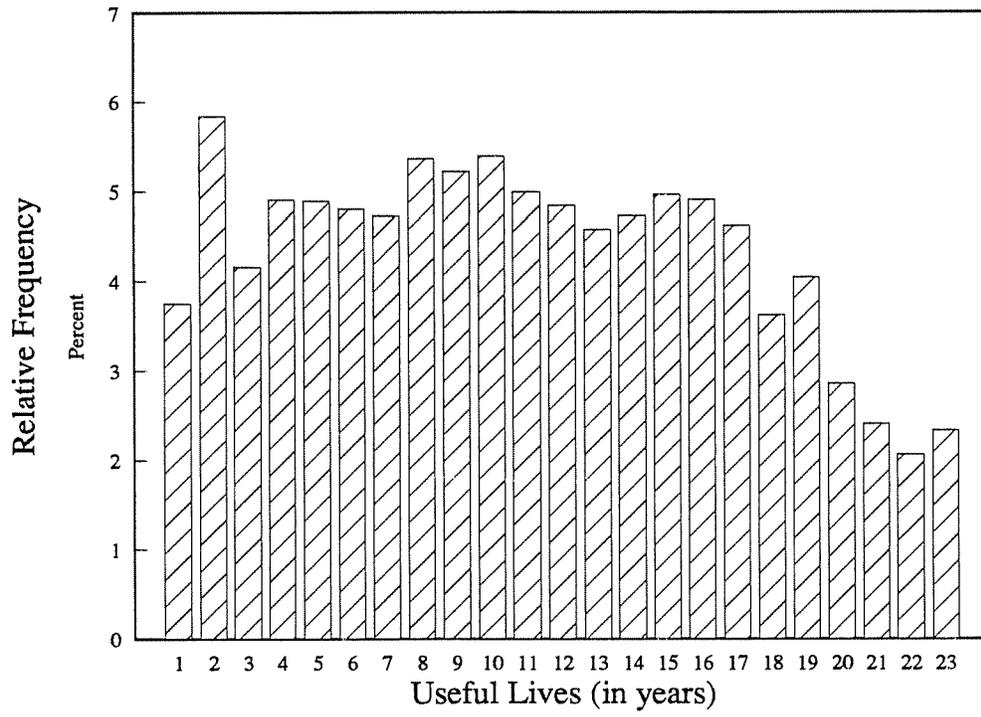In this chapter, average age-price profiles, economic depreciation, and equivalent economic lives are derived separately for geldings, colts/stallions, and fillies/mares. Conceptual issues related to the treatment of gains and losses upon disposition of horses and the treatment of appreciating assets are discussed, and their implications for equivalent economic lives are shown. The estimation of the equivalent economic life of all thoroughbreds is discussed last.

A. The Average Age-Price Profile of Geldings.

Geldings are castrated male horses. In the Hollingsworth study, they outnumber colts by a ratio of nearly three-to-one. For convenience, it is assumed that the value of all racehorses not subsequently used for breeding (and this clearly includes geldings) declines linearly with the age of the horse once it starts racing, which as noted is assumed to occur when the horse is two years of age. No change in value is assumed to occur between the date of acquisition and the date the horse is placed in service. It is also assumed that the salvage value of a horse is five percent of the horse's value as a yearling, and that the imputed price of the horse declines to this value at the end of its useful life (i.e., when it is at the age at which it has won its last race money). Only the value of the horse relative to its acquisition cost is needed to determine its economic depreciation per dollar of investment. Thus, the assumption that the horse's salvage value is proportional to its price as a yearling allows the age-price profiles of horses of varying acquisition costs to be calculated as if they all had the same acquisition cost. For convenience, this cost is taken to be $6,500, which is the median price of all thoroughbred yearlings acquired at auction in 1987. The implications of investment in older horses will be discussed in Chapter IV.

Based on this $6,500 initial price, a five percent salvage value is $325. This may seem low, since healthy retired thoroughbred racehorses may be sold for recreational use for several thousands of dollars, and even lame horses may be sold for slaughter for about $450. On the other hand, the acquisition cost of some yearlings may exceed one million dollars, and the corresponding $50,000 salvage value may be somewhat high. For a horse costing $35,400 (the mean 1987 yearling auction price), the calculated salvage value is $1,770, which approximates amounts received for retired thoroughbred racehorses. A five percent salvage value thus appears reasonable.[9]

In summary, the age-price profile for all racehorses that are not subsequently used for breeding is assumed to exhibit a simple straight-line decline (starting at age two) from the assumed $6,500 initial value. However, different horses are assumed to have different straight-line patterns, as determined by the distribution of their useful lives (although they all have the same assumed $325 salvage value). Selected age-price profiles for geldings, for example, are shown below in Figure 4.

The relative fractions of geldings exhibiting each specific pattern is given by the frequency distribution of the useful lives for geldings (see Figure 1). The average age-price profile for all geldings is shown in Figure 5 below.
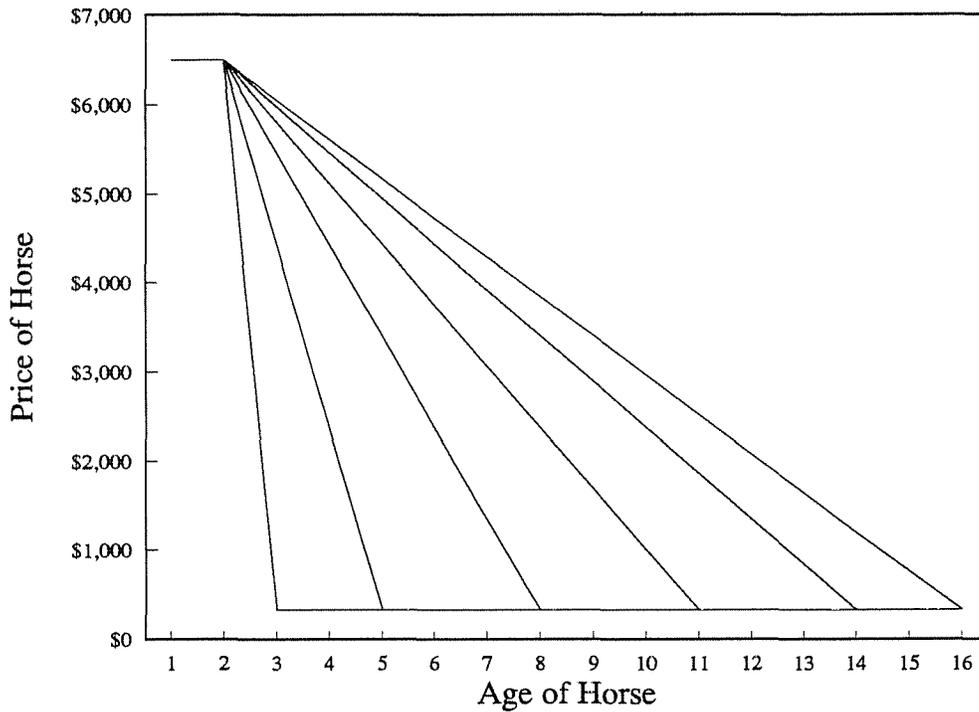
Figure 4. Selected age-price profiles of starting thoroughbred racehorses that are not subsequently used for breeding.

This method of estimating the average value of a set of non-homogeneous assets, each of which declines in value in a straight-line fashion, has been referred to as the Bureau of Economic Analysis method (see, for example, Hulten and Wykoff [1981]), and is known to result in an average age-price profile that resembles that for a single more rapidly declining asset (as is shown in Figure 5). The present value (as of the acquisition date of the horse) of the annual decline in value (i.e., "economic depreciation") for thoroughbred geldings is obtained by discounting each year's decline in the average value (starting at age two) from the middle of the year at a discount rate r:

$$(1) \quad PV = \sum_{i=3} \frac{[V(i-1)-V(i)]}{V(1)(1+r)^{(i-1.5)}} \quad ,$$

where *PV* is the present value of economic depreciation, $V(1)$ is the acquisition price of the horse (assumed acquired as a yearling), and where $V(i)$ is the average value of those horses of age i that are still racing (as determined from the distribution of useful lives in Figure 1). If a four percent real discount rate, r, is used, a present value (as of age one) of 0.8058 is obtained.
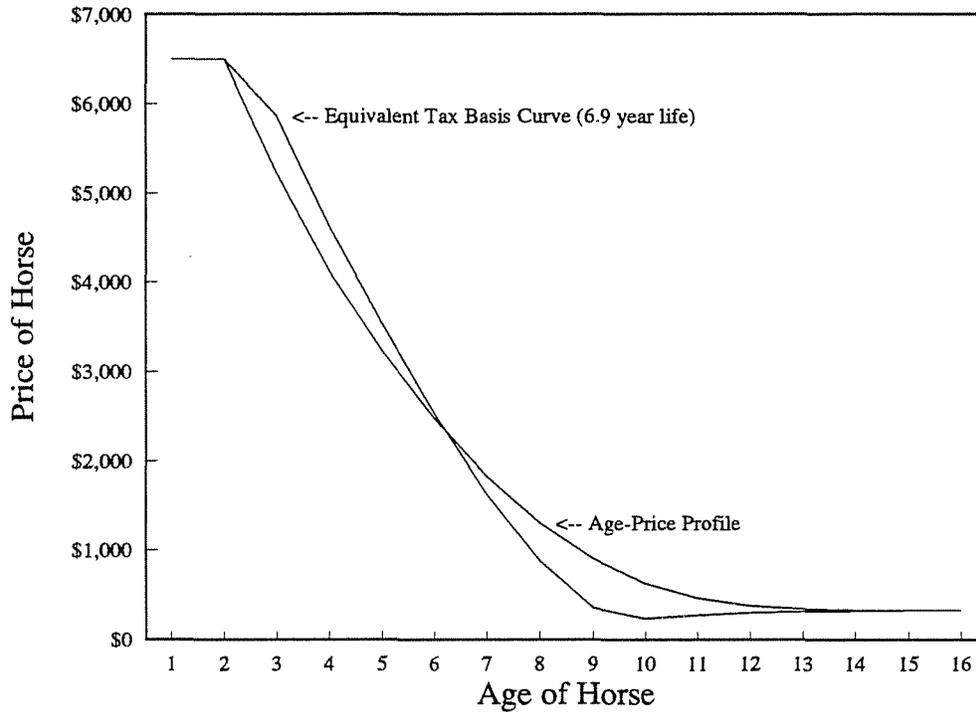
Figure 5. Average age-price profile for starting thoroughbred geldings and the corresponding average equivalent tax basis curve derived from an equivalent economic life of 6.9 years.

B. Translating Economic Depreciation into an Equivalent Economic Life

As noted in Chapter 1, the *General Explanation of the Tax Reform Act of 1986* provides a formula for translating the present value of economic depreciation into an equivalent economic life. In particular, the equivalent economic life is determined by equating the present value of straight-line depreciation (over the to-be-determined equivalent economic life) to the present value of economic depreciation. If this procedure is carried out using the same four percent real discount rate and a mid-year discounting convention, an equivalent economic life of 5.8 years is obtained for thor-

oughbred geldings. This result depends on the assumptions that all geldings are considered placed in service at age two, and that their training and maintenance costs are expensed. It further assumes that all geldings are identical in that they all retire at the same age.

Without this last assumption, a taxpayer would most likely incur a loss (or gain) when his or her horse was retired. This gain (or loss) would be measured by the difference between the remaining tax basis in the horse in the year it was retired and its salvage value. The Depreciation Analysis Division believes that these gains (which arise if the horse is retired later than "average") and losses (which arise if the horse is retired sooner than "average") are alternative ways (in addition to depreciation) of recovering the capital invested in the horse, and should be factored into the analysis. When this is done, the equivalent economic life of a gelding is found to be 6.9 years, which is close to its 6.6-year average useful life. The average equivalent tax basis for geldings is also shown in Figure 5. This curve is obtained by depreciating each horse using a straight-line formula and an equivalent economic life of 6.9 years, and by calculating appropriate losses and gains according to the estimated gelding retirement pattern shown in Figure 1.[10] The areas under the two curves in Figure 5, when discounted to a common age, are equal.

C. Equivalent Economic Life of Colts/Stallions

The age-price profiles for those colts that start but are not subsequently used for breeding are assumed to be similar to those for geldings; the relative fraction of such colts in each useful life class is obtained from the Hollingsworth data on the ages at which colts earned their last race money. The value of those colts that are subsequently used for breeding are, however, imputed from the stud fees which these horses can generate.

Following Hollingsworth, a distinction is made between two groups of breeding stallions. Although only those stallions that sire five or more foals in their lifetime are considered to be used for breeding, a more limited group of stallions (which shall henceforth be referred to as the "very successful" stallions) sire ten or more foals in a single season sometime during their life. The Hollingsworth study notes that only 1.3 percent of all males fall into this category. However, when both the males assumed not to start (and thus also assumed not to be used for breeding purposes) and the starting geldings are excluded, this statistic implies that as many as seven percent of the starting colts become very successful stallions. Likewise, from Hollingsworth's statistic that roughly five percent of all males are used for breeding, it may be inferred that about 21 percent of all starting colts become less than very successful (hereafter referred to as "less successful") breeding stallions.

The ratio of the value of seven-year old breeding stallions to their acquisition cost, RV, is obtained as the product of four factors:

(2) $\quad RV = (Se/AC) \times (Sh/Se) \times N \times (1 - OC)$,

where (Se/AC) is the ratio of the value of a stallion season (the stud fee for servicing a single mare in a single season) to the acquisition cost of the horse (adjusted for inflation), (Sh/Se) is the ratio of the value of a share of the horse (the right to use the stallion to service a single mare each season for the remainder of the stallion's breeding career) to the value of a season (which reflects the discounted value of the number of future seasons the stallion is expected to serve), N is the estimated number of mares serviced per season, and OC is the ratio of the maintenance costs to the stud fees received.

From the 1988 auction data published by *The Blood Horse* (January, 1989), it was found that (Sh/Se), or the ratio of the price of a stallion share to that of a stallion season is about 4.4 for a seven-year old stallion, but this ratio declines thereafter (initially, at about 4.5 percent per year) with the age of the stallion. The Hollingsworth data also indicate that the very successful breeding stallions produce about 10.1 foals per crop at age seven, while the less successful breeding stallions produce about 2.75 foals per crop at age seven. Although the stud fees received are frequently contingent upon the birth of a live foal, this was not the case for most of the auction prices noted. Thus, an adjustment is made to reflect the fact that the number of foals sired might understate the mares serviced by a stallion in a season.[11] Based on a 69 percent breeding success rate (which the Hollingsworth data show to be appropriate for a seven-year old broodmare), the very successful seven-year old stallion appears to service about 14.6 mares per season (i.e., $N = 14.6$), whereas the less successful seven-year old stallion services about 4.0 mares per season (i.e., $N = 4.0$).

It is assumed that the current and future costs of maintaining a breeding stallion are about 20 percent of the fees received by a very successful stallion (i.e., $OC = .20$), and about 55 percent of the fees received by a less successful stallion (i.e., $OC = .55$). Because it was generally not possible to determine yearling values for those stallions whose seasons were sold at public auction, a less exact matching was used to estimate the ratio (Se/AC). From the auction data published in various issues of *The Blood Horse*, the average price was obtained for all yearlings sired by the stallion's sire and sold at auction in the year in which the stallion was a yearling.

When this price is substituted for the acquisition cost of the stallion, an average ratio of the value of a stallion's season to its inflation-adjusted acquisition cost of 11.7 percent is obtained (i.e., $(Se/AC) = .117$). This does not mean that purchasers of every yearling colt can necessarily expect to obtain such fees in the future. It does mean that, if the acquired colt should prove sufficiently successful to be used for breeding, and the relationship between prior yearling prices and current stud fees persists, fees of that magnitude may be expected.

Inserting these factors into Equation (2), the value of a very successful seven-year old breeding stallion is roughly six times its initial cost. Likewise, the value of a less successful seven-year old breeding stallion is about 0.9 times its value as a yearling. The decline in value of breeding stallions with age is taken to be the result of two factors--(1) a decline in the ratio of the value of a share to that of a season (which reflects the decline in the number of future crops anticipated), and (2) a decline in the number of mares serviced, as inferred from the Hollingsworth data on the decline with age in the number of foals sired by active stallions.[12] The resulting age-price profiles of both the very successful and the less successful breeding stallions are shown below in Figure 6. In obtaining these profiles, a linear increase (for the very successful stallions) or decrease (for the less successful stallions) between the value of the horse at age two and its value at age seven is assumed.
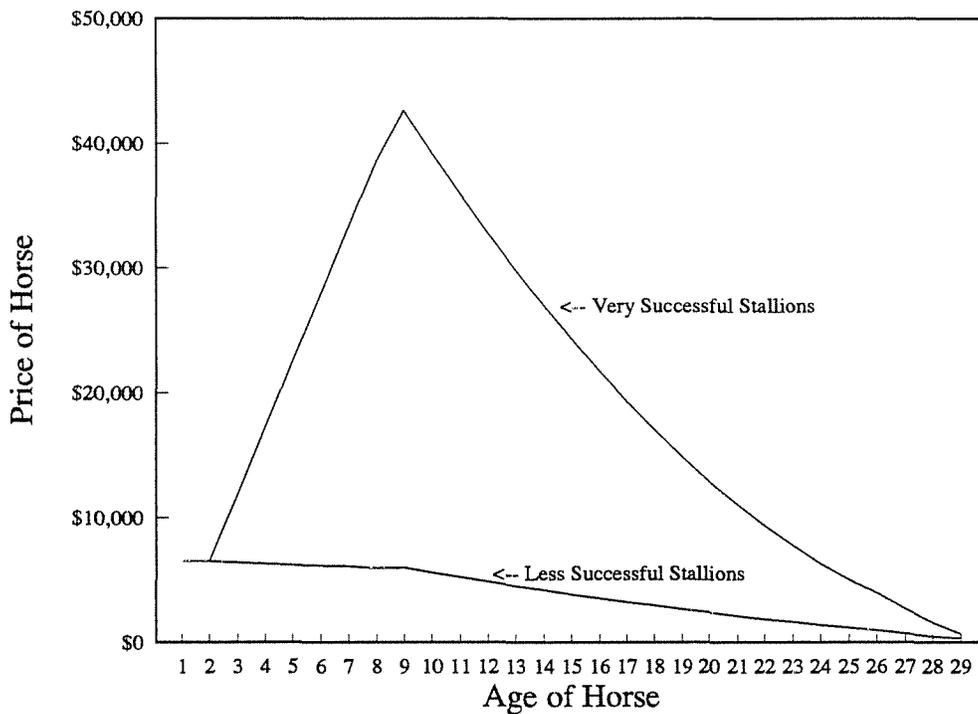
Figure 6. Estimated age-price profiles for unretired starting thoroughbred colts that are subsequently used for breeding stock.

The average age-price profile for all starting thoroughbred colts/stallions is obtained as a mixture of the values of those starting colts that are not subsequently used for breeding and the values of those that are so used. However, the retirement of the breeding stallions must also be considered. Here also, it is assumed that the salvage value of a retired stallion is five percent of its cost as a yearling. The decline in value of retired breeding stock is assumed to be very sudden; just

prior to retirement the horse has the value noted in Figure 6, and a value of $325 immediately thereafter. The frequency of retirements may be obtained from the Hollingsworth data on the ages of stallions in the year they sire their last foal; separate statistics are noted for the very successful and the less successful stallions. When these factors are taken into account, the resulting retirement-adjusted average age-price profile shown below in Figure 7 is obtained. The sharp initial decline in the estimated price is due to the rapid retirement of the less successful racehorses, while the cusp at nine years of age reflects the assumed peak in the value of very successful stallions. The present value (as of the date of acquisition, at a four percent real rate, and with mid-year discounting) of the economic depreciation corresponding to this decline in value is 0.6579.
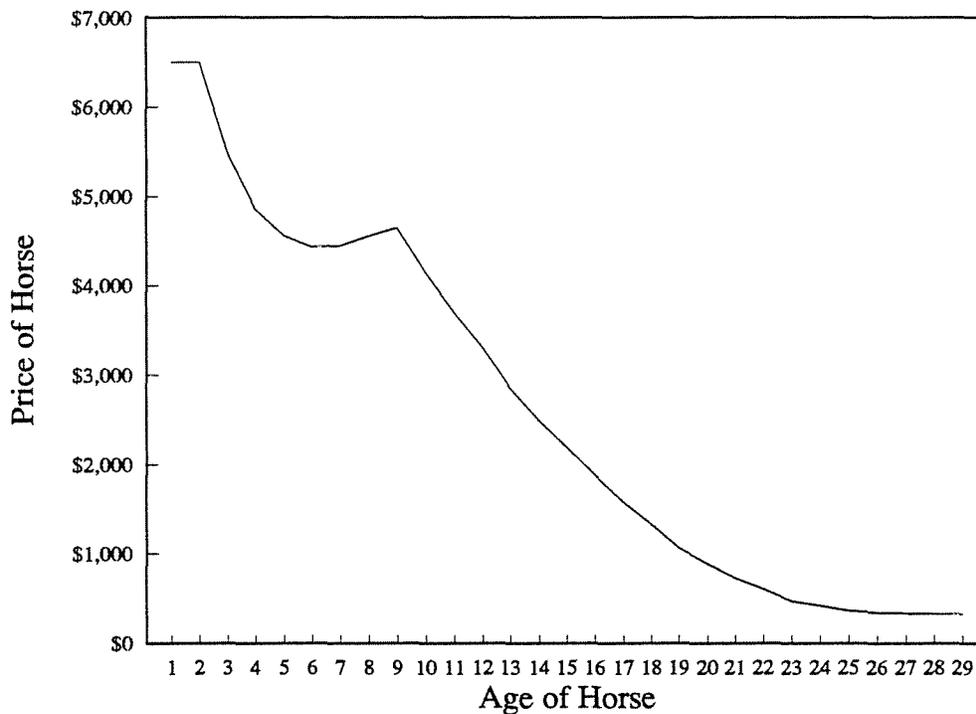
Figure 7. Estimated average age-price profile for starting thoroughbred colts/stallions.

If retirements are disregarded, an equivalent economic life for starting thoroughbred colts/stallions of 17.6 years is obtained. However, a finite equivalent economic life that accounts for the gains and losses incurred by taxpayers upon retirement of the horses cannot be obtained: with depreciation deductions set to zero, the present value of the loss deductions derived solely from the retirement of colts/stallions is 0.7012, which exceeds the present value of economic depreciation. Further "negative depreciation allowances" would be required to equate the present

value of tax deductions with the present value of economic depreciation. This result, when combined with the equivalent economic life formula, implies that thoroughbred colts/stallions should not be treated as depreciable property. The problem arises due to the significant appreciation in the value of the very successful stallions and to the relatively rapid retirement of these horses over the first decade of economic life, despite the fact that only about seven percent of the starting colts ultimately belong in this category.[13]

D. The Treatment of Appreciating Assets

The determination of class lives using the formula of the *General Explanation of the Tax Reform Act of 1986* merits special attention in the case of assets such as very successful colts/stallions that appreciate over a portion of their useful lives. Although economic depreciation, which is simply the negative of the change in value of a depreciable asset during the year, may be negative as well as positive, tax policy considerations may require a distinction be made in the two cases. In the context of the equivalent economic life formula, negative economic depreciation may be viewed as giving rise to an effective tax on the taxpayer's accrued, but unrealized, holding gains. This is reflected in the fact that the asset's equivalent economic life in such cases is typically much greater than its useful life. Although this is simply the converse of allowing taxpayers to claim a depreciation deduction for their accrued but unrealized losses when their assets decline in value, it is not clear that such treatment reflects Congressional intent.

It clearly is not appropriate for taxpayers to effectively claim depreciation deductions during that period when their asset is appreciating in value. On the other hand, under current law, which looks to industry-wide or asset-wide evidence in the determination of a class life, to deny depreciation deductions for an asset such as a horse, which has a finite useful life, may also be viewed as inappropriate (even if the period over which any specific asset is retained by a given taxpayer may not be ascertainable).[14] The legislative history indicates that both the anticipated decline in the value of the asset (its "economic depreciation") and its anticipated useful life should be considered in the determination of its class life. The Depreciation Analysis Division generally views the asset's decline in economic value to be the more important factor, but this position may not be tenable when, as in the case of colts/stallions, an equivalent economic life based on the decline in economic value is so different from the asset's useful life.

An alternative approach, which shall be followed in this study, is to treat the value of the very successful stallions as equal to their initial value until their estimated price finally declines below the initial value. More specifically, in applying the formula of the *General Explanation* to thoroughbred colts/stallions, the economic depreciation of the very successful stallions is taken to be

zero between ages 2 and 23. When this is done, the average age-price profile of thoroughbred colts/stallions is that shown below in Figure 8. The cusp-like behavior present in Figure 7 is absent, and the resulting present value (as of the date of acquisition) of economic depreciation is 0.7570.
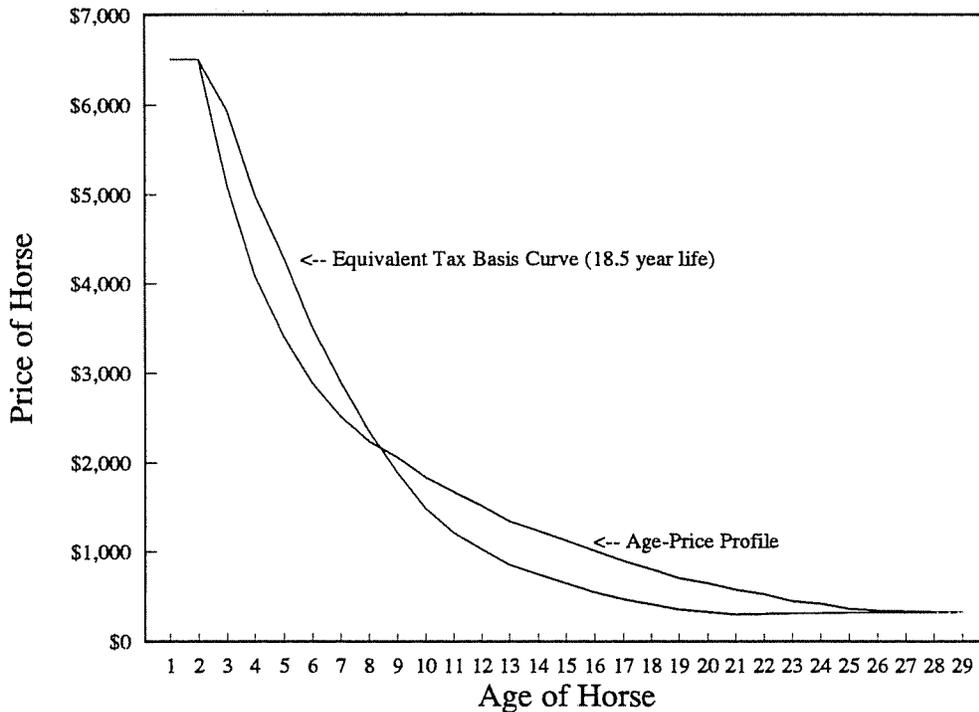

Figure 8. Average age-price profile for starting thoroughbred colts/stallions, ignoring the appreciation in value of the very successful stallions, and the corresponding average equivalent tax basis curve derived from an equivalent economic life of 18.5 years.

If asset retirements are taken into account, an equivalent economic life for starting thoroughbred colts/stallions of 18.5 years is obtained. The corresponding average equivalent tax basis curve is also shown in Figure 8. Finally, if both retirements and the appreciation in the value of the very successful stallions are ignored, the equivalent economic life is 9.3 years.

E. The Equivalent Economic Life of Thoroughbred Fillies/Mares

The determination of the equivalent economic life of thoroughbred fillies/mares introduces an additional complication: a fraction of broodmares are sold at auction at varying ages The availability of such market data, however, makes the estimation of their age-price profile somewhat more direct. Even in this case, though, the value of the mares must be inferred. Most broodmares sold at auction are believed to be in foal, and the price paid must thus be allocated between the

potential future weanling and the mare itself.[15] In order to do this, the ratios of the average value of a weanling sired by the same stallion believed to have covered the mare, to the price of the mare in foal, were examined for a sample of about 250 mares sold at auction in 1988.

From these data, it is found that the average price of a weanling sired by the same stallion that covered the broodmare is about 43 percent of the average price of the broodmare. As noted, Hollingsworth's data indicate that live foals are produced by about 69 percent of all active seven-year old broodmares (this fraction declines with the age of the broodmare). It may thus be inferred that the value of the broodmare alone is about 70 percent (1.0 - (0.69)(0.43)) of the sales price of the broodmare. This fraction shall be used over the entire economic life of the broodmare, which tends to understate the value of the broodmare.
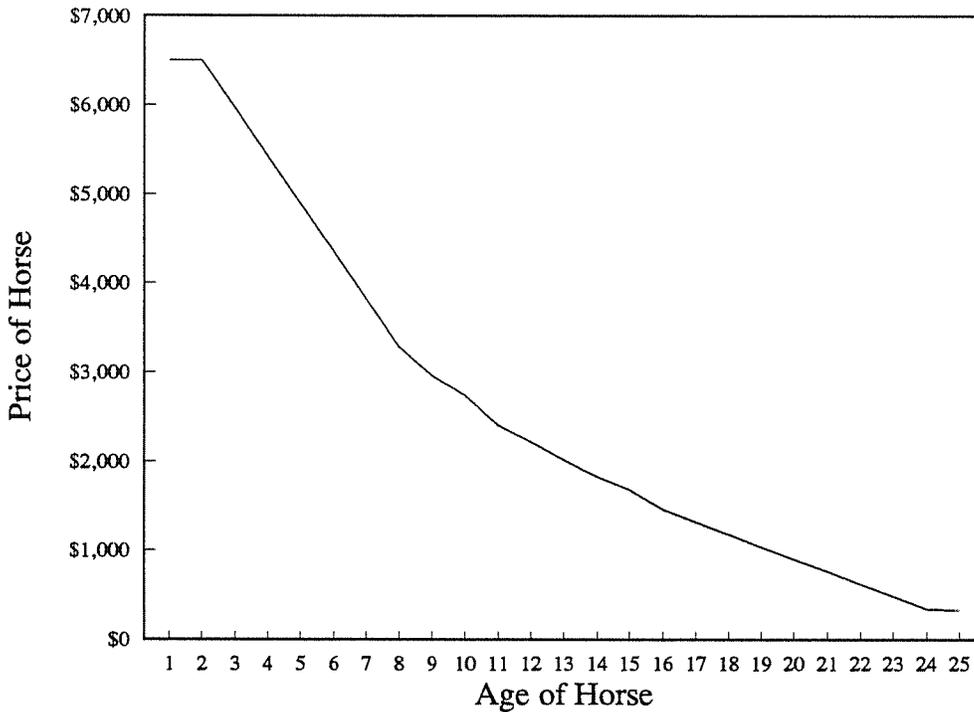

Figure 9. Age-price profile for unretired starting thoroughbred fillies that are subsequently used for breeding stock.

From a sample of about 200 broodmares sold at auction in 1988, the price of a seven-year old broodmare is about 72 percent of the average price paid six-years earlier for female yearlings

sired by the same stallion that covered the mare, when adjusted for inflation. The average price of a seven-year old broodmare alone is thus estimated to be about 50 percent of its initial price as a yearling (0.70×0.72).

By regressing the auction prices of broodmares sired by a given stallion against the age of the broodmare, it is also found that the value of a broodmare (adjusted for inflation) declines with age from age seven (initially at about seven percent per year). In performing the regression, the prices of about 175 broodmares sired by some of the most prolific stallions were examined. In this study, the value of a broodmare is assumed to decline even faster: first by a uniform six percent per year, and then by a second factor reflecting the decline in fertility of broodmares with age, as determined from the Hollingsworth data. This procedure results in an average rate of decline in the price of unretired broodmares in excess of 12 percent annually.[16]

The resulting age-price profile for those fillies that are ultimately used for breeding (67 percent of the starting fillies) is shown in Figure 9. A linear decrease in value between ages two and seven is assumed. As in the case of thoroughbred colts, the average age-price profiles of the 33 percent starting fillies that are not subsequently used for breeding are assumed to decline in a linear fashion. Paralleling the treatment of stallions, a fraction of those mares that are used for breeding are assumed to retire at varying ages, as determined from the statistics given in the Hollingsworth study on the ages at which broodmares produce their last foal. It is likewise assumed that, when a broodmare is retired, taxpayers claim a loss (or gain) on the difference between their adjusted tax basis for the horse and its assumed $325 salvage value.

The estimated average age-price profile for the overall mix of starting racing fillies and broodmares is shown in Figure 10. The resulting economic depreciation has a present value (using a real 4 percent discount rate and a mid-year discounting convention) of 0.7569. Taking into account the gains and losses incurred by taxpayers upon the retirement of their horses, an equivalent economic life for thoroughbred fillies/mares of 12.0 years is obtained. As in the case of the geldings (but in contrast to that of colts/stallions), the equivalent economic life for fillies/mares is not much greater than their average useful life (11.0 years). Furthermore, if the taxpayer's retirement gains and losses are ignored, the equivalent economic life is 9.3 years.
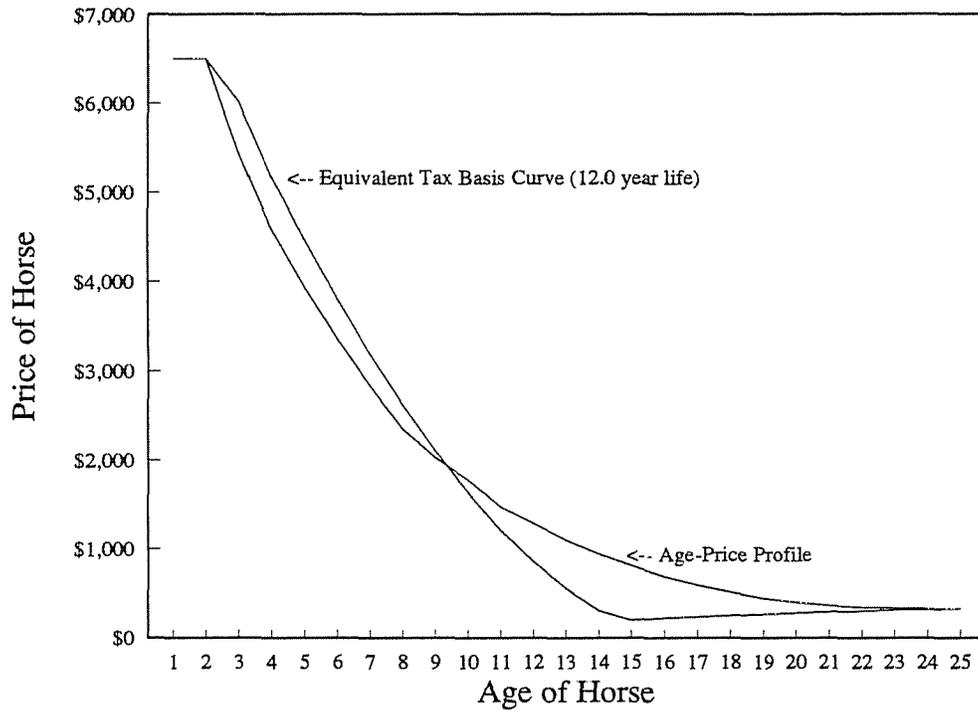
Figure 10. Average age-price profile for starting thoroughbred fillies/mares, and the corresponding average equivalent tax basis curve derived from an equivalent economic life of 12.0 years.

F. The Equivalent Economic Life of All Thoroughbreds

The data presented in the Hollingsworth study, when used in conjunction with public auction data, has allowed the equivalent economic lives of thoroughbred geldings, colts/stallions, and fillies/mares to be separately determined. The 6.9 year equivalent economic life of geldings, whose business use is confined to racing, is much shorter than that for colts/stallions and fillies/mares (18.5 years and 12.0 years, respectively, if the appreciation in the value of the very successful stallions is neglected).

Although it is possible to establish separate asset classes for each type of horse, the use of a single combined asset class (as under current law) would result in a less complicated asset classification system. Since many taxpayers own both male and female horses for business use, an average class life based on the economics of horses of both sexes should not unduly disadvantage one group of taxpayers over another. In determining the combined equivalent economic life for all thoroughbreds, it is appropriate to weight the present values of economic depreciation for each type of horse by the relative level of investment in that type of horse. As noted, the auction data indicate

that the average price of male yearlings is 16 percent greater than that of female yearlings. When this factor is used to adjust the relative numbers of horses of each type, a single weighted average present value is obtained by:

(3) $\quad Wtd\,Avg\,PV = .3946PV(g) + .1398PV(c/s) + .4656PV(f/m).$

Inserting the present values of economic depreciation for geldings, $PV(g)$, colts/stallions, $PV(c/s)$, and fillies/mares, $PV(f/m)$, into Equation (3) yields an investment-weighted present value of economic depreciation of 0.7762 if the appreciation in the value of the very successful stallions is ignored, and 0.7624 if it is not. Equating these present values to those for straight-line depreciation leads to an overall equivalent economic class life for all starting thoroughbreds of 10.6 years if the appreciation in value of the very successful stallions is ignored, and 12.7 years if it is not. These results take into consideration the gains and losses incurred by taxpayers on the retirement of their horses. Figure 11 below shows the corresponding estimated average age-price profile and the average equivalent tax basis curve for all starting thoroughbreds. In this illustration, the appreciation in the value of the very successful stallions is ignored. The 10.6 year equivalent economic life is not much greater than the current 10 year class life for work and breeding horses. In contrast to current law, however, this estimated life applies to all starting thoroughbreds.

A 10.6-year equivalent economic life is, of course, an average. Short-lived horses -- principally those that will not subsequently be held for breeding -- would be almost entirely retired before being fully depreciated, according to the available data. The present value of the deductions for such horses would be less than the present value of their economic depreciation. Breeding stock, on the other hand would tend to have useful lives that extended well beyond the tax depreciation period. These horses, therefore, would be treated relatively favorably. It would be possible, (but not necessarily desirable) to establish two classes -- distinguished by the horse's breeding status. For example, it would be straightforward to establish a separate category for geldings having a class life that reflected the 6.9-year equivalent economic life found for such horses. This would necessitate a longer class life for the remaining horses. An analysis of such horses yields an equivalent economic life of 12.8 years for non-gelded thoroughbreds, if we neglect the appreciation of very successful stallions, and 16.6 years, if that appreciation is taken into account.
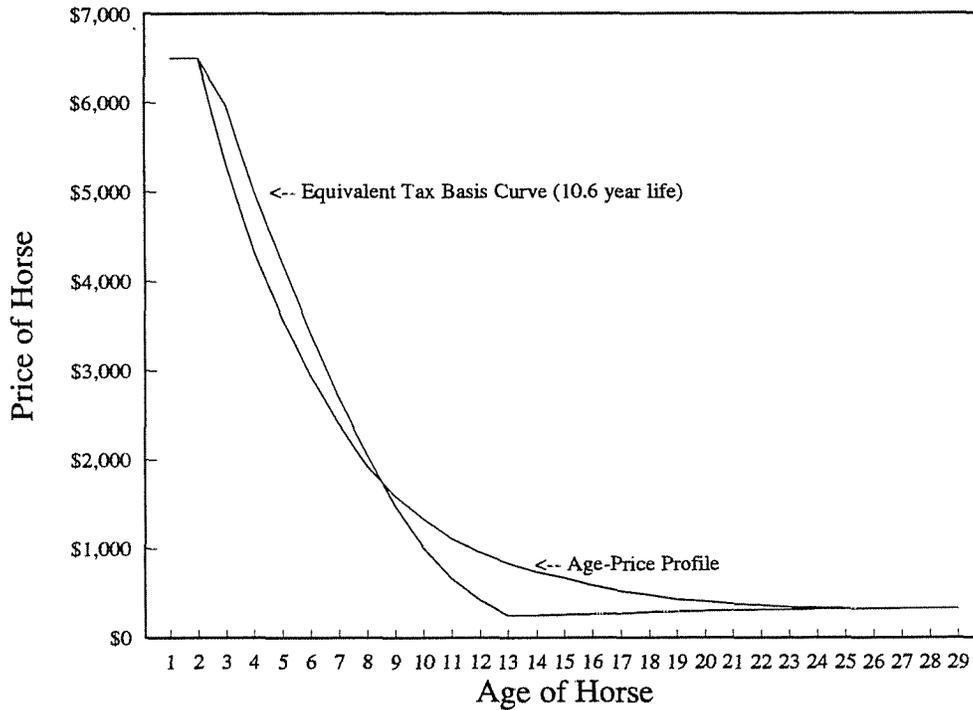
Figure 11. Average age-price profile for all starting thoroughbreds, with neglect of the appreciation in the value of the very successful stallions, and the corresponding average equivalent tax basis curve derived from an equivalent economic life of 10.6 years.

Establishing a second asset class that included all horses not eventually held for breeding would be much more complicated. This would require the classification of horses into breeding and non-breeding horses *at the time the horse is placed in service*. To prevent abuse, severe penalties would have to be created for later changing a horse's status from "non-breeding" to "breeding". Not only would adherence to this scheme place severe restrictions on horse owners, there is a question of whether such a classification system could be implemented properly and enforced. In any case, analysis yields an equivalent economic life of 6.4 years for "non-breeding" horses and 15.1 years for "breeding" stallions and mares. If the appreciation in value for certain stallions is included, this latter figure increases to 20.5 years.

The thoroughbred results are summarized in the table below.

| | | Equivalent Economic Life | |
| | | (Includes the effects of retirements) | |
Category	Useful Life	Disregarding the Appreciation of Stallions	Including the Appreciation of Stallions
Geldings	6.6	6.9	6.9
Colts/Stallions	7.9	18.5	Not Computed
Fillies/Mares	11.0	12.0	12.0
Non-gelded Horses	10.3	12.8	16.6
"Breeding" Horses	14.3	15.1	20.5
"Non-breeding" Horses	5.8	6.4	6.4
All Horses	8.8	10.6	12.7

Thoroughbred Results

(Lives are expressed in terms of years)

Chapter IV. The Implications of the Sale of Older Horses

The previous analysis has been based on the assumption that horses are acquired as yearlings, and are held by their owners until retired from racing or, if used for breeding, until retired from the breeding stock. The assumption that horses are acquired as yearlings appears to be reasonably validated by the auction records. *The Blood Horse* (January, 1989) indicates that 9,083 yearlings were sold at auction in 1988, while only 1,362 weanlings and 3,645 two-year olds were sold. Moreover, since depreciation cannot generally be claimed until the horse is at least two years old, the fact that some horses are acquired as weanlings or two-year olds should not appreciably affect the calculations of their equivalent economic lives. This is so despite the fact that the price paid for a weanling is expected to be lower than that paid for a yearling, and likewise the price paid for a two-year old is expected to be higher than that for a yearling. While the average 1988 auction price for weanlings was $16,044, which is about half of the $31,250 average for yearlings, the average price for two-year olds was only $16,464. This suggests that horses offered for sale as two-year olds may not be as promising as those retained by their owner. This problem, which has been discussed by Ackerlof (1970), is not an easy one to resolve. Although their lower auction prices make it likely that the equivalent economic lives of horses acquired as two-year olds may be somewhat shorter than the equivalent economic lives of horses acquired as weanlings or yearlings, the fact that the Hollingsworth data do not distinguish horses acquired as two-year olds from other horses precludes any detailed examination of this issue.

The fact that horses acquired as two-year olds may have different useful lives than those acquired at earlier ages is not, however, the issue that has concerned the horse industry. Rather, it is the problem of older horses that has long been of interest to this industry. Under the "facts and circumstances" depreciation system in effect prior to the Economic Recovery Tax Act of 1981, the period over which an asset was intended to be used by the taxpayer (its "useful life") determined its depreciation period (its "service life").[17] Because older horses are not expected to be used over as long a period as younger horses (their "useful life" is clearly limited by their mortality), the horse industry has long believed that the recovery period allowed for older horses should be much shorter than that for younger horses.

Based on the results of his study, Hollingsworth proposed special treatment for older horses. More specifically, he suggested that for racehorses acquired as a weanling or yearling, a five-year useful life be used for colts and fillies, and a six-year useful life for geldings. However, he also suggested that these useful lives generally be reduced by one year for each year of the horse's age (above the age of one) at which it was placed in service as a racehorse. Likewise, he suggested a useful life of 10 years for thoroughbred breeding stock placed in service before the horse is seven

years old, and that this life also generally be reduced by one year for each year of age (in excess of six years) at which the horse is placed in service. As noted, current tax law reflects this suggestion to a limited extent by assigning a three-year recovery period to any horse (other than a racehorse) that is placed in service when more than 12 years of age.

Although the remaining useful life of nearly all depreciable assets (including horses) generally declines by one year with each year of the asset's life, it does not necessarily follow that its equivalent economic life behaves in a similar fashion. Nor does it necessarily follow that separate asset classes should be established for assets differing only by age. If (as appears to be the case for horses) only a modest fraction of used (older) assets are acquired, it is administratively convenient to factor the relative investment in these used assets into the calculation of a single class life for all assets of that type, regardless of their age when acquired. To do otherwise for all assets would require enlargement of the approximately 125 existing asset classes by a factor of perhaps 25 or more.
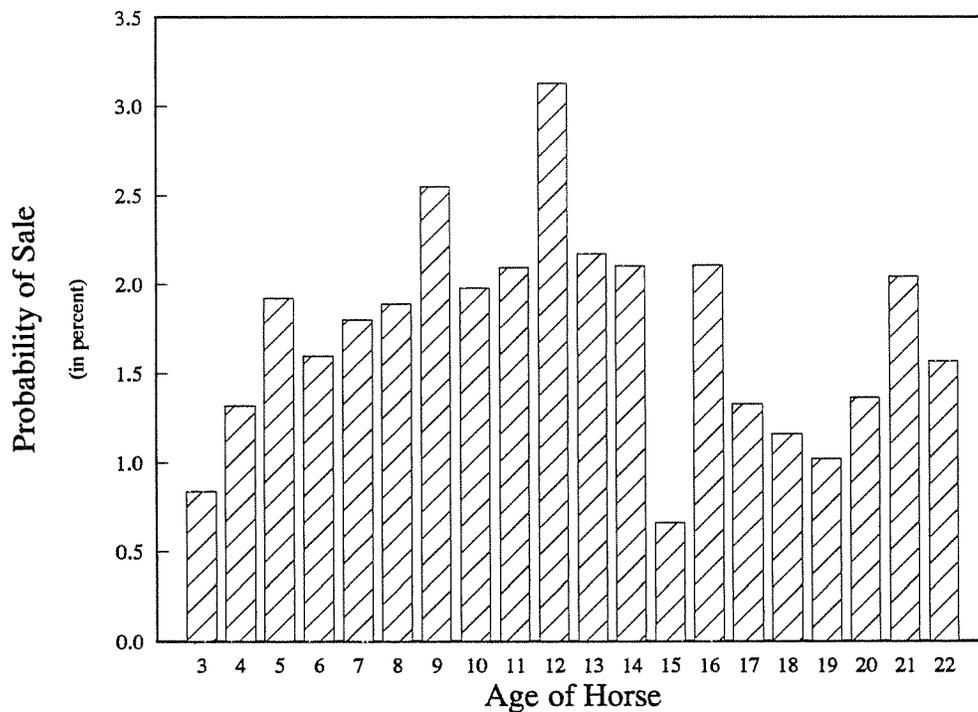
Figure 12. Estimated probability of an auction sale of thoroughbred broodmares as a function of the age of the broodmare.

While shares in a limited number of older stallions are sold at public auction (shares in 200 stallions were sold in 1988), only older broodmares appear to be sold at public auction in appreciable numbers (5,746 in 1988).[18] These mares represent less than 10 percent of all active thoroughbred broodmares (which, for 1985, are estimated by the American Horse Council to total about 65,000). Based on an analysis of the ages of a random sample of 250 broodmares sold at auction in 1988, the probability of an active broodmare being sold at any given age is shown in Figure 12. In obtaining this probability distribution, the growth in the numbers of yearlings registered each year, the relative numbers of the female yearlings that are ultimately used for breeding, and the fraction of broodmares that remain active at each age (as inferred from the Hollingsworth data on the ages at which broodmares produce their last foal) have all been considered. From Figure 12, it appears that broodmares are sold at all ages, rather than only when they have completed their racing career and are being converted into breeding stock.[19]

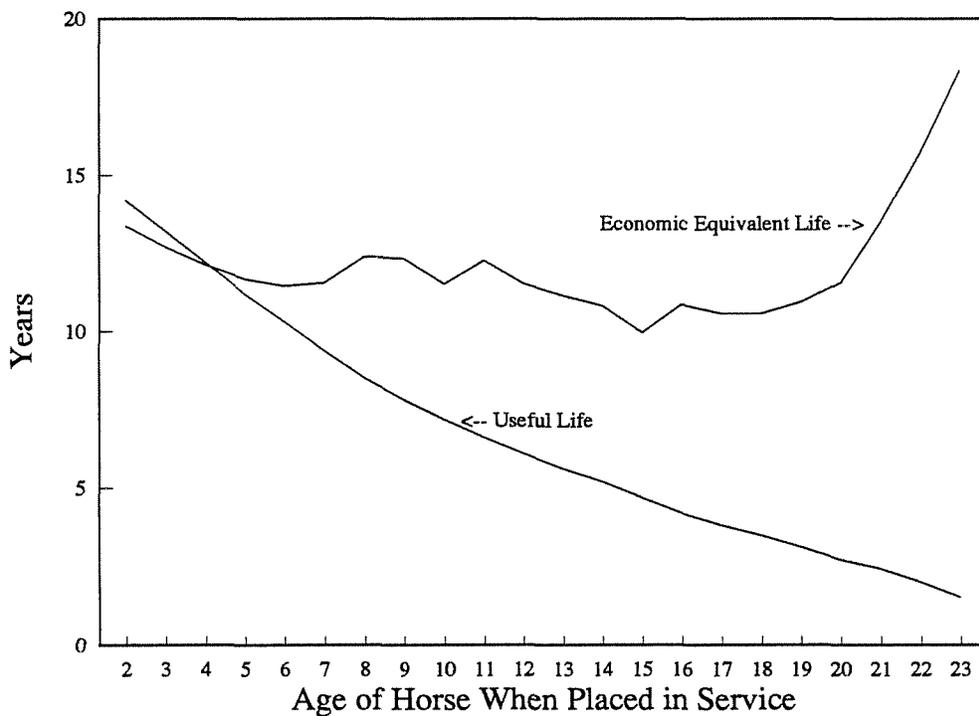**Figure 13.** Equivalent economic life and useful life of a thoroughbred broodmare as a function of the age of the mare when placed in service.

Even though the level of investment in broodmares may not be sufficient to warrant the establishment of separate asset classes for horses placed in service at each age, the potential impact of these horses on the overall class life merits examination. The estimated useful lives and equivalent

economic lives of thoroughbred broodmares acquired at ages two to twenty-three are shown in Figure 13. It may be noted from this figure that, while the useful life declines monotonically with the age in which the broodmare is placed in service, the equivalent economic life does not exhibit any particular trend. Indeed, it tends to *increase* at higher ages. This is due to the increasing importance of the salvage value relative to the acquisition cost for older horses. This salvage value provides a "floor" for the price of the horse, and thus limits the rate of economic depreciation. While alternative assumptions regarding the salvage value might lead to a decline of equivalent economic lives of thoroughbred broodmares with their age when placed in service, neither the existing evidence regarding the relative levels of investment in older horses nor the speed of the decline in their equivalent economic lives provide compelling evidence for modification of the overall 10.6-year equivalent economic life noted earlier for all thoroughbreds.[20]

Chapter V. Conclusion and Recommendations

The analysis has so far focused solely on the useful lives and equivalent economic lives of thoroughbreds. However, *The Blood Horse* (January, 1989) reports that about $532 million was spent in 1988 on the acquisition of thoroughbred weanlings, yearlings, two-year olds, and broodmares through sales at public auction. *The Harness Horse* (February, 1989) indicates that about $83 million was spent on auction sales of harness horse yearlings, and perhaps another $350 million was invested in 1988 on all other business-use horses. Because investment in thoroughbreds thus appears to account for over half of the total investment in business horses, the picture obtained from the study of this single breed may be reasonably representative of that for all breeds combined.[21]

Other information obtained indicates that the useful lives of horses generally do not exceed 16 years, but does not otherwise provide evidence on either average useful lives nor average equivalent economic lives. This information includes a letter from Mr. Peter Ruhlen, president of the Ruhlen Agency, Inc., which is considered to be the largest all-breed insurance underwriter in North America. The letter indicates that the Ruhlen Agency does not generally insure any horses over 16 years of age, and that the Ruhlen Agency has developed information indicating that a horse's productive life ends at 16. Another letter, from Mr. John Darnell, vice president of the First National Bank of Louisville, states that his bank feels comfortable financing broodmares, or using broodmares as collateral, up to the age of 16. For horses as old as 18 years of age, the bank takes precautions to minimize its risk.

This study shows that the current law distinction between racehorses and horses used for work or breeding is at variance with the general criteria established by the 1986 Act for determining class lives. It also shows that the equivalent economic lives of older broodmares fail to decline with age, and that the frequency of their purchase fails to support the establishment of a separate asset class for older horses.

This study finds that the average useful life of thoroughbreds is 8.8 years, and their average equivalent economic life is 12.7 years, by using the straightforward application of the *General Explanation* method. If, however, the appreciation in horse values is ignored, then this method yields an average equivalent economic life of 10.6 years. These lives appear to also represent reasonable approximations to the economic lives of other breeds of horses. An argument for creating multiple horse classes to reflect the diversity of actual useful lives does not seem compelling in light of the added complexity such classes would create. Thus, the Treasury Department recommends that the current five MACRS asset classes for horses (01.221, 01.222, 01.223, 01.224, and 01.225; see Rev. Proc. 88-22) be combined into a single class, and that the current 10-year class life for asset class 01.221 (any breeding or work horse that is 12 years old or less at the time it is

placed in service) be assigned to the single new asset class. This would result in a seven-year MACRS recovery period for all horses. Treasury also recommends repeal of the current law assignments of a three-year MACRS recovery period for racehorses placed in service after two years of age and for horses other than racehorses that are more than 12 years old when placed in service.

These conclusions may, at first glance, appear unduly harsh, since only a limited fraction of all horses acquired for business purposes become very successful racehorses, or are used for breeding. Yet it is the prospect of such success that provides the incentive to invest. The increased value of these more successful horses, on average, roughly offsets their smaller numbers. Focusing only on less successful horses, as suggested by the American Horse Council, while allowing a depreciation pattern more closely matching the experience of the majority of horses, would be inconsistent with the basic economics of the horse industry.

Appendix

Exhibits Related to the Congressional Mandate

Exhibit 1

Section 168(i)(1)(B) of the Internal Revenue Code as Revised by the Tax Reform Act of 1986

    (i) Definitions and Special Rules.

        For purposes of this section--

            (1) Class Life.

                (B) Secretarial authority. The Secretary, through an office established in the Treasury--

                    (i) shall monitor and analyze actual experience with respect to all depreciable assets, and

                    (ii) except in the case of residential rental property or nonresidential real property--

                        (I) may prescribe a new class life for any property,

                        (II) in the case of assigned property, may modify any assigned item, or

                        (III) may prescribe a class life for any property which does not have a class life within the meaning of subparagraph (A).

        Any class life or assigned item prescribed or modified under the preceding sentence shall reasonably reflect the anticipated useful life, and the anticipated decline in value over time, of the property to the industry or other group.

Exhibit 2

Section 168(i)(1) of the Internal Revenue Code as Revised by the Technical and Miscellaneous Revenue Act of 1988

    (i) Definitions and Special Rules.

        For purposes of this section--

        (1) **Class Life.** Except as provided in this section, the term "class life" means the class life (if any) which would be applicable with respect to any property as of January 1, 1986, under subsection (m) of section 167 (determined without regard to paragraph (4) and as if the taxpayer had made an election under such subsection). The Secretary, through an office established in the Treasury, shall monitor and analyze actual experience with respect to all depreciable assets.

Exhibit 3

Provisions for Changes in Classification from the General Explanation of the Tax Reform Act of 1986

The Secretary, through an office established in the Treasury Department is authorized to monitor and analyze actual experience with all tangible depreciable assets, to prescribe a new class life for any property or class of property (other than real property) when appropriate, and to prescribe a class life for any property that does not have a class life. If the Secretary prescribes a new class life for property, such life will be used in determining the classification of property. The prescription of a new class life for property will not change the ACRS class structure, but will affect the ACRS class in which the property falls. Any classification or reclassification would be prospective.

Any class life prescribed under the Secretary's authority must reflect the anticipated useful life, and the anticipated decline in value over time, of an asset to the industry or other group. Useful life means the economic life span of property over all users combined and not, as under prior law, the typical period over which a taxpayer holds the property. Evidence indicative of the useful life of property, which the Secretary is expected to take into account in prescribing a class life, includes the depreciation practices followed by taxpayers for book purposes with respect to the property, and useful lives experienced by taxpayers, according to their reports. It further includes independent evidence of minimal useful life -- the terms for which new property is leased, used under a service contract, or financed -- and independent evidence of the decline in value of an asset over time, such as is afforded by resale price data. If resale price data is used to prescribe class lives, such resale price data should be adjusted downward to remove the effects of historical inflation. This adjustment provides a larger measure of depreciation than in the absence of such an adjustment. Class lives using this data would be determined such that the present value of straight-line depreciation deductions over the class life, discounted at an appropriate real rate of interest, is equal to the present value of what the estimated decline in value of the asset would be in the absence of inflation.

Initial studies are expected to concentrate on property that now has no ADR midpoint. Additionally, clothing held for rental and scientific instruments (especially those used in connection with a computer) should be studied to determine whether a change in class life is appropriate.

Certain other assets specifically assigned a recovery period (including horses in the three-year class, qualified technological equipment, computer-based central office switching equipment, research and experimentation property, certain renewable energy and biomass properties, semi-conductor manufacturing equipment, railroad track, single-purpose agricultural or horticultural structures, telephone distribution plant and comparable equipment, municipal waste-water treatment plants, and municipal sewers) may not be assigned a longer class life by the Treasury Department if placed in service before January 1, 1992. Additionally, automobiles and light trucks may not be reclassified by the Treasury Department during this five-year period. Such property placed in service after December 31, 1991, and before July 1, 1992, may be prescribed a different class life if the Secretary has notified the Committee on Ways and Means of the House of Representatives and the Committee on Finance of the Senate of the proposed change at least 6 months before the date on which such change is to take effect.

Notes

1. Although the conventional age of a horse is usually derived from a fictional January 1 birthdate, the current classification of horses for depreciation purposes is dependent upon on their true ages. The analysis contained in this report, however, uses data which is based on the conventional age classification of horses. Thus, a horse classified as a "two-year old" can have an actual age between one and three years.

2. See the discussion between Senators McConnell, Ford, and Packwood, as reported in the Congressional Record of September 27, 1986 (p. S13953).

3. It is possible that retirements will result in *additions* to income where salvage value is a significant factor. This is particularly true for retirements that occur after the asset group has been fully depreciated for tax purposes. Such gains are treated as negative deductions.

4. The American Horse Council points to information from *The Blood Horse's Stallion Register for 1988* , which indicates that about 67 percent of the thoroughbred stallions listed are owned by a syndicate, and 33 percent are owned by an individual or farm. From these statistics, they conclude that the ownership of perhaps 75 percent of these stallions may have been transferred at the conclusion of their racing career. Unfortunately, their data do not indicate the fraction of ownership retained by the owner(s) of the racehorse, nor when the transfer took place. As noted in note 18 below, information from auction sales of stallion shares suggest that these caveats may be important. Even if the 75 percent figure were accepted, it would imply that, under current law, the owners of 25 percent of the more successful stallions could fully depreciate their horses over a three-year recovery period, despite their continued value for breeding purposes. Moreover, the establishment of a single asset class for all horses would not necessarily be inequitable even to those owners that actually sell their horses when their racing careers are over. As shown in Figure 6 and Figure 9, the average decline in value of such horses is not expected to be as rapid as the 200 percent declining balance depreciation over a seven-year recovery period allowed for assets with a 10-year class life In any case, the greater allowances that might otherwise have been claimed would have been recaptured when the horse was sold.

5. In particular, the American Horse Council believes this study should only cover racehorses (and not breeding and workhorses), objects to the inclusion in this study of data relating to the very successful horses (which they believe do not comprise more than a small fraction of the total population of racehorses), believes that the ability of taxpayers to claim a loss on the disposition of their horses should not be factored into the calculation of an equivalent economic life for horses, and in general believes that the depreciation of horses cannot be studied by an approach of the type used for other assets, because horses are considered too unlike all other assets. For the reasons noted in the text, the Depreciation Analysis Division does not concur with these views.

6. The American Horse Council argues that the presumed short economic life of the 40 percent of the thoroughbred foals that do not start should be considered in determining the useful life of a racehorse. (They also provide information that a correspondingly large fraction of standardbred foals do not start). The Depreciation Analysis Division believes, however, that only assets for which depreciation may be claimed should be considered when estimating appropriate class lives. Unfortunately, a breakdown is not available between those horses that are trained for racing (and are thus placed in service) but do not start, and those that are not placed in service. To the extent that the non-starters are depreciable business assets with relatively short lives, the useful lives reported in this study are somewhat overstated.

7. The American Horse Council believes that the fact that a mare produced a single foal does not necessarily indicate that the mare is being used for breeding purposes. Likewise, it does not believe that the fact that a stallion sired five foals in its lifetime does not necessarily imply that the stallion is being used for breeding. In their view, only about 5 percent of all thoroughbred males, 3 percent of standardbred males, and about 13 percent of quarterhorse males ever become breeding stallions.

They admit that a higher percentage of fillies become mares (they provide information showing that about 70 percent of all quarterhorse fillies and somewhat less than one-half of all standardbred fillies become mares), but also note that many mares produce relatively few foals. Unlike the statistics calculated by the Depreciation Analysis Division for thoroughbreds, the percentages suggested by the American Horse Council are not adjusted to reflect the fact that a significant fraction of foals do not start, and it is generally only those that do that are subsequently used for breeding purposes.

8. The American Horse Council believes that very few horses would be allowed to continue to race long after their last winning race.

9. The American Horse Council believes that it is more appropriate to assume that the salvage value is independent of the initial value of the horse (although it does not suggest what this value might be). As noted in the text, the primary motivation for the assumption of a fractional salvage value was the desire to be able to express the resulting economic depreciation as a fraction of the initial investment. The Depreciation Analysis Division does not believe that the use of an independent salvage value would have a significant effect on the calculated equivalent economic lives. Indeed, setting salvage to zero lowers the estimated equivalent economic life for thoroughbreds by less than one-half year.

10. A half-year convention was employed in applying the straight-line formula, i.e., the first year's deduction was set equal to one-half of the full straight-line deduction. In addition, the initial year's depreciation and loss deductions were each discounted by a half-year discount factor.

11. The American Horse Council believes that guaranteed breeding fees are less common than assumed, which suggests that the imputed value of the stallions may be somewhat overstated, and thus the calculated equivalent economic life also somewhat overstated.

12. The data on number of foals sired were first regressed against age in order to obtain a smoothed fertility-age curve.

13. Compare the retirement distribution shown in Figure 2 with those of Figures 1 and 3.

14. Of course, even if no depreciation is allowed, the taxpayer can recover his investment by claiming a loss upon the asset's retirement.

15. The American Horse Council believes that many fillies are bought off the track for breeding, and are thus not in foal. Since in this study a portion of the value of the mare is assumed to be allocated to the foal, to the extent this need not be done, the calculated values of the mares are understated, and the resulting equivalent economic life also understated.

16. The Hollingsworth data show a decline in fertility to age 16 and then a small general upward trend throughout the remaining life. This increase in fertility was ignored in the calculation of the age-price profile.

17. For a more detailed discussion of the pre-1981 "facts and circumstances" depreciation system and the concept of useful lives then in effect, see for example, Brazell, Dworin, and Walsh (1989).

18. Since the ownership of a stallion may be divided into as many as 40 shares, and on average only one or two shares in each horse was sold at auction, even the sale of shares in 200 horses represents only a very small transfer of ownership in breeding stallions. It might also be noted that these 200 horses were of varying ages, with an average age of 13.5 years. See note 4 above, however, for a contrary view of the extent to which racehorses are sold at the end of their racing career.

19. Notice, however, that the data in Figure 12 imply that only about one-third of all sales of broodmares occur at ages 3 or above.

20. The level of investment in older broodmares is not negligible. In 1988, thoroughbred broodmare auction sales totaled about $166 million out of a total of $532 million in auction sales of all thoroughbreds. Because their salvage value does not decline appreciably with age, however, only broodmares placed in service at 15 years of age or older have an equivalent economic life appreciably lower than the 12.4-year life noted for a yearling, as shown in Figure 13. As may be seen from Figure 9, the estimated price of such broodmares is much lower than for younger broodmares. Thus, when weighted by the level of investment, the contribution of these much older broodmares to the overall equivalent economic life of all thoroughbreds is quite small.

21. The American Horse Council suggests that some other breeds of horses, such as standardbreds and quarterhorses, may have somewhat shorter economic lives than thoroughbreds.

References

Ackerlof, George A., "The Market For "Lemons": Quality Uncertainty and the Market Mechanism", *Quarterly Journal of Economics*, No. 3 (August, 1970), pp. 490-500.

Brazell, David, Lowell Dworin, and Michael Walsh, *A History of Federal Tax Depreciation Policy*, OTA Paper 64 (U.S. Department of the Treasury, Washington, D.C., May, 1989).

Hollingsworth, Kent, "So What is the Economic Useful Life of a Thoroughbred?", *The Blood Horse*, (Thoroughbred Owners and Breeders Association, March, 1972), pp. 11.01-11.06.

Hulten, Charles R. and Frank C. Wykoff, "The Measurement of Economic Depreciation", in *Depreciation, Inflation, and the Taxation of Income From Capital*, ed. by C. Hulten, The Urban Institute (Washington, D.C., 1981), pp. 99-103.

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