

Handicapping Derby Thoroughbreds: Edward's Minit, Race-O-Matic, and Kel-Co II Slide Rules

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Abstract

Given an historical synopsis of horse racing and wagering, the sport of kings is explored from the perspective of three handicapping slide rules, Edward's Minit (1959), the Super Race-O-Matic (1964), and the Kel-Co II (1971). Rules were examined by various scales which purport to capture handicapping factors predictive of thoroughbred racing outcomes. All three rules rely on past performance statistics, such as those reported in the Daily Racing Form. A demonstration comparing slide rule predictions was drawn from the 127th running of the Kentucky Derby, May 5, 2001. Handicapping ratings for all horses in the field of 17 were obtained using each slide rule. The Minit rule was found to be age, weight, and track sensitive, whereas the Race-O-Matic capitalized on speed, finish positions, and weight data. The Kel-Co II rule combined the concept of established class, reflecting finish performance and annual earnings, with adjustments for previous track circuits run. Rule ratings were compared with morning line and final odds, and with actual race outcomes. Findings indicated that if the four top-rated horses from any of the three slide rule prognostications had been bet to win (four \$2 bets), that Monarchos, the winner which paid \$10.50 to \$1, would have been selected, and would have returned \$23.00 for the \$8 play.

Introduction

The purpose of this paper is to present a description and demonstration of slide rules designed for handicapping thoroughbred horse races. The three rules were selected to be representative of past decades and diverse computation strategies, and consist of the Edward's 1959 'Minit' Handicapper [1], the 1964 Super Race-O-Matic [2], and the 1971 Kel-Co Improved Class Calculator for Thoroughbred Race Horses [3].

Horse Racing: Past and Present

Horse racing has a long and unique history, spanning from about 4000 B.C.E. when Asian tribes first domesticated the horse, to Greek Olympics contests, to the Circus Maximus Hippodrome where chariot races were held in Rome's Coliseum. The first modern race horses were descended from Arabian stallions brought back by medieval nobles from the Crusades and bred to English mares. British Kings Richard the Lion-Heart, Henry VIII, Charles II, and Louis XVI of France were race aficionados, hence the phrase "the sport of kings". As racing developed, so did the horses, and by the early 1700s the thoroughbred race horse had evolved. All thoroughbred stock is said to be descended from three stallions named the Darley Arabian, Byerly Turk, and Godolphin Barb. Horse racing was introduced to the North American continent in the British colonies. The first formal race course was laid out on Long Island, New York, in 1665 by the royal colonial governor, Col. R. Nicolls.

Organized racing continued in the new United States; first President and father of our country, George Washington, raised race horses and served as honorary steward for the Maryland Jockey Club. By 1821 the first thoroughbred race track, Union Course, was opened on Long Island [4].

Today the sport of organized horse racing continues, and is legal in 43 of the 50 states in the U.S.; however, one of the 43 states, Utah, does not allow wagering on races. Excluding harness and quarter-horse racing, thoroughbred horse racing alone is a billion-dollar enterprise. The Jockey Club Fact Book [5] estimates that the pari-mutuel "handle", the amount of money involved in legal thoroughbred horse race betting at tracks in the year 2000, was in excess of \$14.2 billion.

In a 1995 economic impact study by the American Horse Council, the entire U.S. horse industry, including racing, showing, recreation, training, breeding, employment, and services paid \$1.9 billion in statutory taxes and fees to federal, state and local governments, and contributed \$25.3 billion to the Gross National Domestic Product, leading the motion picture industry by one-half billion dollars, and furniture and fixtures manufacturing by more than \$6 billion [5].

Pari-mutuel betting and the Totalisator

In addition to the pageantry and color of horse races, the excitement is heightened when spectators bet or wager on race outcomes. Unlike casino gambling or gaming where the player bets against the house, horse race betting is done by pari-mutuel wagering. The concept of pari-mutuel betting was first introduced in 1870 in Paris, by French businessman Pierre Oller [4]. His sporting bet system allowed wagers to be controlled from centralized betting pools known as pari-mutuels, from the French "parier-" meaning "to bet, lay or stake", and "mutuel" meaning "together, reciprocal, or among us" [6]. Pay-offs are determined by the type of bet made on a given horse in a race: win (finish first), place (finish first or second), or show (finish in the top three). A percentage or take-out rate, called the "take" (usually 14-25%), is deducted from each of the win-place-show (WPS) betting pools for the governmental parimutuel tax, the purse for the horse owners, and the commission or profit for the racetrack. The balance is distributed equitably by odds to players who wagered on winning horses. Payoff odds are calculated by dividing pool balances by the number of winning tickets for each of the WPS pools. Later brought to England where it was first called the "Paris-mutuel", the pari-mutuel arrived in New York City in 1877, but

because the system is regarded as, perhaps, the fairest form of race betting, corrupt bookmakers who controlled the NYC race tracks viewed the system as a threat to their illicit odds-making practices and had pari-mutuel usage quietly and quickly discontinued. Some 30 years later, and 34 years after the first running of the Kentucky Derby, Col. Matt Winn and Judge Charles Price reintroduced the pari-mutuel in 1908 at Churchill Downs in Louisville, Kentucky. The system became extremely popular and soon race tracks across the nation adopted the pari-mutuel as the "legal standard" betting system.

In 1913, Sir George A. Julius, an Australian railroad engineer, invented a pari-mutuel mechanism called the totalisator. Originally conceived as a vote counter, the massive mechanical device, housed in several buildings, used epicyclic bevel gear trains, wires, pulleys, belts and numerous rows of shaft adder mechanisms. This remarkable machine could print and issue betting tickets, tally and record the WPS bet pools, deduct the take, and calculate and display odds. Odds were posted using a bank of mechanical display dials and indicators mounted in the windows of a two story house-like structure situated in front of the grandstand on the infield of the racetrack, which later evolved into the modern 'tote' board. An internet website by Brian Conlon contains a full detailed history of the totalisator, complete with photographs [7]. In the 1930s, Harry Straus, an electrical engineer from Baltimore working with Arthur Johnson of the General Electric Company, made major modifications to the totalisator design, replacing mechanical gearing with electrical relays, solenoids, and mercury and rotary switches, and electrifying the tote board digit read-out display with light bulb arrays. The totalisator ticketing and odds reporting system, based on pari-mutuel wagering, popularized thoroughbred racing from then to the present day. Modern computerized totes report up to the second odds, issue tickets for straight bet WPS pools and exotic bet pools such as Daily Double, Exacta or Perfecta, Quinella, and Trifecta, display post times, declare winners and list final odds for payoffs.

Handicapping Race Horses

In the discipline of mathematical statistics, formal

probability theory is the study of possible outcomes of given events in terms of their relative likelihoods and distributions of occurrences. One of the earliest scientific DELPHI forecasting studies, conducted by the RAND corporation, focused on handicapping horse races [8], and cognitive dissonance theory, associated with attitudes toward horse race betting behavior, has been studied in the social psychology literature [9]. In what may be a betting man's probability theory, the art of handicapping, or predicting the winner of a horse race, entails the consideration of a wealth of statistical data. The leading authoritative source of statistical horse race data is the *Daily Racing Form (DRF)*[10], a news sheet that reports on past performances of horses being run in particular races, at various distances, at specific tracks, together with a constellation of additional factors and information for each horse such as past races "in the money" (win, place or show), running times at fractional mile marker posts around the track, race finish times, previous tracks and races run, dollars earned from previous races, past and expected track surface and weather conditions, the various trainers, jockeys, owners and stables involved, together with a myriad number of other race details.

Handicapping Slide Rules

Numerous handicapping slide rules were manufactured in the later part of the 20th Century. Generally the slide rules were made inexpensively, out of cardboard and plastic. The three rules examined here have some common features. Handicapping factors are arrayed on quantitative scales matched for varying degrees of race characteristics. Two of the rules consist of a stator-type envelope or sleeve with primary and secondary graduations on various scales. All rules have at least two graduated slides. Slide rule features and factors are discussed below.

Edward's "Minit" Handicapper

As shown in Figure 1, both the front and the back of the Minit rule are scaled. Two slides are used in sequence to compute a performance rating in U.S. standard, one-fifth of a second clocking intervals predictive of a track advantage or "edge" for a horse at a specific race course. Table 1 displays the fixed and sliding scales for the Minit.

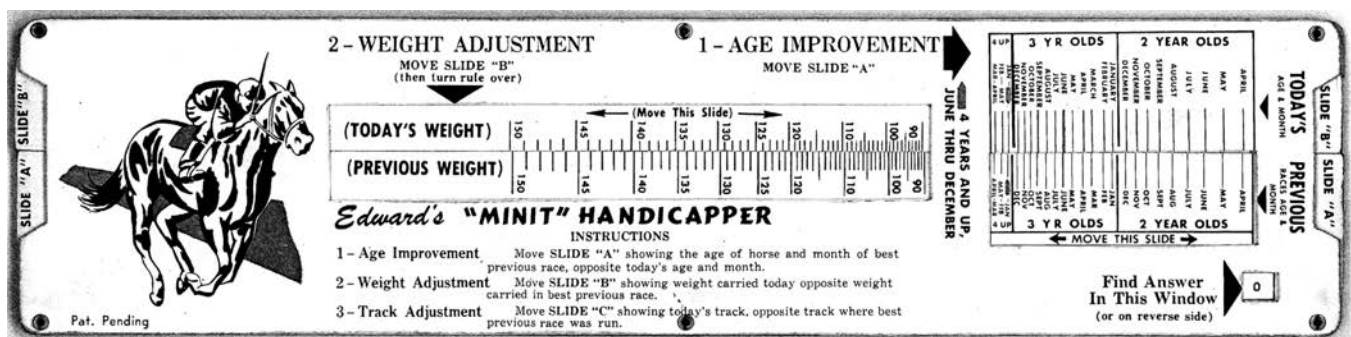


Figure 1a. The face of the Minit Handicapper

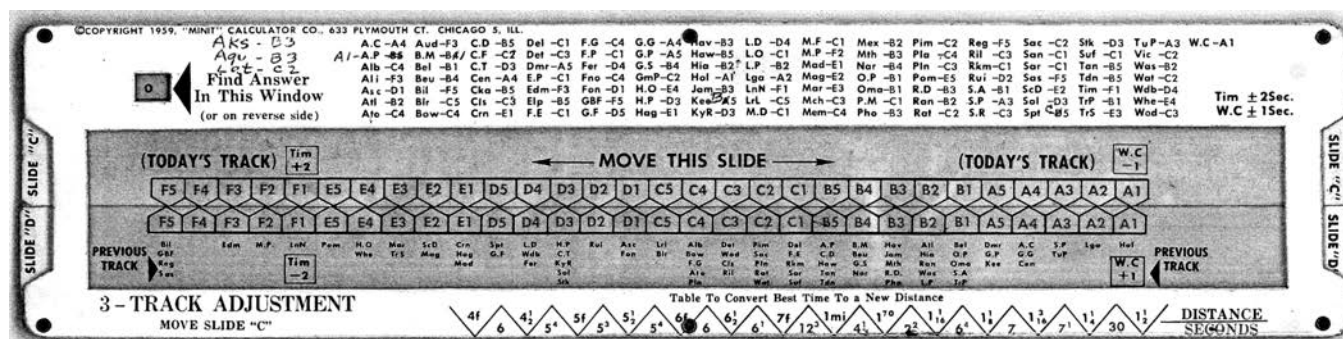


Figure 1b. The back of the Minit Handicapper

Predictive performance ratings are obtained by setting the age and month of the best previous race on slide A to the current age and month fixed scale. Next, the today's weight carried scale on slide B is moved to the best previous race weight carried scale on slide A. These factors consider age and weight improvements in race performance. Maintaining these settings, the rule is turned over, and the today's track scale on slide C is aligned to match the best previous race's track scale on slide D. The standard two- or three-letter *DRF* codes for over 100 race tracks are grouped into six alphabetical categories and five subcategories by track speed. The expected edge, in one-fifth of a second clocking units, is read in the Answer window, and can be positive or negative, depending on the speed differential between the previously run track and the current track, and the age and weight improvements.

Super Race-O-Matic

Figure 2 shows the front and back of the Super Race-O-Matic (ROM) slide rule, and Table 1 lists the factors used for this rule. Final ratings range from 50 to 100 points. The first ROM factor is the average of *DRF* speeds from the last three completed races obtained from slides and scales 1 to 3. The average speed is entered on the reverse of the rule on scale 4. Next, total finish points from the last three races run, as listed in the *DRF*, are tallied, with 3 points for W, two points for P, and 1 point for S, and entered on scale 5. If a past distance has been run longer than today's race, the best time at distance is entered on scale 6 if speed is over 75; otherwise the slide is set at the less-than-75 speed graduation. The final rating is read under the *DRF* listed current race weight value on the weight scale.

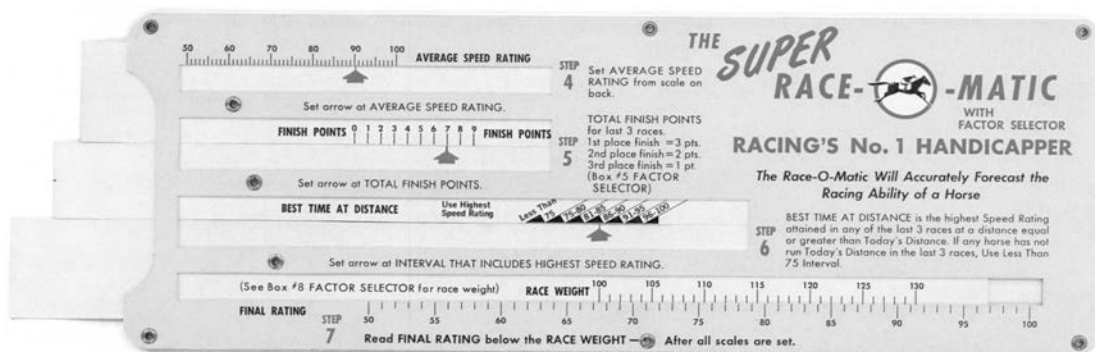


Figure 2a. The front of The Super Race-O-Matic

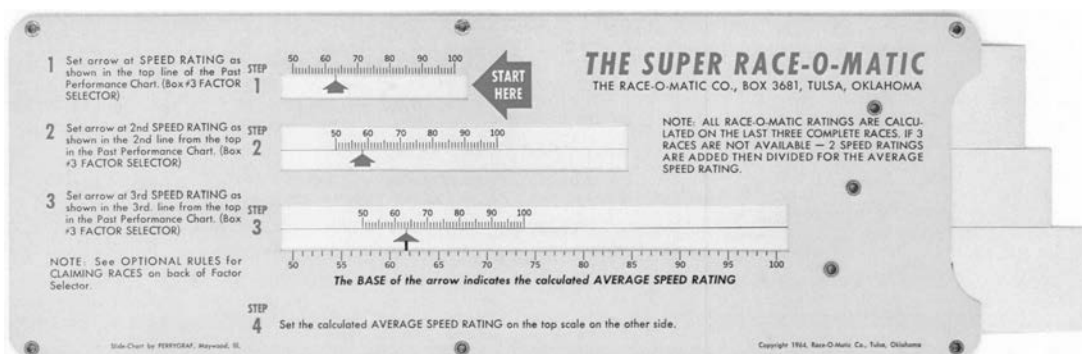


Figure 2b. The back of The Super Race-O-Matic

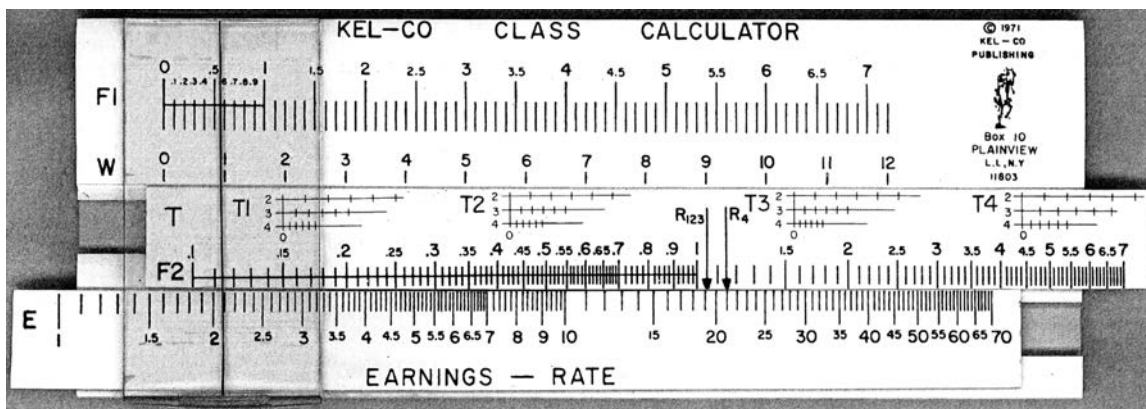


Figure 3. The Kel-Co Class Calculator

Kel-Co Improved Class Calculator for Thoroughbred Race Horses

The Kel-Co II slide rule is shown in Figure 3. All scales, slides, and graduations are on the front face of the slide rule. Obtained Kel-Co II ratings reflect a given horse's racing potential, in terms of what is called established class or expected earnings rate, expressed in 1971 thousands of dollar units (\$K).

The earlier model Kel-Co thoroughbred slide rule model (not pictured) had a black cursor with small window read-outs [11] which was replaced in the Kel-Co II by the familiar clear slide rule cursor with a hairline indicator. As shown in Table 1, the Kel-Co II uses DRF data from races in the current year; if there were less than four races, data from the last two years are used. First, the cursor hairline is set over the number of first place wins from all tracks on the W scale. The T slide has four subscale track groupings, T1 to T4, based on four geographical track circuits that reflect purse and speed differences. The T1 subscale has graduations for 2nd, 3rd and 4th places, for races at Delaware, Florida (Hialeah), Kentucky, and New York tracks. The T2 subscale has another set of graduations for races at Florida (Calder, Gulfstream & Tropical), Louisiana, New Jersey, and Pennsylvania. The T3 subscale is graduated for finishes at Arkansas, Maryland, Colorado and all other states not listed. The T4 subscale is for California, Illinois, and Nebraska tracks. The proper T subscale is moved under the hairline. The hairline is then moved to the right for the number of place (2), show (3) and fourth (4) finishes at the different tracks that a given horse may have run. Effectively the hairline is moved to the right for each money finish. The cumulative finish position increments are read from the hairline setting above on the F1 scale, the effective value of past finishes from all in-the-money races (values range from 0 to 7.2). The F1 reading is transferred to the F2 scale by moving the F2 slide under the hairline to the same value (0 to 7) on the F2 scale. Next, the Earnings slide and scale is centered under the hairline at the total 1971-dollar earnings, in \$K, of the horse for the races considered. The hairline is then moved over to either the R123 or the R4 arrow, depending on whether

the current race is run at a T1, T2, T3 track or a T4 track, and the 1971 expected earnings rate reflecting the established class is read off the E scale at the hairline below the proper arrow.

Derby Demonstration

Perhaps the most famous of all horse races is the "Run for the Roses", the Kentucky Derby. This race, the first leg of the Triple Crown of thoroughbred racing, is run each year on the first Saturday in May at Churchill Downs in Louisville, Kentucky. To provide a demonstration and test of the accuracy of prediction for each of the slide rules, statistical data were taken from the *DRF* for Derby Day, May 5, 2001 [10], and performance rating prognostications for each of the 17 derby horses were obtained from each slide rule. Table 2 shows a comparison of results from the three slide rules listed in the last three columns. To compute performance ratings on the Kel-Co II handicapping rule, earnings data from 2000 and 2001 were adjusted to 1971-dollar equivalents with the use of an internet inflation adjustment calculator [12], earnings and 1971-adjusted earnings are displayed in the table. To simplify reading of final Kel-Co II ratings for comparing entries to one another, figures are listed in ten-thousand 1971-dollar units carried to one decimal place. The first two columns in the table list the race finish positions and names of the derby horses run.

Column three, post position, indicates how close to the inside rail each horse was at the starting gate, and also indicates the program number of the horse that must be used to make a pari-mutuel window bet. The top three money horses were Express Tour, Monarchos, and Balto Star.

Average speed ratings for the ROM computations are also shown in the table, and indicate that the fastest averages, over 95, were turned in by Congaree, and AP Valentine. However, true handicapping requires multivariate consideration of combined factors rather than a single factor.

Top Slide Rule Picks

The Minit slide rule combining age, weight, and track data predicted four horses with a one-second or more time advantage; in order, they were Startac, Songandaprayer,

Monarchos, and AP Valentine. The ROM slide rule, combining speed with past finish and weight data indicated the top horse as Congaree (88), with tied second place ratings for Point Given and Express Tour (87), followed close on by Monarchos (86), and Millennium Wind and Balto Star tied with ratings of 85, after which a natural break in ratings occurred from 84 to 83. The Kel-Co II slide rule, heavily weighting earnings and finish position with track data, ranked top-down contenders from Fifty Stars, Express Tour, Millennium Wind, Monarchos, and Songandaprayer to Point Given before a gap occurred at the \$70,000 earnings mark.

Slide Rules vs. The Experts

The morning line odds (Table 2, column 4) reflect the anticipated betting patterns of the race crowd estimated by the track experts and race industry professional handicappers. Modern morning line odds in the year 2001 reflect state-of-the-art technology, including computer simulated algorithmic sophistication far beyond the four or five factors considered by the slide rule predictions. As shown, the ‘chalk horse’ Point Given (No. 17), the favorite expected to be most heavily bet, carried morning line odds of 9 to 5 (same as 1.8 to 1). Point Given was tied for second position on the ROM rank order list, and ranked 6th in Kel-Co II predictions. Morning line odds for the second pick Congaree (No. 8) were at 5 to 1; the ROM rule listed Congaree as the top pick horse. The

morning line third pick was tied for Millennium Wind (No. 2) and Monarchos (No. 16) both at 6 to 1. Both the Minit and the ROM slide rules had Monarchos ranked as third, and the Kel-Co II slide rule ranked Millennium Wind third, with Monarchos as fourth. While predictions from the slide rules and the Derby experts did not match exactly, the slide rules and the experts’ morning line rankings effectively ruled out eight of the 17 entries in the field.

Betting Strategy

Many strategies exist for wagering. For example, in an “across the board” bet, three \$2 bets, one each for win, place, and show could be made on a single top-rated horse, and, if it finished first all three bets would pay off. Unfortunately, none of the slide rules picked the same horse for first place. Another strategy often used is ‘bet favorites to win’. Rather than placing multiple bets on one horse, win bets are distributed among several favorites. To bet the morning line favorites, three horses could be bet, each one to win at \$2 per bet; however, the third position was tied with Millennium Wind and Monarchos at 6 to 1, so four \$2 bets would be required to cover the top three positions. The same “bet favorites to win” strategy could be used for the slide rule picks. The Minit slide rule clearly identified four top-rated horses, each with a one-second or more time edge. Likewise, the ROM or Kel-Co II four top-rated horses could be bet in the same fashion.

Table 1. Comparison of Three Horse Race Handicapping Slide Rules

Year	Slide Rule/Manufacturer	Scales	s/f*	Variables/Factors
1959	Edward’s ‘Minit’ Handicapper Minit Calculator Co. 622 Plymouth Ct. Chicago 5, ILL.	A	s	Age of horse and month of best previous race
		B	s	Weight carried, current vs. best previous race
		C	s	Location name of current track**
		D	s	Track where best previous race was won
		-	f	Conversion chart for best time to new distance
1964	The Super Race-O-Matic (Herman Nichols) Box 3681 Tulsa, OKLA.	1.	s	Speed rating of last completed race
		2.	s	Speed rating of 2nd to last completed race
		3.	s	Speed rating of 3rd to last completed race
		4.	s	Average speed rating from slides 1, 2, and 3
		5.	s	Total finish points last 3 races, W=3, P=2, S=1
		6.	s	Best time at current track distance or greater
		7.	f	Final rating read below the Race Weight scale
1971	Kel-Co Improved Class Calculator for Thoroughbred Race Horses (Professor Alton Kelsey) Kel-Co Publishing Corp. Plainview, L. I., N. Y.	F1	f	Effective value of ‘in-money’ finish positions
		W	f	Wins 0 to 12 for all races in current year
		F2	s	Finish positions, with 4 T racing circuit*** and 2 R rating reference line subscales
		E	s	Earnings and final class rating
		-	s	Clear hairline indicator cursor

Notes: * Indicates if scales are sliding (s), or fixed (f)

** 106 race tracks indicated by two- or three-letter initials from the *Daily Racing Form*

*** Four geographic race track circuits based on variations in purse distributions

Table 2. Predictive Forecasts and Outcomes for 127th Kentucky Derby, May 5, 2001

Finish Position	Horse	Post Position	Morning Line Odds	Final Odds\$1	2001 \$K	1971 \$K*	Speed Rating**	Slide Rule Ratings		
								Minit	ROM	Kel-CoII
1	Monarchos	16	6-1	10.50	789.6	184.3	91.3	1.1	86	9.7
2	Invisible Ink	13	30-1	55.00	179.5	41.9	85.3	.9	79	3.1
3	Congaree	8	5-1	7.20	512.4	119.6	97.0	.4	88	6.8
4	Thunder Blitz	4	30-1	25.40	167.4	39.1	88.3	.8	82	3.7
5	Point Given	17	9-5	1.80	600.0	140.1	93.7	.9	87	8.1
6	Jamaican Rum	15	50-1	20.20	198.1	46.2	90.7	.9	80	4.8
7	A P Valentine	9	15-1	19.90	39.1	9.1	95.0	1.0	82	1.2
8	Express Tour	6	15-1	18.10	1613.5	376.7	94.3	.9	87	15.2
9	Fifty Stars	5	50-1	43.60	552.3	128.9	90.7	-.8	82	16.8
10	Startac	12	50-1	102.40	130.2	30.4	90.0	1.4	82	3.3
11	Millennium Wind	2	6-1	9.90	679.6	158.7	90.7	.0	85	10.1
12	Arctic Boy	7	50-1	101.20	54.9	12.8	82.0	.8	79	1.3
13	Songandaprayer	1	20-1	35.90	303.0	70.7	86.0	1.2	81	8.8
14	Balto Star	3	8-1	8.30	716.4	167.2	91.3	.9	85	6.7
15	Dollar Bill	10	10-1	6.60	195.0	45.5	88.3	-.8	81	6.4
16	Keats	14	30-1	95.00	251.3	58.7	82.0	.3	81	5.2
17	Talk is Money	11	50-1	47.10	89.3	20.8	82.3	-.8	78	2.3

Notes: All horses in the 1-1/4 mile route race were three-year-olds and carried 126 pounds.

* Dollar earnings converted from 2000/2001 to 1971 dollars for Kel-Co II earnings scale based on Consumer Price Index-Historical Statistics and U.S. Statistical Abstracts (Friedman, 2000)

** Average track speed rating of horse based on the last three races run

Outcomes and Payoffs

Monarchos (No. 16) finished first by a decisive $4\frac{3}{4}$ length margin, with a time of 1 minute, $59\frac{4}{5}$ seconds, the second fastest speed ever recorded at the Kentucky Derby. Pari-mutuel payoffs, listed as final odds in Table 1, indicate that Monarchos paid \$10.50 to every \$1 bet. Since payoffs are made returning the winning bet investment with the return on investment, a \$2 bet on Monarchos paid off at \$23.00. Of course the other three \$2 win bets were losses. These findings indicated that if the four top-rated horses from any of the three slide rule prognostications had been bet to win (four \$2 bets), that the winner, Monarchos, would have been selected, and would have returned \$23.00 for the \$8 play.

Acknowledgement

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