Drivers of Handle: An Analysis of XXX Races

Agenda

- Project Synopsis
- Executive Summary
- Summary of Results for Individual Tracks
- Track Level Regression Models
- Track Level Simulator
- Follow-Up Analysis
- Track Level Decision Trees
- Data Exploration
- Data Preparation

Project Synopsis

Background

There are over 50,000 thoroughbred races run the U.S. annually. These races generate nearly $15 billion in handle. XX Incorporated (XX) tracks account for nearly 4,000 of the races and approximately $2 billion of the wagering. XX Incorporated is committed to **improving its market share** (as measured by handle) in the North American thoroughbred racing industry.

Objectives

XX is seeking in-depth, statistically sound, analytic investigation of historic thoroughbred races in the U.S. and Canada to **determine the race characteristics that drive handle**, the relationship between these characteristics, and the business impact and opportunities that may result from altering the characteristics.

Available Data

Data for all races taking place in US and Canada during the calendar years 2005, 2006 and YTD 2007.

Scope

Specific models to be built for the four individual tracks:

- ✓East
- ✓West
- ✓North
- ✓South

Executive Summary

Analysis of XX race data reveals some of the key drivers of handle as:

	Drivers of Handle	Impact on Handle
Race Characteristics	Number of runners	+ve
	Purse	+ve
	Race Sequence	-ve for the first 3 races
	Sex Restriction	-ve for ‘B’ & ‘F’
	Track Surface	-ve for Dirt
Time Characteristics	Day of Week	+ve for Friday, Saturday, Sunday, -ve for Tuesday
	Holiday	+ve

Key Drivers of Handle for XX

Analysis of XX race data reveals some of the key drivers of handle as:

	Drivers of Handle	Impact on Handle
Race Characteristics	Number of runners	+ve
	Purse	+ve
	Race Sequence	-ve for the first 3 races
	Sex Restriction	-ve for ‘B’ & ‘F’
	Race Type	+ve for ALW, STK, MSW
Time Characteristics	Races within 7 minutes	-ve
	Day of Week	+ve for Friday, Saturday, Sunday, -ve for Tuesday
	Hour of Day	+ve for 1pm-4pm
	Holiday	+ve

An Ideal Race for XX

Ideal Values	
Race Number	8
Number of Runners	12
Month	4
DOW	7
Purse	$ 50,000
HOD	14
Sex Restriction	A
Race Type	STK
Holiday Indicator	0
# Race in 7 minutes	6

Ideal Race

- Between 2 and 3 pm. Next best 3 to 4pm or 1 to 2 pm

- Should be the 4th to 8th race of the day

- Saturday. Next best Friday or Sunday

- For every $1 increase in purse the handle increases by $1.3. Jump after $86k.

- No sex restriction or restriction = A

- Race type should be STK, ALW or MSW

- Number of race happening in 15 minutes around the race seems to be a factor

- April is the best month. May next.

- Number of runners should be high

Average Handle	**$ 791,642**
Expected Handle At Ideal Value	**$ 1,396,967**
% Increase in Handle	**76%**

Key Drivers of Handle for YY

Analysis of YY race data reveals some of the key drivers of handle as:

	Drivers of Handle	Impact on Handle
Race Characteristics	Number of runners	+ve
	Purse	+ve
	Race Sequence	-ve for the first 3 races
	Sex Restriction	-ve for 'B'
	Race Type	+ve for STK
	Track Condition	+ve for 'FM', 'GD','SF', 'YL'
Time Characteristics	Day of Week	+ve for Friday, Saturday, Sunday, -ve for Tuesday
	Hour of Day	+ve for 12pm-1pm and 4pm-5pm
	Holiday	+ve

An Ideal Race for YY

Ideal Values	
Race Number	6
Number of Runners	12
Month	4
DOW	7
Purse	$ 27,000
HOD	16
Sex Restriction	0
Holiday Indicator	0
Race Type	STK
Surface	D
Track Condition	GD

Ideal Race

- Between 12 and 1 pm. Next best 4 to 5pm

- Should be the 4th to 8th race of the day

- Saturday. Next best Friday or Sunday

- For every $1 increase in purse the handle increases by $.66.

- No sex restriction or restriction = A or F

- Race type should be STK

- Number of runners should be high. Handle increases by $30k for every increment in number of runners

- Track condition in (("FM","GD","SF","YL")

Average Handle	**$ 435,855**
Expected Handle At Ideal Value	**$ 766,079**
% Increase in Handle	**76%**

Key Drivers of Handle for AA

Analysis of AA race data reveals some of the key drivers of handle as:

	Drivers of Handle	Impact on Handle
Race Characteristics	Number of runners	+ve
	Purse	+ve
	Race Sequence	-ve for the first 3 races
	Race Type	+ve for MSW
	Track Surface	-ve for Dirt
Time Characteristics	Day of Week	+ve for Friday, Saturday, Sunday, -ve for Tuesday
	Hour of Day	-ve for 12pm-2pm
	Races within 5 minutes	-ve

An Ideal Race for AA

Ideal Values	
Race Number	4
Number of Runners	12
Month	2
DOW	7
Purse	$ 32,000
HOD	14
Race Type	MSW
Surface	T
# Race in 5 minutes	2

Ideal Race

- Between 2 and 3 pm.

- Should be the 4th race of the day

- Saturday. Next best Friday or Sunday

- For every $1 increase in purse the handle increases by $.71.

- Race type should be MSW

- Number of runners should be high. Handle increases by $27k for every increment in number of runners

Average Handle	**$ 430,085**
Expected Handle At Ideal Value	**$ 717,641**
% Increase in Handle	**67%**

Key Drivers of Handle for BB

Analysis of BB race data reveals some of the key drivers of handle as:

	Drivers of Handle	Impact on Handle
Race Characteristics	Number of runners	+ve
	Purse	+ve
	Race Sequence	-ve for the first 3 races
	Race Type	+ve for STK, STR, MSW
	Sex Restriction	-ve for ‘B’
Time Characteristics	Day of Week	+ve for Friday, Saturday, Sunday, -ve for Tuesday
	Hour of Day	-+ve for 2pm-3pm

An Ideal Race for BB

Ideal Values	
Race Number	4
Number of Runners	12
Month	5
DOW	7
Purse	$ 23,000
HOD	16
Sex Restriction	B
Holiday Indicator	0
Race Type	MSW
Surface	T
Age Restriction	34
Distance	200
# Race in 4 minutes	3
# Race in 3 minutes	3
# Race in 2 minutes	2

Ideal Race

- Between 2 and 3 pm.

- Should be the 4th race of the day

- Saturday. Next best Friday or Sunday

- For every $1 increase in purse the handle increases by $.7.

- No sex restriction or restriction = A or B

- Race type should be STK, STR, MSW

- Number of runners should be high. Handle increases by $23k for every increment in number of runners

Average Handle	**$ 296,413**
Expected Handle At Ideal Value	**$ 513,166**
% Increase in Handle	**73%**

Track Level Regression Models

Regression Modeling Approach

- The modeling approach is a combination of Decision Trees and Classical Linear Regression Modeling.
- The regression analyzes each variable individually and attempts to isolate the impact of each variable individually, ceteris paribus
- Decision trees analyze the impact of combinations of variables. We identified the important interaction effects and included them in our model
- This increases the overall predictive power of the model and brings the predicted curve closer to the actual one.

Relative Importance of Key Drivers of Handle – Comparison of Tracks

Label	Churchill Down	Arlington Park	BB Race Course	Fair Grounds
Number of Runners	42266	31720	23072	27088
Race Number = 1	-308451	-111212	-67142	-76308
DOW = Saturday	157184	83974	84842	77682
DOW = Friday	53917	42982	39172	16981
Purse	1.27	0.66	0.70	0.71
Sex Restriction = B	-27508	-10052		

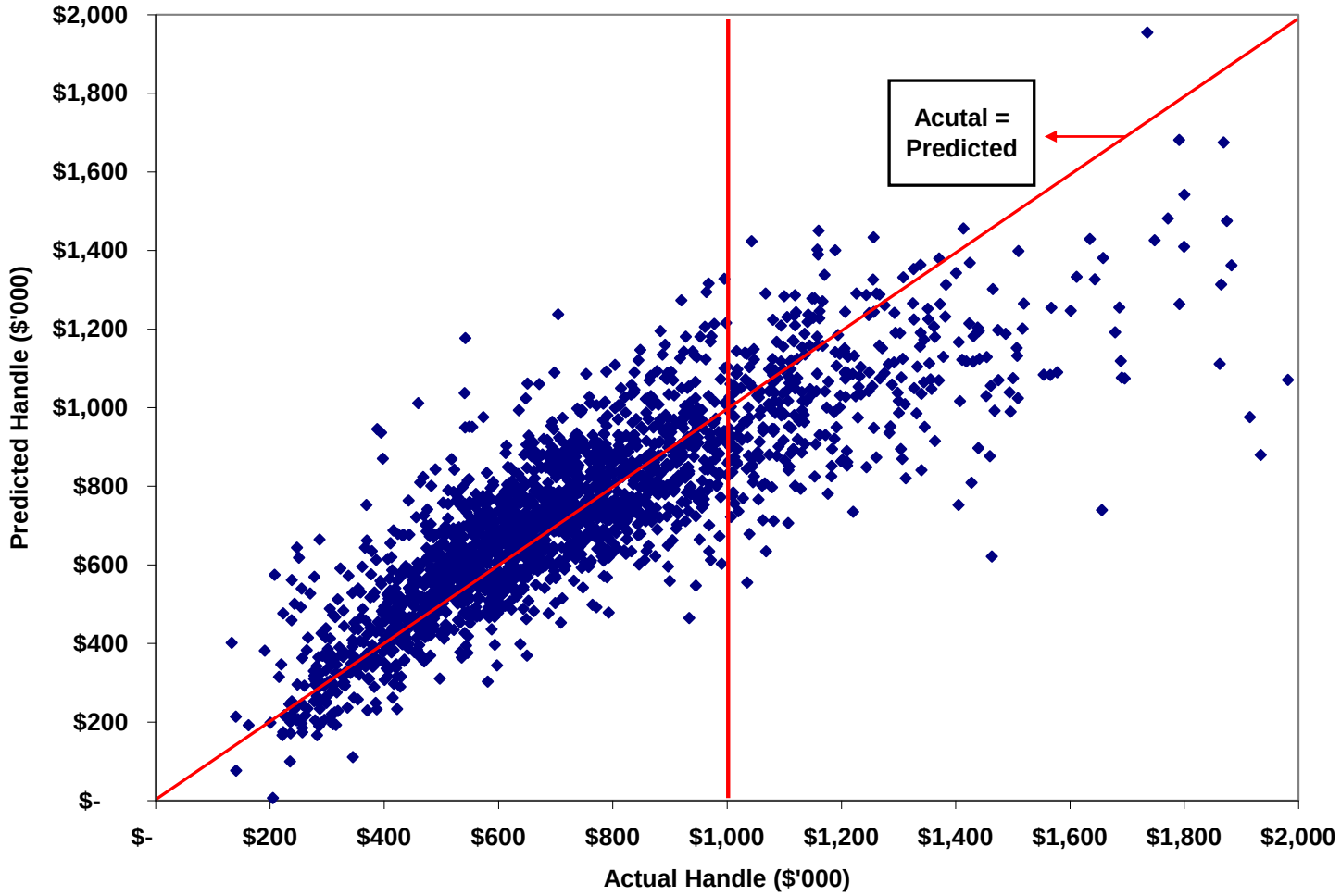
Label	Direction	Churchill Down	Arlington Park	BB Race Course	Fair Grounds
Number of Runners	+ve	4	2	1	3
Race Number = 1	-ve	1	2	3	4
DOW = Saturday	+ve	2	3	1	4
DOW = Friday	+ve	3	2	1	4
Purse	+ve	3	4	1	2
Sex Restriction = B	-ve	1	2		

Note that for BB handle sensitivity to purse is more than 1 while for other races it is less than 1

East – Regression Model

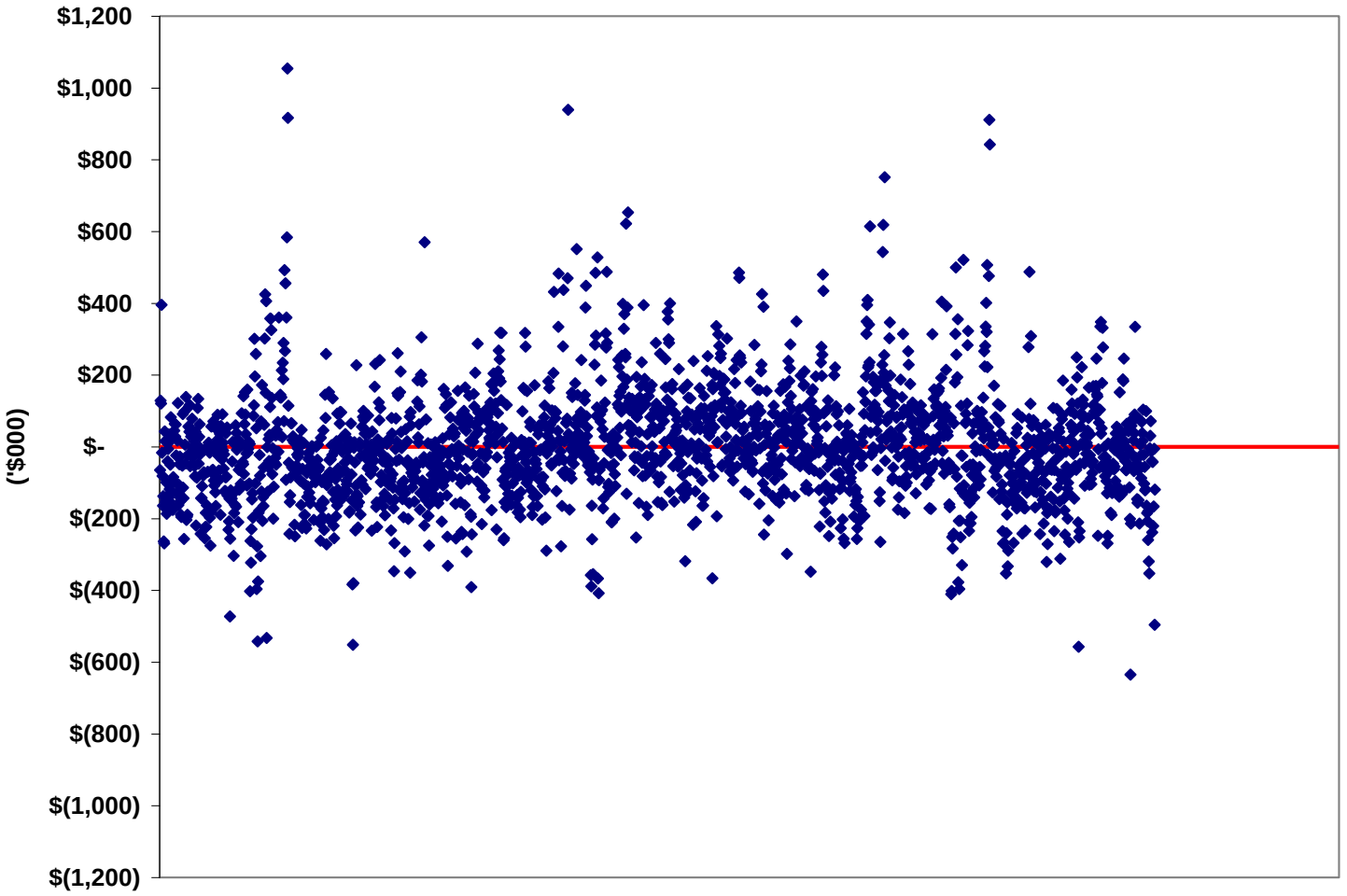
Variable	Label	Mean	Minimum	Maximum	Coefficient
Intercept	**Constant**				287563
race_number_1	**Race Number = 1**	10%	0	1	-308451
number_of_runners	**Number of Runners**	9	3	14	42266
node2_cd	**Purse <86k + Race Num >9**	10%	0	1	269047
dum_month_MAY	**Month = May**	30%	0	1	146838
dow_7	**DOW = Saturday**	21%	0	1	157184
purse_usa	**Purse**	$ 42,809	$ 14,000	$ 750,000	1.3
dow_5	**DOW = Thursday**	18%	0	1	-102705
race_number_2	**Race Number = 2**	10%	0	1	-132829
node3_cd	**Race Type = ("ALW","STK","MSW") + Sat or Sun**	19%	0	1	105376
dow_4	**DOW = Wednesday**	16%	0	1	-101891
dow_3	**DOW= Tuesday**	3%	0	1	-207874
HOD_19	**HOD = 7pm - 7:59pm**	2%	0	1	-256536
race_number_3	**Race Number = 3**	10%	0	1	-110876
HOD_14	**HOD = 2pm - 2:59pm**	18%	0	1	85169
dum_month_APR	**Month = April**	2%	0	1	202566
dum_month_JUN	**Month = June**	28%	0	1	62861
HOD_15	**HOD = 3pm - 3:59pm**	19%	0	1	70472
dum_month_JUL	**Month = July**	10%	0	1	81531
n_7min	**# Races in 7 min**	6	1	19	-6304
node1_cd	**Purse >= 86k**	5%	0	1	112755
node5_cd	**Number of Runners <= 7**	34%	0	1	-46016
HOD_13	**HOD = 1pm - 1:59pm**	17%	0	1	57756
dow_6	**DOW = Friday**	20%	0	1	53917
dum_sex_restrict_B	**Sex Restriction = B**	33%	0	1	-27508
dum_sex_restrict_F	**Sex Restriction = F**	11%	0	1	-35452
HOD_18	**HOD = 6pm - 6:59pm**	5%	0	1	-40476
dum_holi	**Holiday**	9%	0	1	30125
race_number_8	**Race Number = 8**	10%	0	1	26421
HOD_20	**HOD = 8pm - 8:59pm**	0%	0	1	-232315

East– Actual Handle & Model Predicted Handle



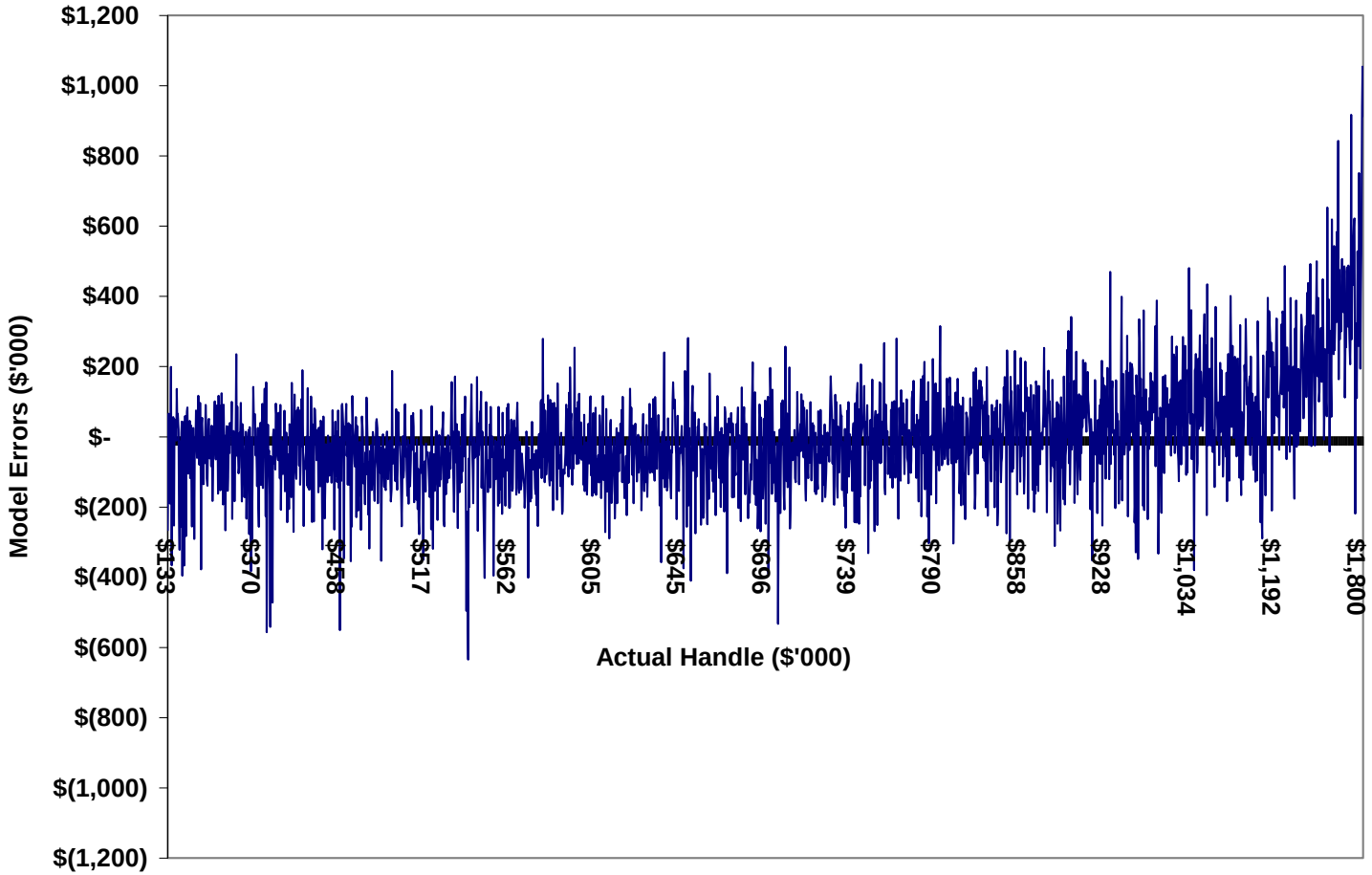
For higher levels of handle (over $1M), the model tends to under-predict the actual handle.

East– Model Errors



As desired, model errors seem to be evenly distributed around zero

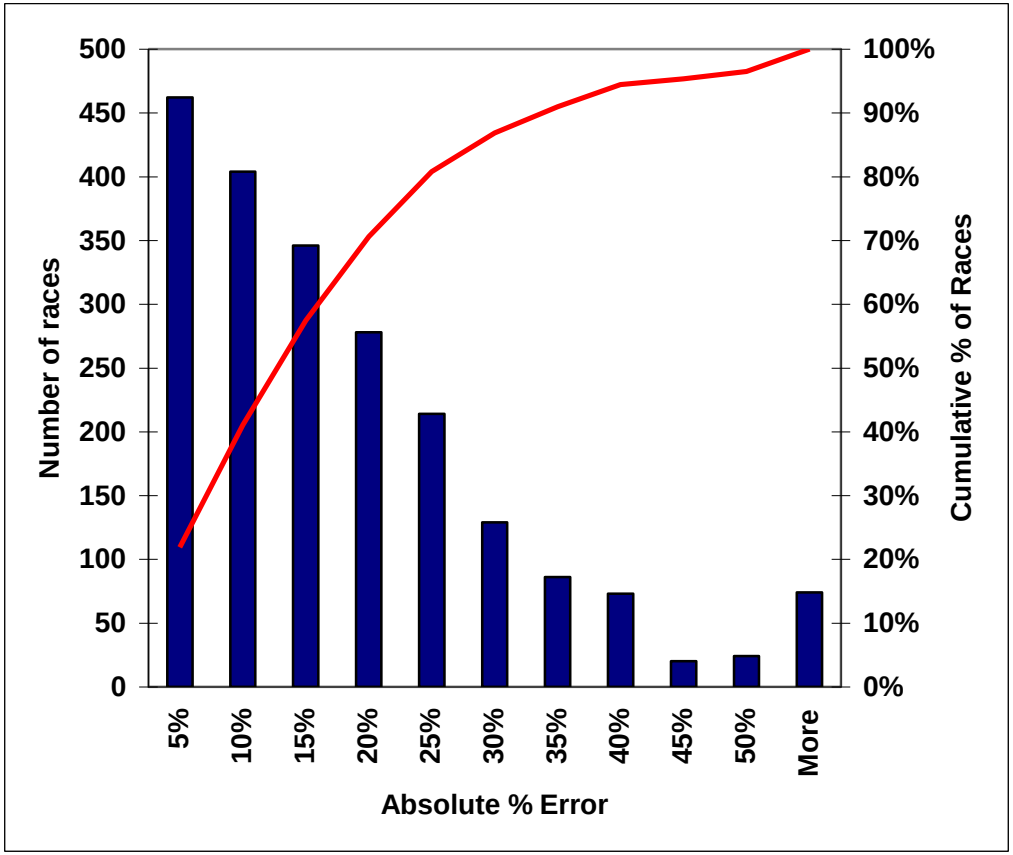
East– Model Errors Ordered by Increasing Handle



Model errors variance remains fairly constant with increasing handle

East– Model Percent Errors

Absolute % Error Range	*Number of Races*	*% of Races*	*Cumulative % of Races*
5%	462	22%	22%
10%	404	19%	41%
15%	346	16%	57%
20%	278	13%	71%
25%	214	10%	81%
30%	129	6%	87%
35%	86	4%	91%
40%	73	3%	94%
45%	20	1%	95%
50%	24	1%	96%
More	74	4%	100%

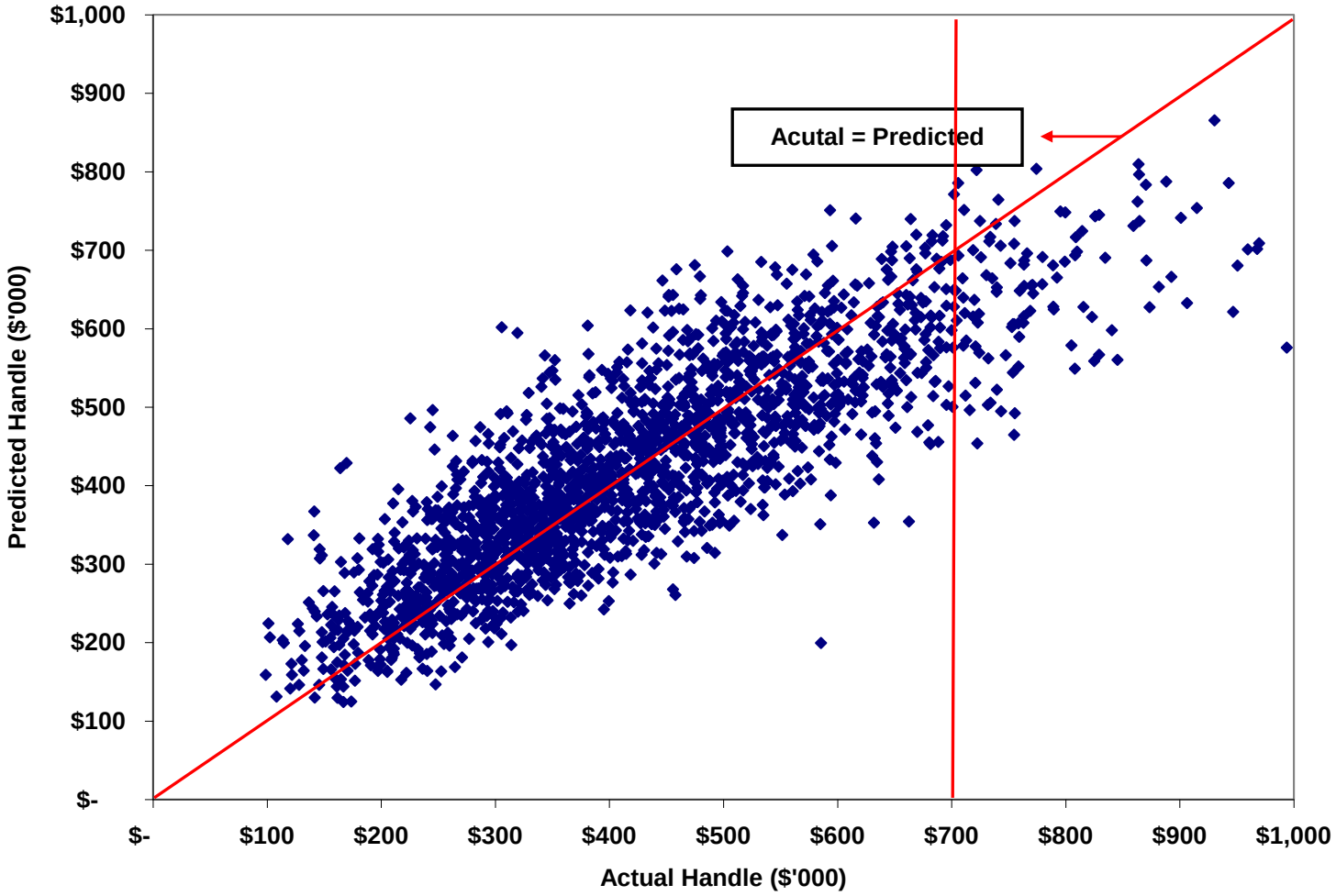


Mean Absolute Percent Error (MAPE) = 16.5%

West– Regression Model

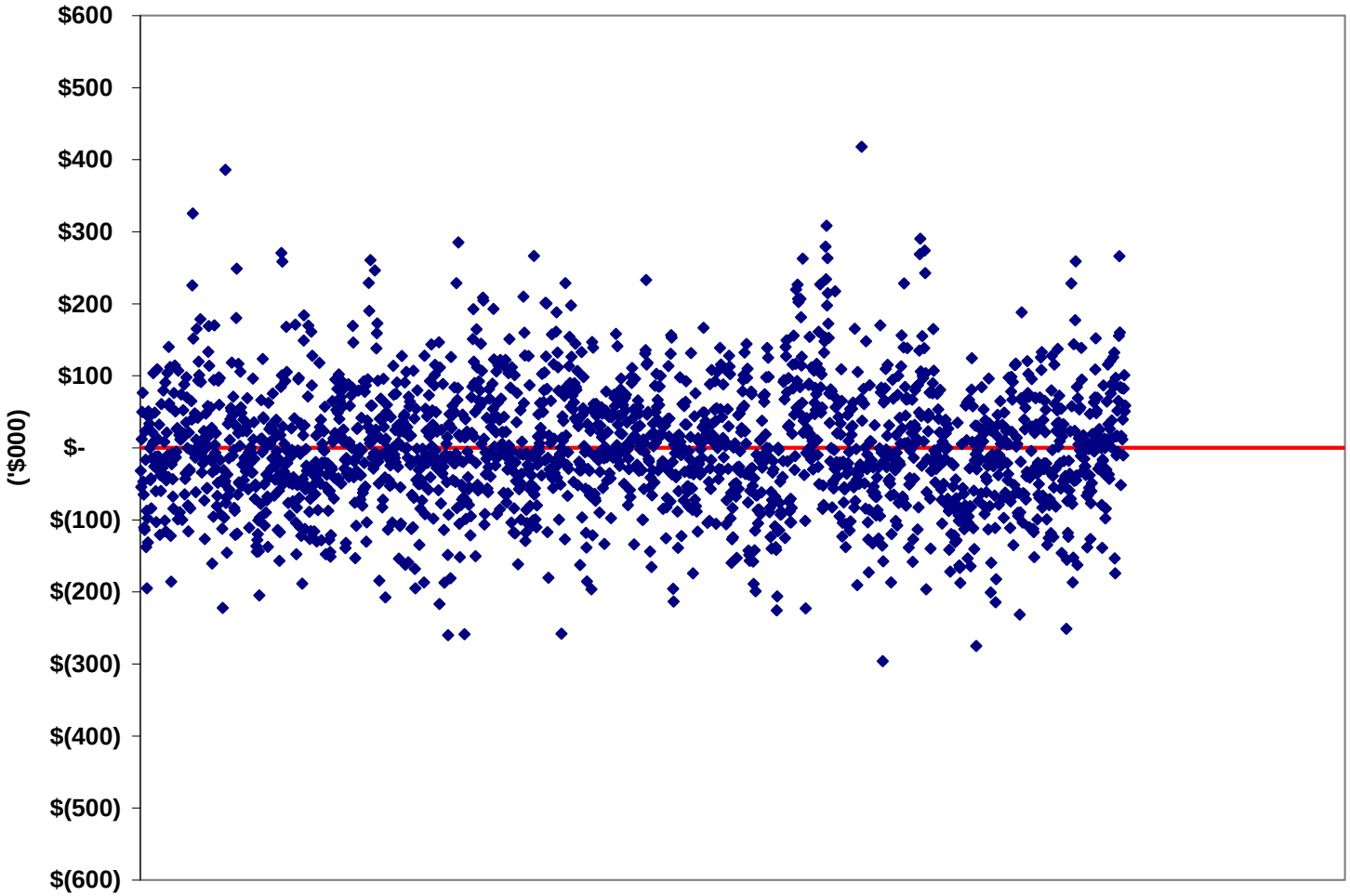
Variable	Label	Mean	Minimum	Maximum	Coefficient
Intercept	**Constant**				278975
number_of_runners	**Number of Runners**	8	3	14	31720
dum_month_MAY	**Month = May**	23%	0	1	-105272
dum_month_JUN	**Month = June**	26%	0	1	-81379
race_number_1	**Race Number = 1**	11%	0	1	-111212
dow_7	**DOW = Saturday**	22%	0	1	83974
dum_race_type_CLM	**Race Type = CLM**	39%	0	1	-58811
dum_race_type_ALW	**Race Type = ALW**	17%	0	1	-62489
dum_race_type_AOC	**Race Type = AOC**	9%	0	1	-67297
dum_race_type_MCL	**Race Type = MCL**	12%	0	1	-59392
dum_race_type_MSW	**Race Type = MSW**	15%	0	1	-53023
dow_6	**DOW = Friday**	21%	0	1	42982
node2_ap	**number_of_runners > 7 and race_number >4**	37%	0	1	35796
dum_month_JUL	**Month = July**	20%	0	1	-35571
purse_usa	**Purse**	$ 26,629	$ 9,500	$ 1,000,000	0.66
race_number_ge9	**Race Number > 8**	14%	0	1	39548
surface_d	**Surface = Dirt**	75%	0	1	-31087
race_number_8	**Race Number = 8**	11%	0	1	-35304
race_number_2	**Race Number = 2**	11%	0	1	-33827
race_number_3	**Race Number = 3**	11%	0	1	-32805
node3_ap	**Surface = D and hod < 16**	52%	0	1	-19764
HOD_12	**HOD = 12pm - 12:59pm**	0%	0	1	185531
dow_3	**DOW= Tuesday**	1%	0	1	-93974
dum_race_type_STR	**Race Type = STR**	2%	0	1	-57833
dow_5	**DOW = Thursday**	19%	0	1	-19664
node6_ap	**track_condition in ("FM","GD","SF","YL") and mon > 6**	15%	0	1	21451
race_number_4	**Race Number = 4**	11%	0	1	-23910
dum_month_AUG	**Month = August**	19%	0	1	16164
dow_1	**DOW = Sunday**	21%	0	1	13433
dum_holi	**Holiday**	7%	0	1	17867
race_number_7	**Race Number = 7**	11%	0	1	-15059
dum_sex_restrict_B	**Sex Restriction = B**	28%	0	1	-10052

West– Actual Handle & Model Predicted Handle



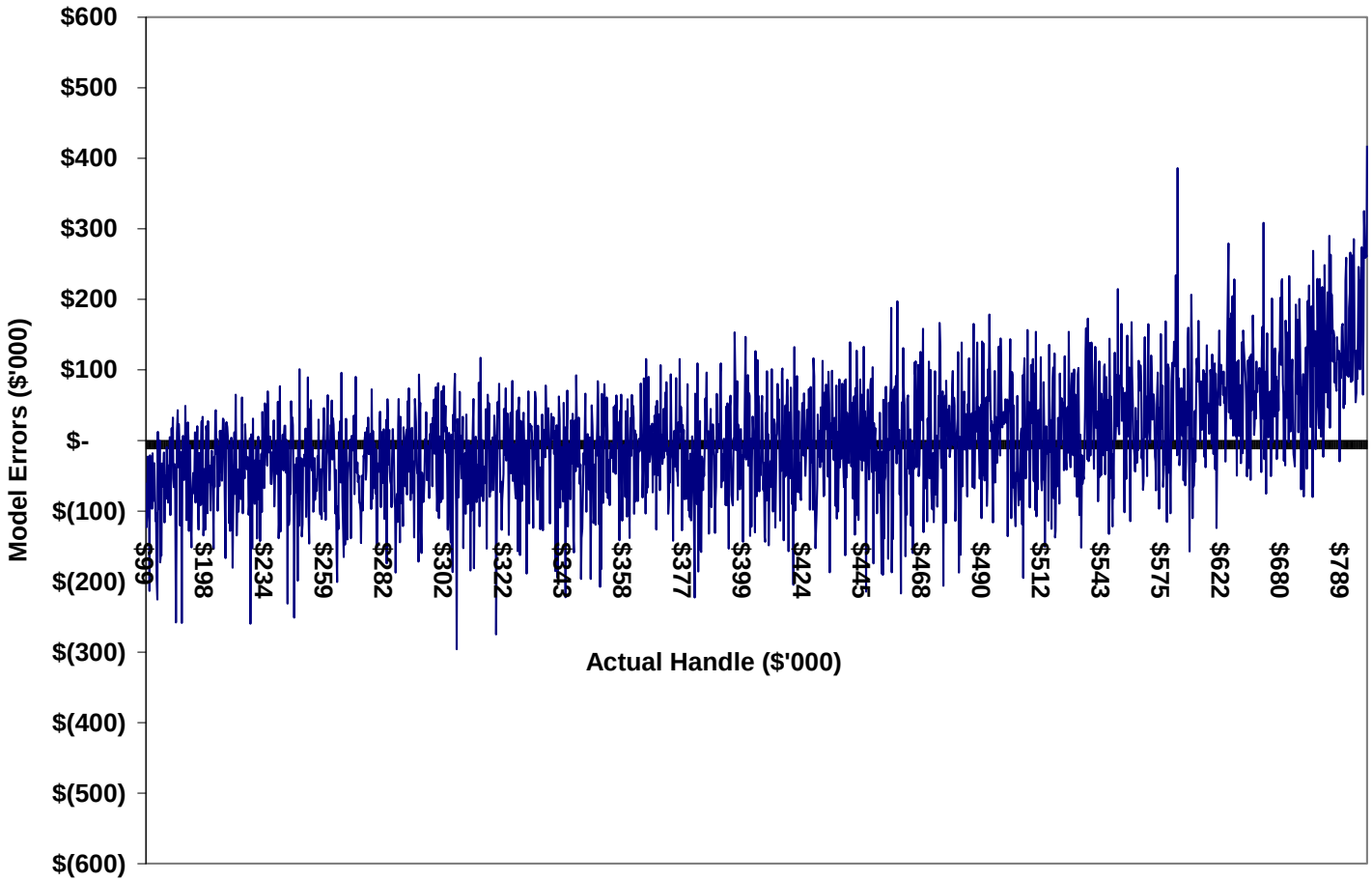
For higher levels of handle (over $700,000), the model tends to under-predict the actual handle.

West– Model Errors



As desired, model errors seem to be evenly distributed around zero

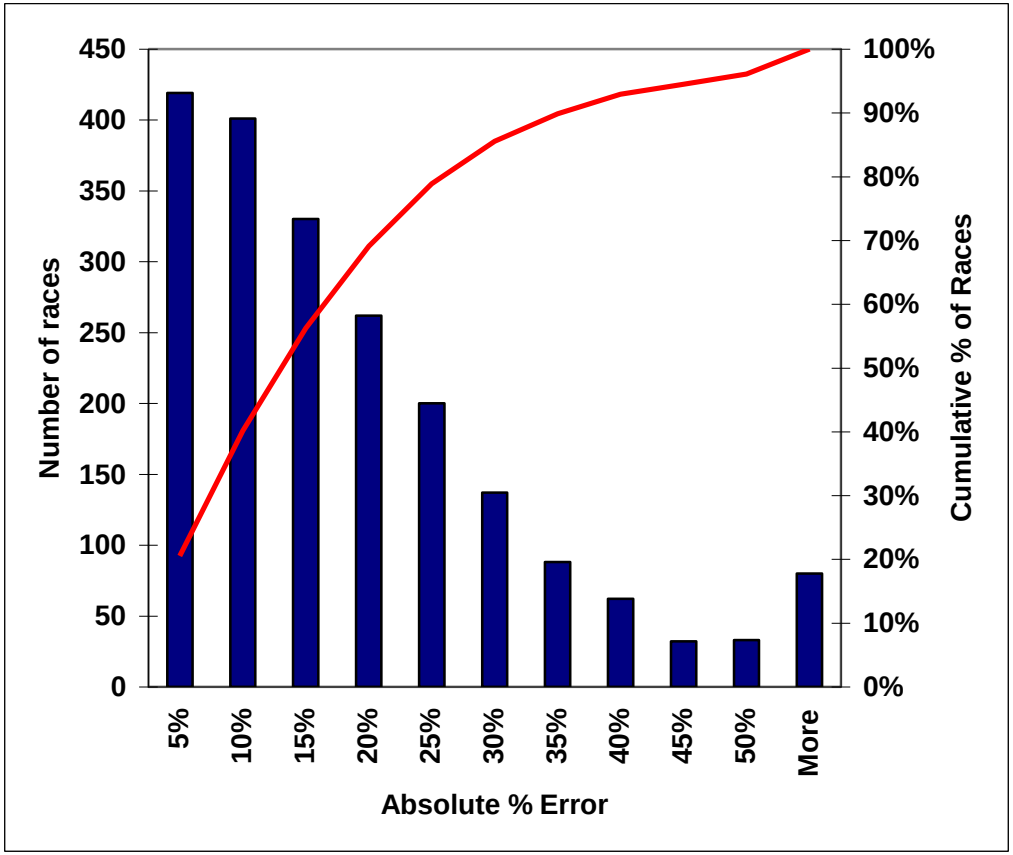
West– Model Errors Ordered by Increasing Handle



Model errors variance remains fairly constant with increasing handle

West– Model Percent Errors

Absolute % Error Range	*Number of Races*	*% of Races*	*Cumulative % of Races*
5%	419	20%	20%
10%	401	20%	40%
15%	330	16%	56%
20%	262	13%	69%
25%	200	10%	79%
30%	137	7%	86%
35%	88	4%	90%
40%	62	3%	93%
45%	32	2%	94%
50%	33	2%	96%
More	80	4%	100%

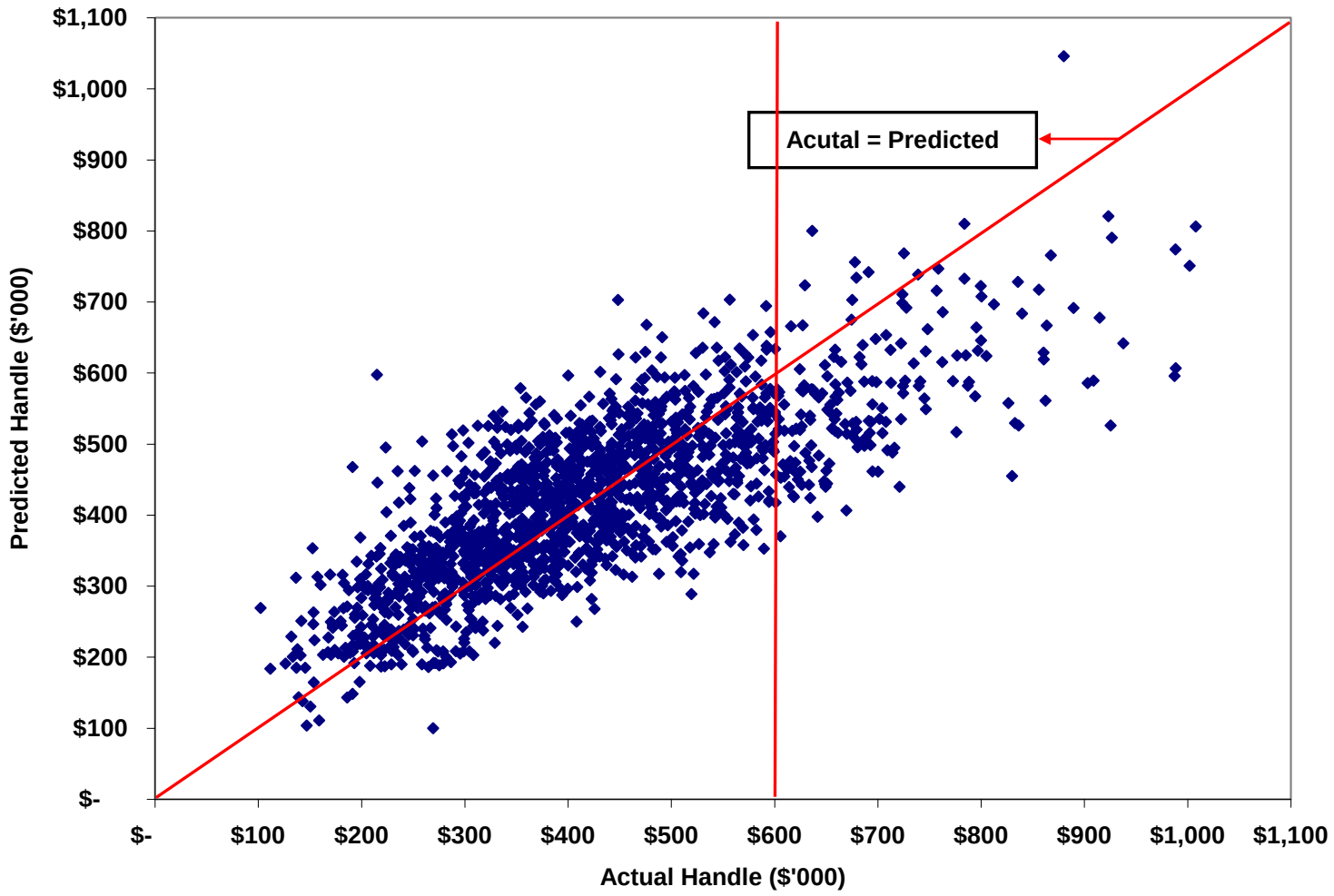


Mean Absolute Percent Error (MAPE) = 17.1%

North– Regression Model

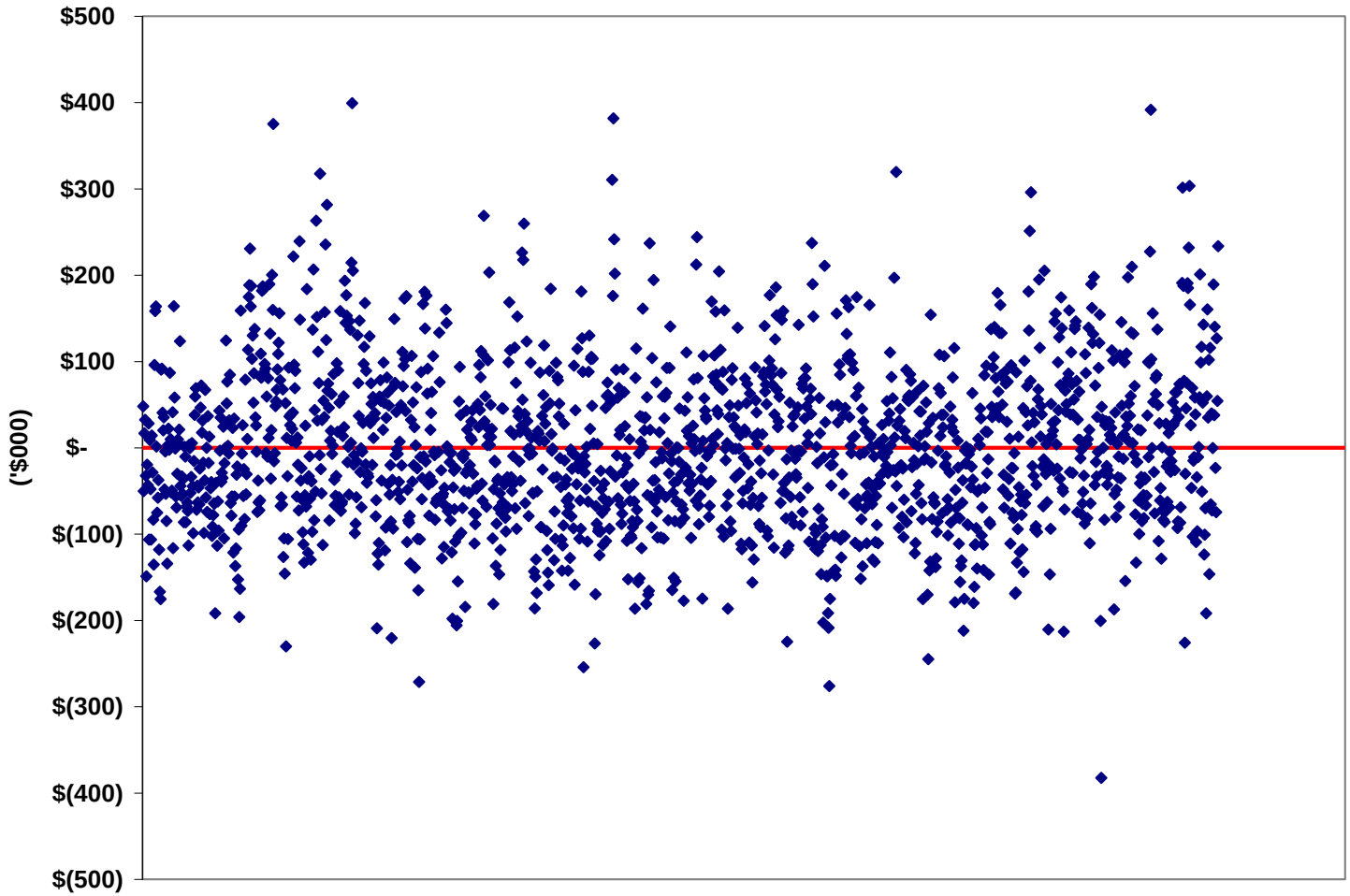
Variable	Label	Mean	Minimum	Maximum	Coefficient
Intercept	**Constant**				120155
number_of_runners	**Number of Runners**	8	4	14	27088
dum_month_FEB	**Month = Feb**	24%	0	1	108506
dum_month_JAN	**Month = Jan**	27%	0	1	99940
dum_month_MAR	**Month = Mar**	22%	0	1	96233
dum_month_DEC	**Month = Dec**	21%	0	1	86427
dow_7	**DOW = Saturday**	22%	0	1	77682
race_number_1	**Race Number = 1**	10%	0	1	-76308
HOD_12	**HOD = 12pm - 12:59pm**	13%	0	1	-63029
HOD_13	**HOD = 1pm - 1:59pm**	23%	0	1	-48422
purse_usa	**Purse**	$ 32,340	$ 8,000	$ 600,000	0.71
node2_fg	**hod > 13 and number_of_runners > 7**	46%	0	1	32386
node3_fg	**purse < 46250 and race_type in ("ALW", "AOC","CLM","MCL","STK","STR")**	74%	0	1	-31459
node4_fg	**purse > = 46250 and Saturday**	6%	0	1	56928
node6_fg	**surface = "T" and Saturday/Sunday**	9%	0	1	40029
n_5min	**# Races in 5 min**	4	1	11	-4467
dow_6	**DOW = Friday**	22%	0	1	16981
dow_3	**DOW= Tuesday**	1%	0	1	-66736
dow_2	**DOW = Monday**	13%	0	1	-16039
surface_d	**Surface = Dirt**	80%	0	1	-12902

North– Actual Handle & Model Predicted Handle



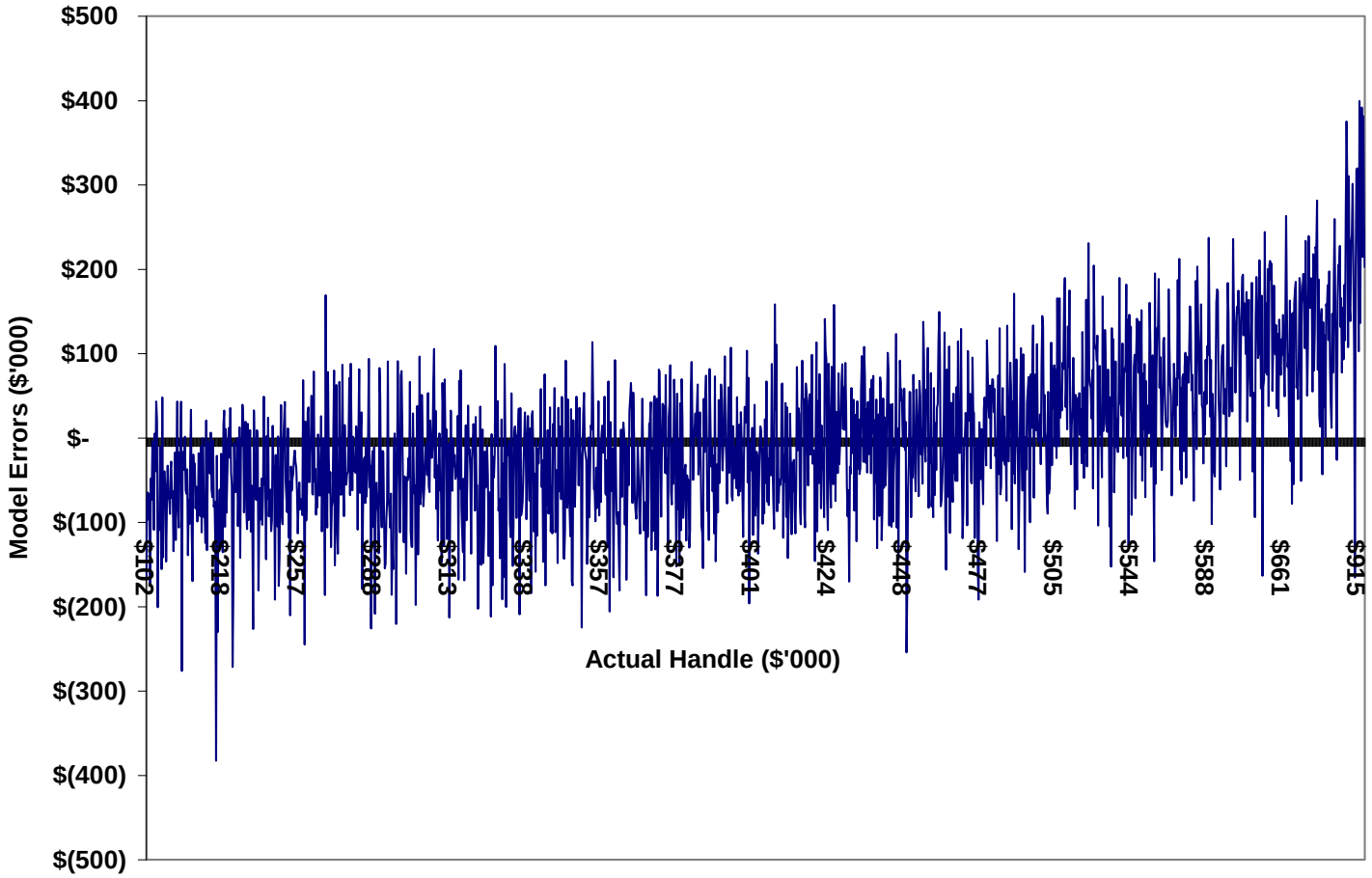
For higher levels of handle (over $600,000), the model tends to under-predict the actual handle.

North– Model Errors



As desired, model errors seem to be evenly distributed around zero

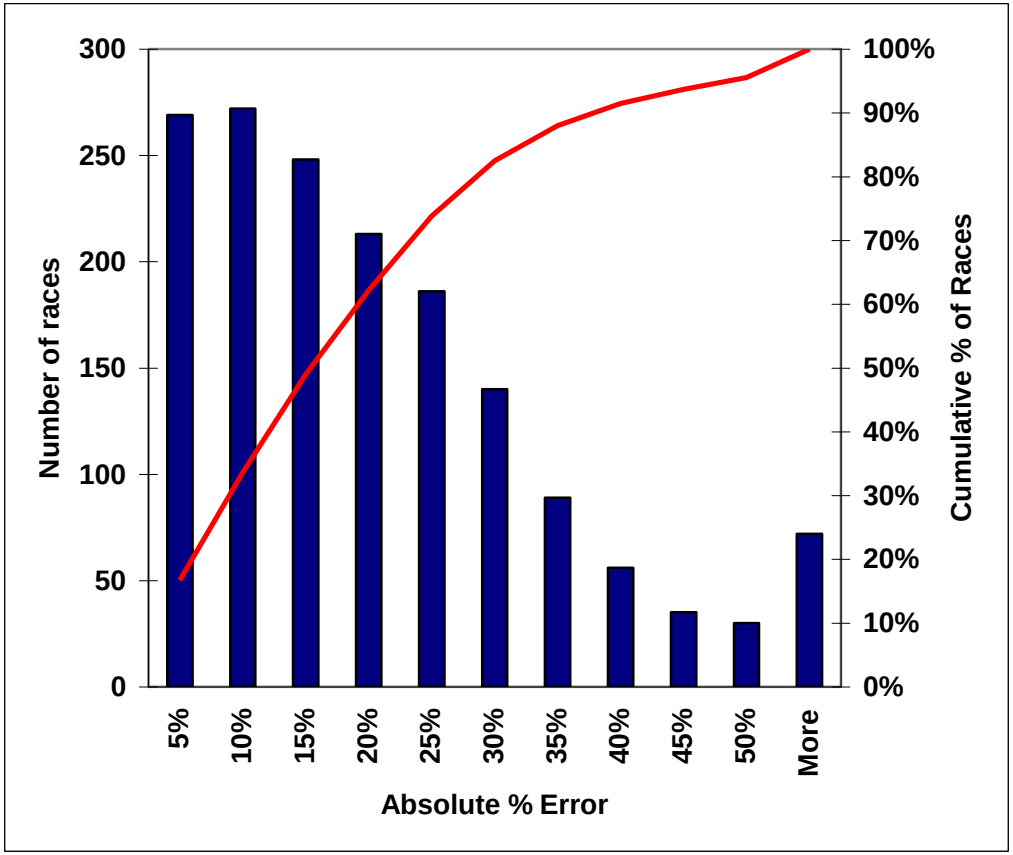
North– Model Errors Ordered by Increasing Handle



Model errors variance remains fairly constant with increasing handle

North– Model Percent Errors

Absolute % Error Range	*Number of Races*	*% of Races*	*Cumulative % of Races*
5%	269	17%	17%
10%	272	17%	34%
15%	248	15%	49%
20%	213	13%	62%
25%	186	12%	74%
30%	140	9%	82%
35%	89	6%	88%
40%	56	3%	91%
45%	35	2%	94%
50%	30	2%	96%
More	72	4%	100%

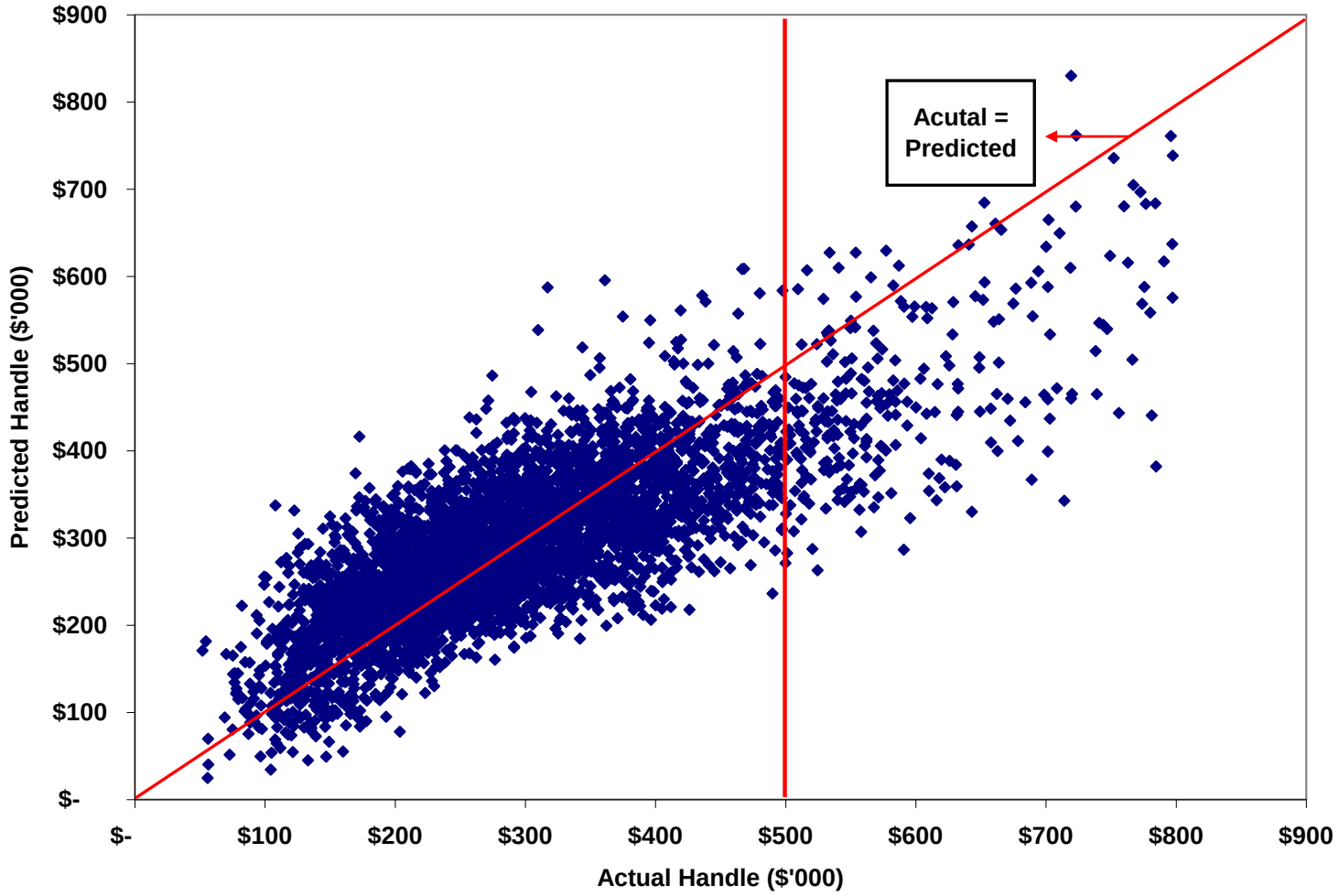


Mean Absolute Percent Error (MAPE) = 18.9%

South– Regression Model

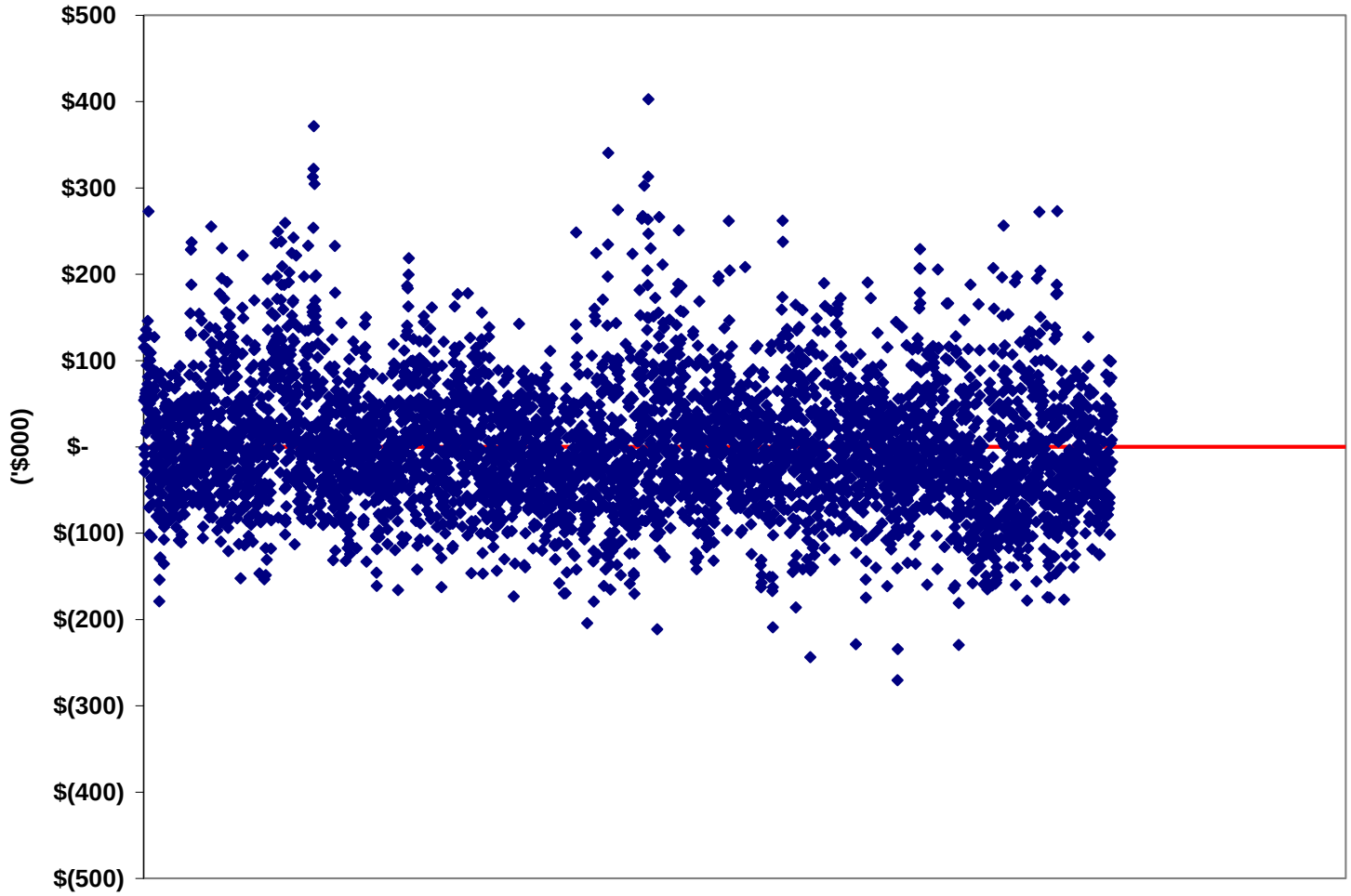
Variable	Label	Mean	Minimum	Maximum	Coefficient
Intercept	**Constant**				83382
dum_month_DEC	**Month = Dec**	18%	0	1	122423
number_of_runners	**Number of Runners**	8	3	13	23072
dow_7	**DOW = Saturday**	24%	0	1	84842
dum_month_JAN	**Month = Jan**	1%	0	1	181245
race_number_1	**Race Number = 1**	9%	0	1	-67142
purse_usa	**Purse**	$ 22,839	$ 7,000	$ 500,000	0.7
dow_6	**DOW = Friday**	19%	0	1	39172
node2_crc	**number of runners > 7 + purse > = 55k**	2%	0	1	85789
dum_month_MAY	**Month = May**	13%	0	1	30067
dum_month_NOV	**Month = Nov**	13%	0	1	25980
dum_age_restrict_3U	**Age Restriction = 3U**	49%	0	1	-16238
n_4min	**# Races in 4 min**	4	1	15	-3073
dum_month_APR	**Month = April**	2%	0	1	51339
node3_crc	**HOD <=12 + NOT Saturday**	10%	0	1	-25725
n_3min	**# Races in 3 min**	4	1	13	-3538
node4_crc	**Race type in ("MSW","STK","STR") + Saturday**	9%	0	1	26525
dow_2	**DOW = Monday**	17%	0	1	17121
node6_crc	**surface = "T" and n_2min < = 1**	3%	0	1	29559
dow_1	**DOW = Sunday**	21%	0	1	12601
dum_sex_restrict_F	**Sex Restriction = F**	23%	0	1	-11767
dum_month_JUN	**Month = June**	13%	0	1	-14417
dow_3	**DOW= Tuesday**	7%	0	1	-15626
dum_age_restrict_4U	**Age Restriction = 4U**	1%	0	1	-38480
dum_age_restrict_34	**Age Restriction = 34**	14%	0	1	9134
HOD_14	**HOD = 2pm - 2:59pm**	18%	0	1	7659
dum_holi	**Holiday**	7%	0	1	10890
race_number_4	**Race Number = 4**	9%	0	1	9245
race_number_2	**Race Number = 2**	9%	0	1	-7871
distance_id	**Distance**	689	200	1600	-15.5

South– Actual Handle & Model Predicted Handle



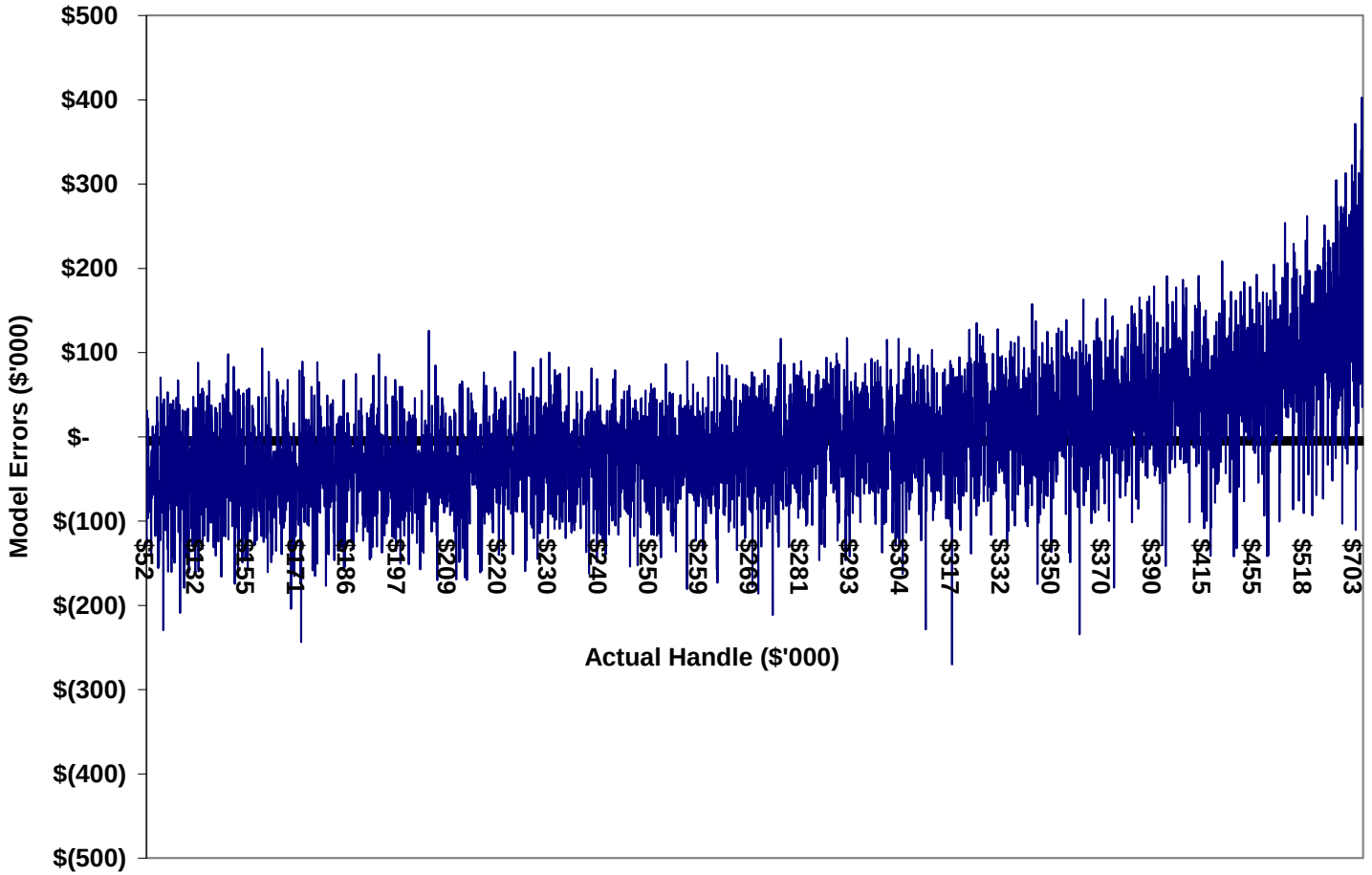
For higher levels of handle (over $500,000), the model tends to under-predict the actual handle.

South– Model Errors



As desired, model errors seem to be evenly distributed around zero

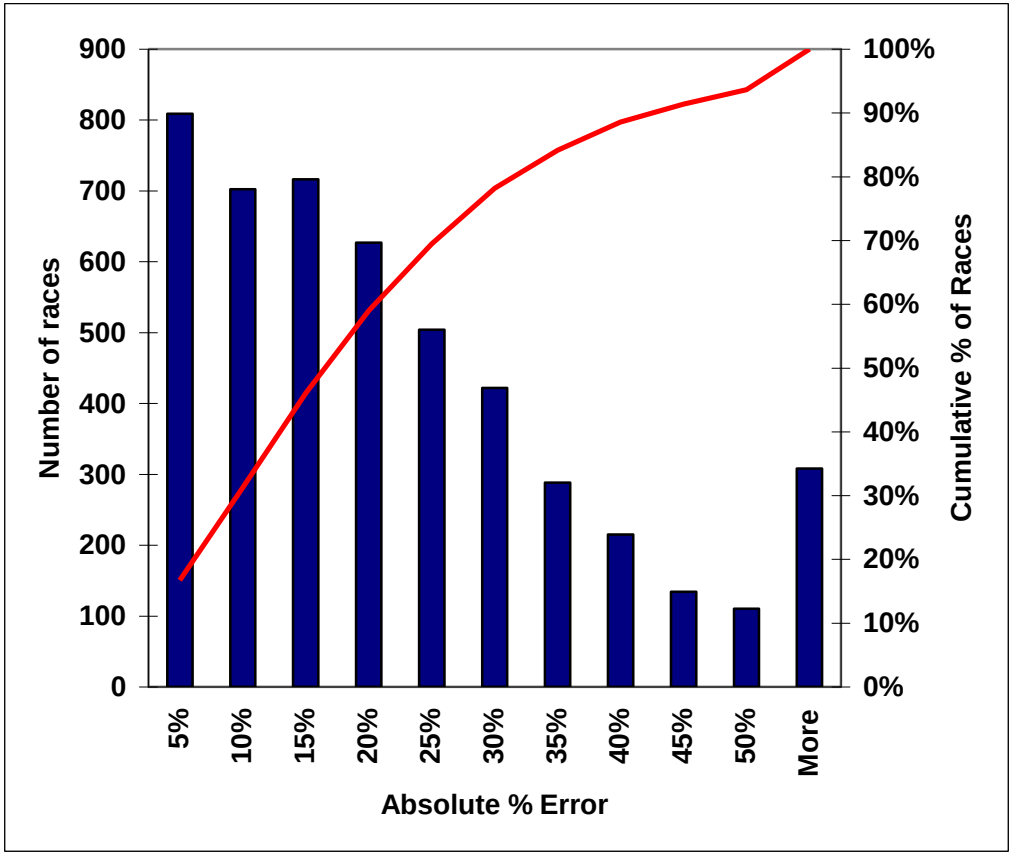
South– Model Errors Ordered by Increasing Handle



Model errors variance remains fairly constant with increasing handle

South– Model Percent Errors

Absolute % Error Range	*Number of Races*	*% of Races*	*Cumulative % of Races*
5%	809	17%	17%
10%	702	15%	31%
15%	716	15%	46%
20%	627	13%	59%
25%	504	10%	69%
30%	422	9%	78%
35%	288	6%	84%
40%	215	4%	89%
45%	134	3%	91%
50%	110	2%	94%
More	308	6%	100%



Mean Absolute Percent Error (MAPE) = 20.9%

Regression Simulator

We have built simulation tools for each of the tracks to help take decisions. This tool can be used to-

- ✓Change the values of drivers of handle and understand their impact on total handle.
- ✓Evaluate the trade off between two different drivers of handle, say between “number of runners” and “purse”.
- ✓Arrive at an ideal combination or mix of drivers of handle to maximize total handle.

Regression Simulator

Follow-Up Analysis

- For each track, build a pair of models, one each for “low” and “high” handle.
- Build a separate model for Stake Races
- Build a model for first race of the day
- AAA
- BBB
- CCC
- DDD
- EEE

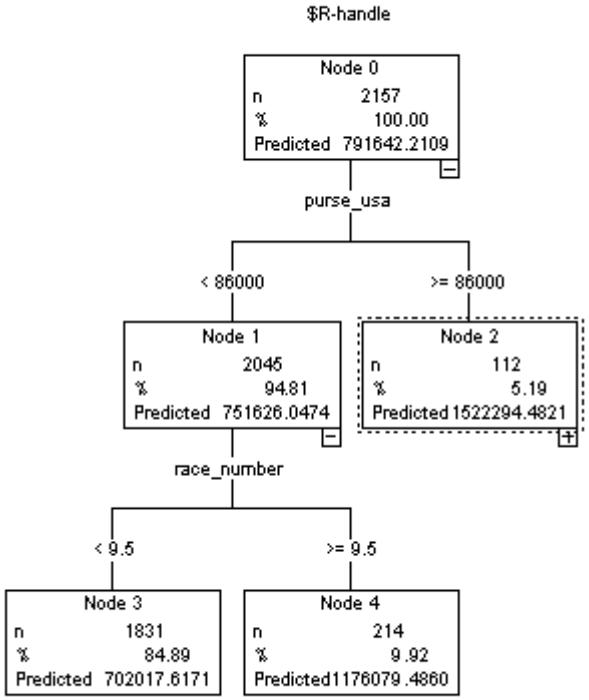
Track Level Decision Trees

Decision Trees Approach

- Decision trees were used to capture interaction effects of important variables
- The interaction effects were used in Regression modeling to improve the accuracy of the models
- We limited ourselves to 2 levels of interaction to get more robust results

XX

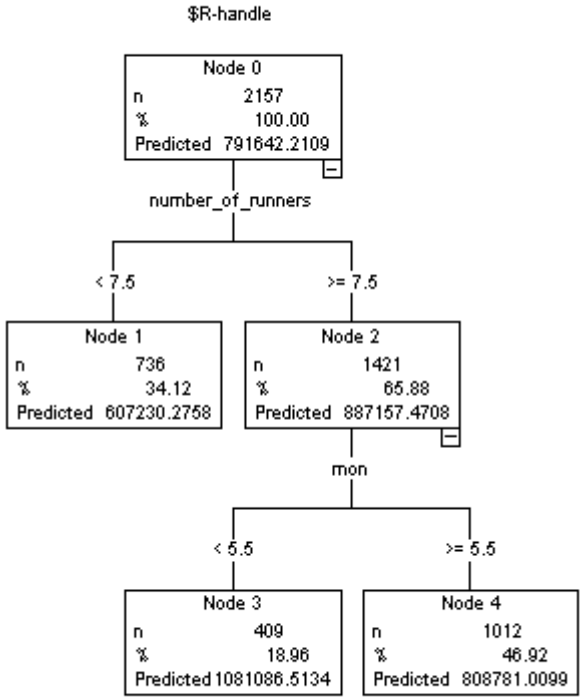
Purse and Race Number



Races with:

- Purse >= 86000 generate high handles
- Purse < 86000 and race number <=9 generate low handles

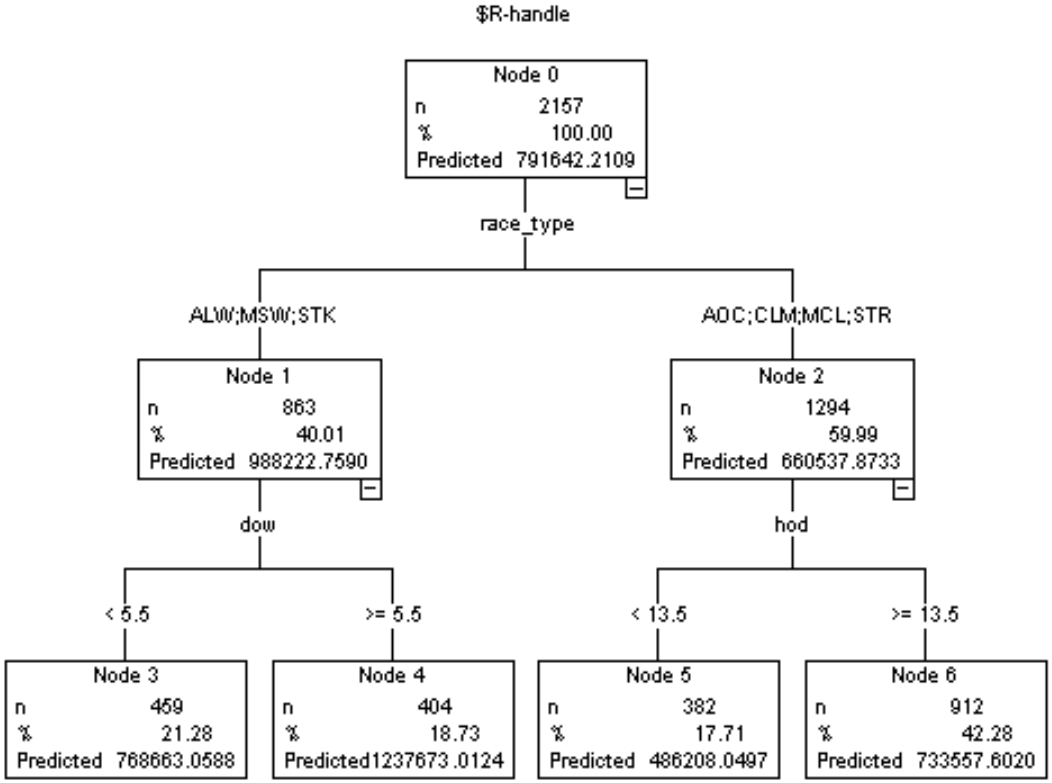
Number of Runners and Month



Races with:

- Number of Runners > 7 and month <=5 generate high handles
- Number of Runners <= 7 generate low handles

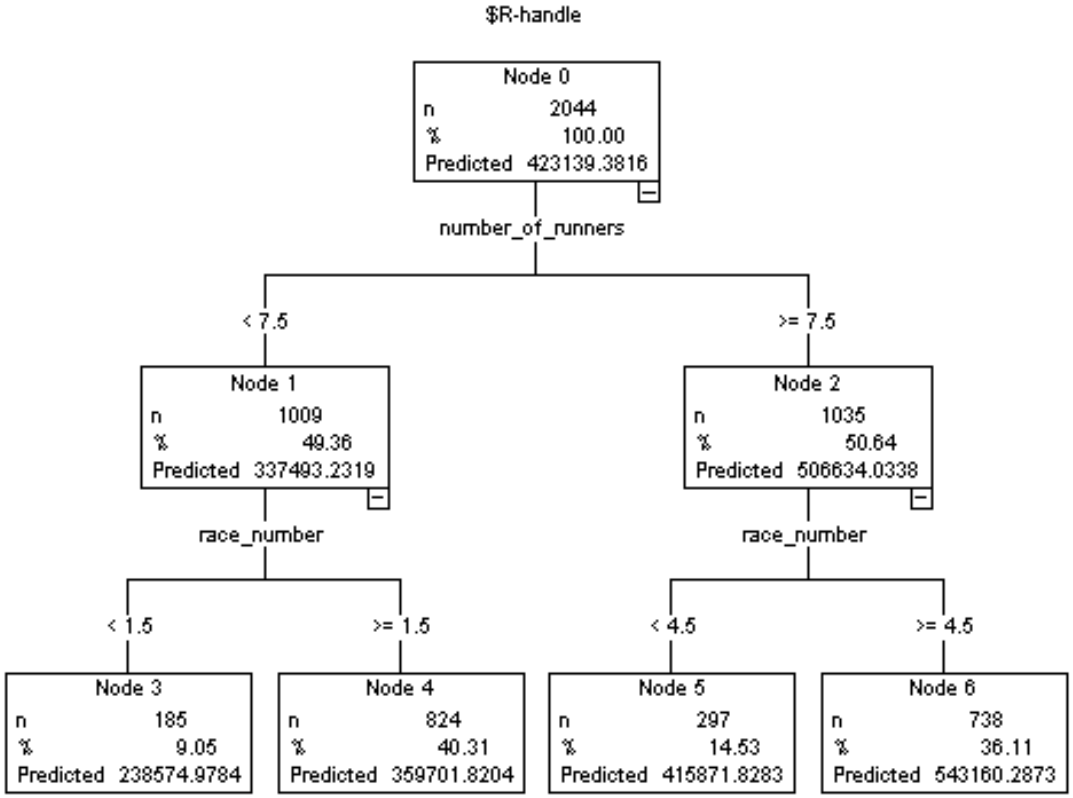
Race Type, Day of Week and Hour of Day



Races with:

- Race Type in (ALW, MSW, STK) and DOW> 5 generate high handles
- Race Type in (AOC, MCL, CLM, STR) and HOD <= 13 generate low handles

Number of Runners and Race Number

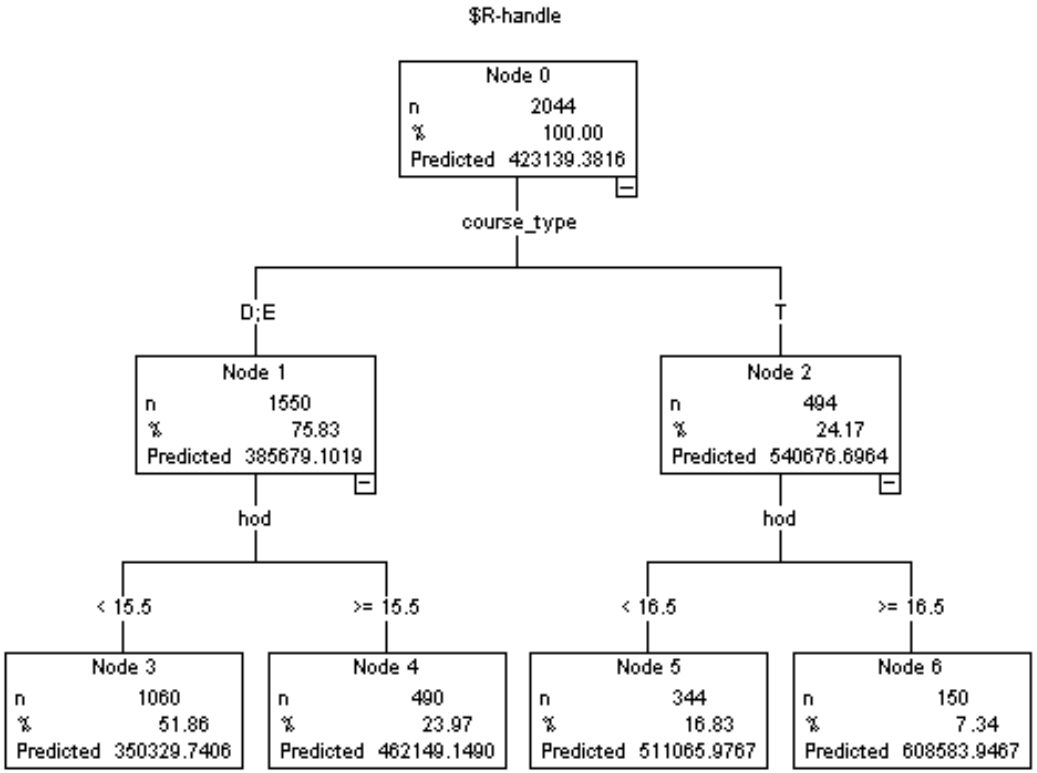


Races with:

- Number of runners > 7 and race number > 4 generate high handles
- Number of runners <= 7 and race number =1 generate low handles

YY (Contd.)

Course Type and Hour of Day

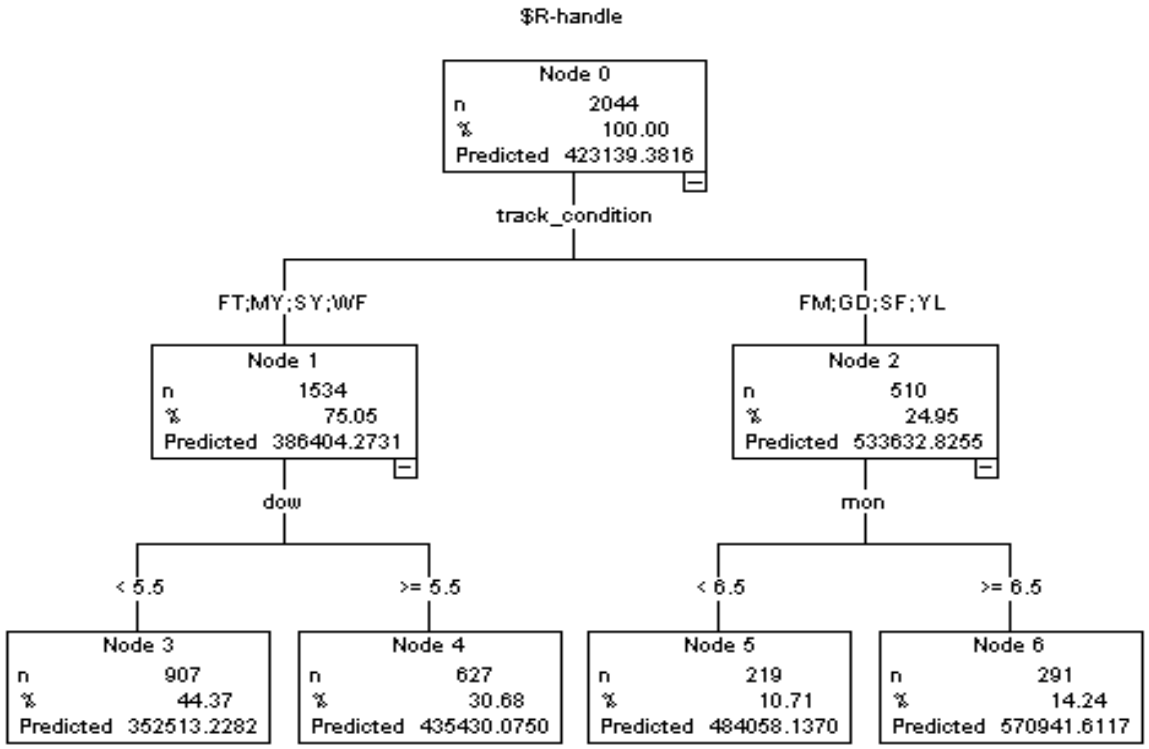


Races with:

- Course type = T and HOD>16 generate high handles
- Course type ne T and HOD<=15 generate low handles

YY (Contd.)

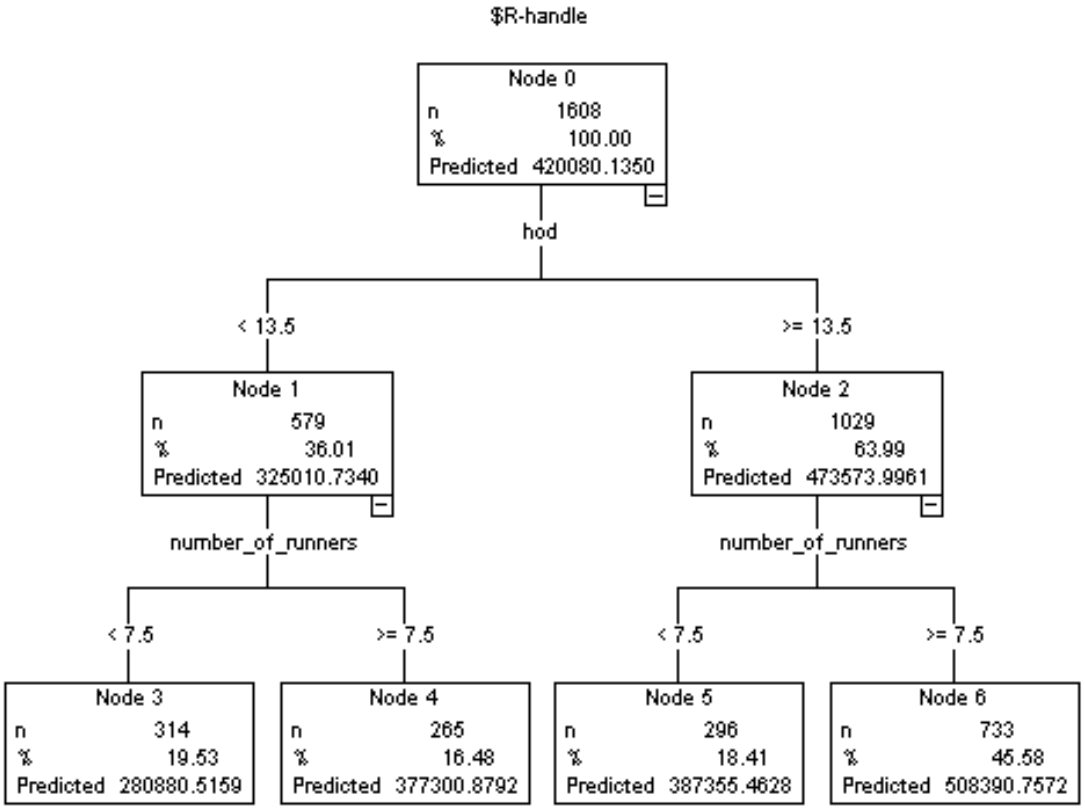
Track Condition, Day of Week and Month



Races with:

- Track condition in (FM, GD, SF, YL) and month > 6 generate high handles
- Track condition in (FT, MY, SY, WF) and DOW <5 generate low handles

Hour of Day and Number of Runners

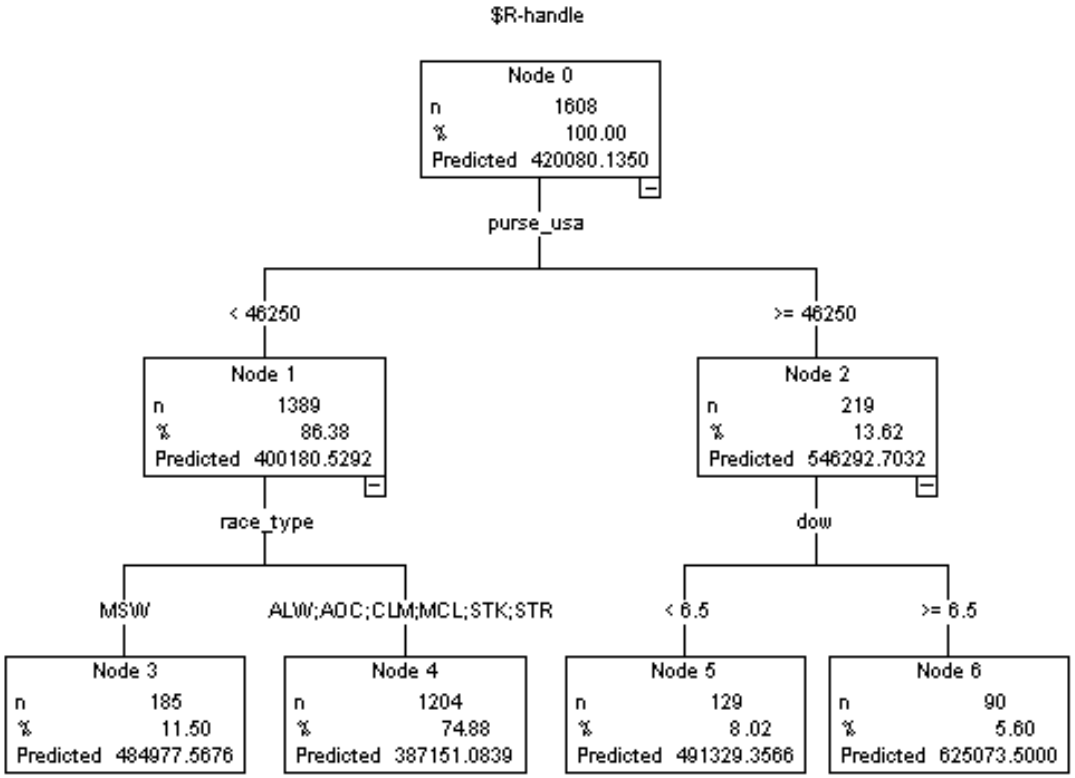


Races with:

- HOD>13 and Number of Runners >7 generate high handles
- HOD <=13 and Number of Runners <=7 generate low handles

AA (Contd.)

Purse, Race Type and Day of Week

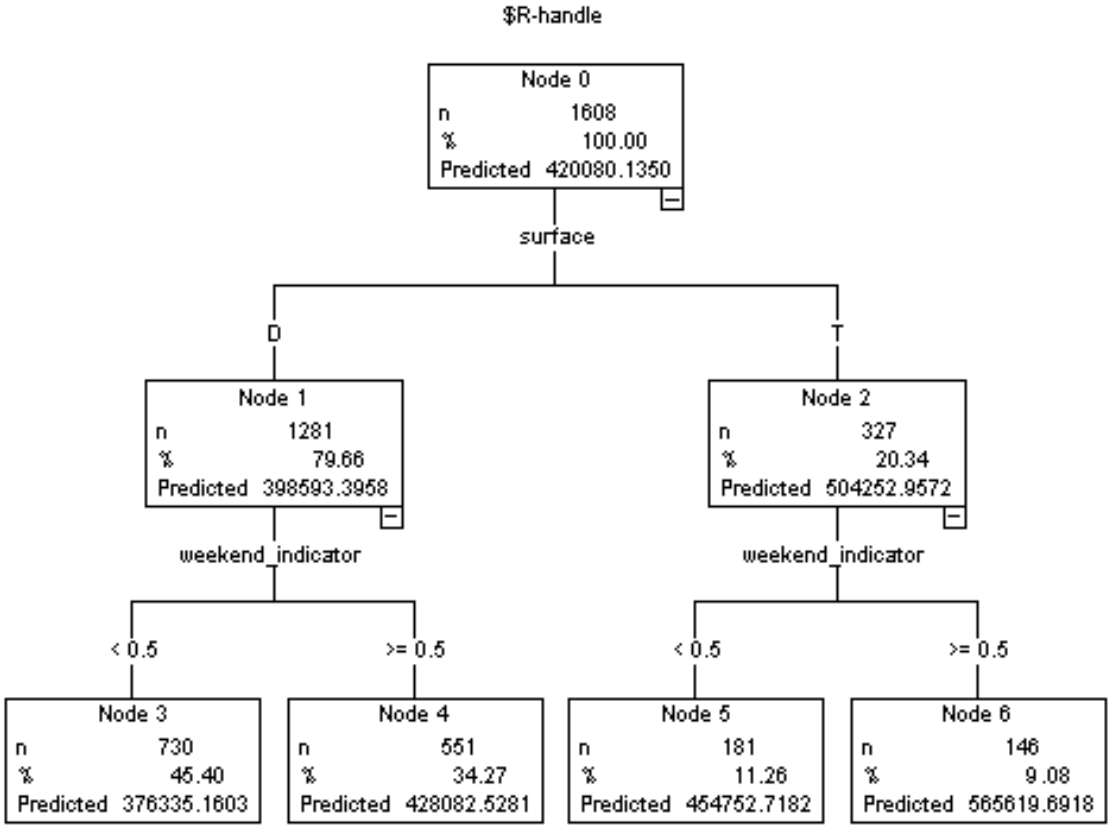


Races with:

- Purse >= 46250 and DOW> 6 generate high handles
- Purse < 46250 and Race Type in (ALW, AOC, MCL, CLM, STR, STK) generate low handles

AA (Contd.)

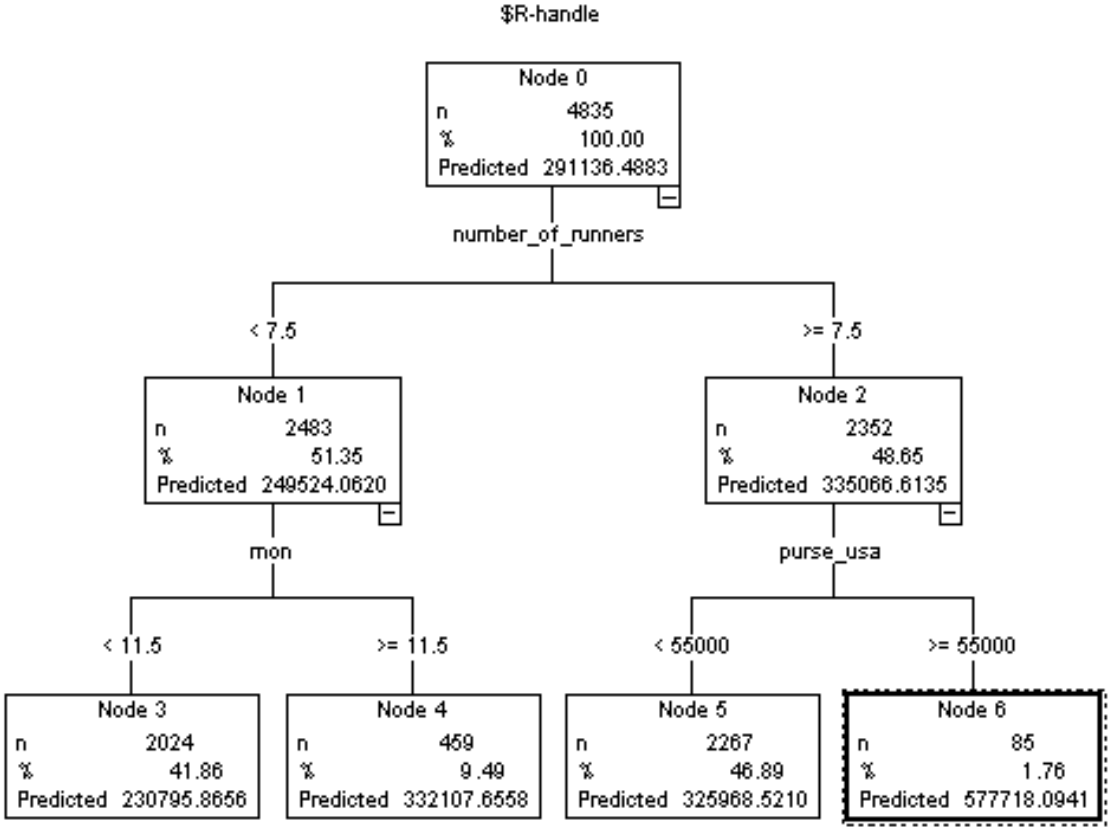
Surface and Weekend Indicator



Races with:

- Turf surface on weekends generate high handles
- Dirt surface on weekdays generate low handles

Number of Runners, Purse and Month

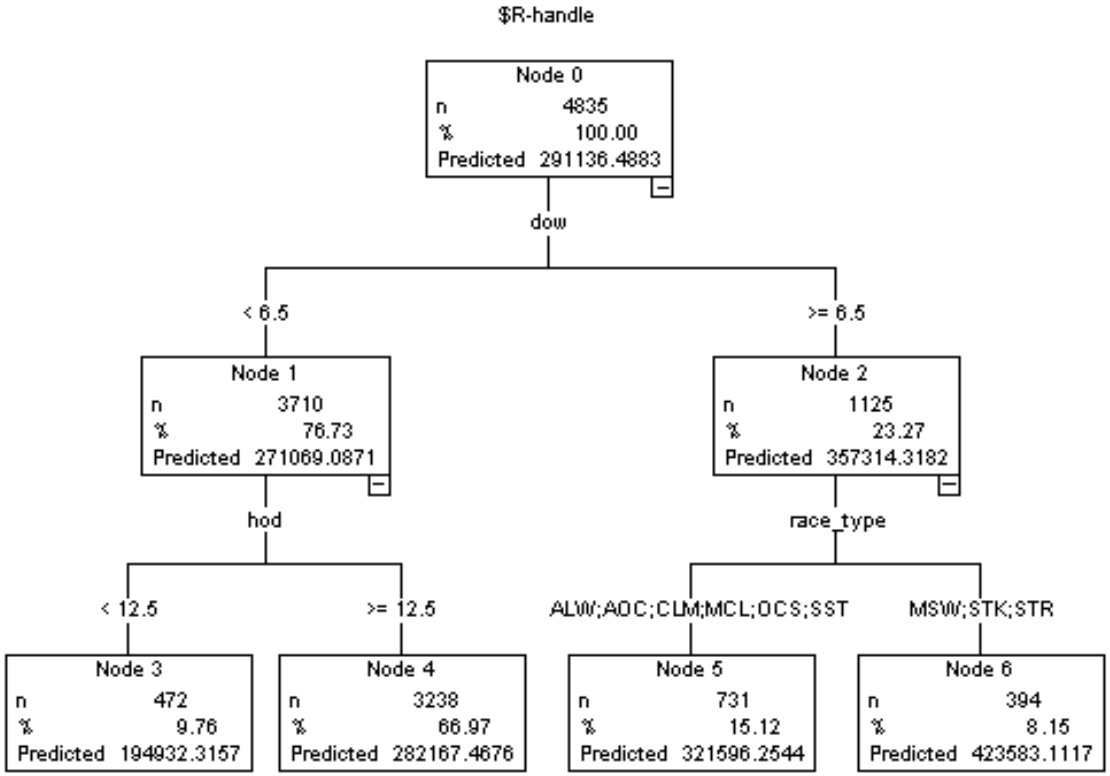


Races with:

- Number of Runners > 7 and purse >= 55000 generate high handles
- Number of Runners <= 7 and month <=11 generate low handles

BB (Contd.)

Race Type, Day of Week and Hour of Day

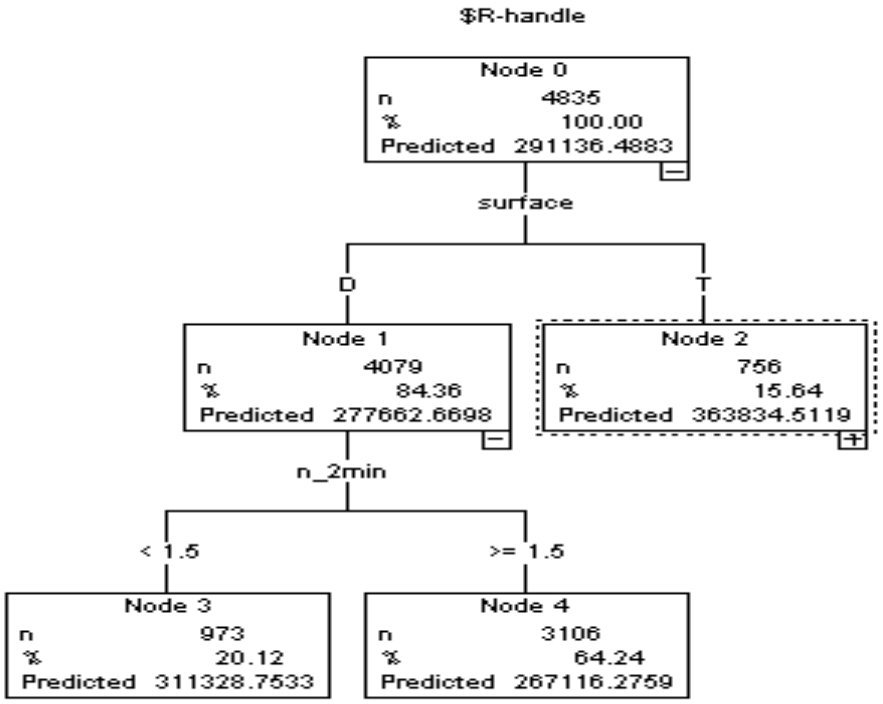


Races with:

- DOW> 6 and Race Type in (MSW, STK, STR) generate high handles
- DOW<=6 and HOD <= 12 generate low handles

BB (Contd.)

Surface and Other races in 2 minutes

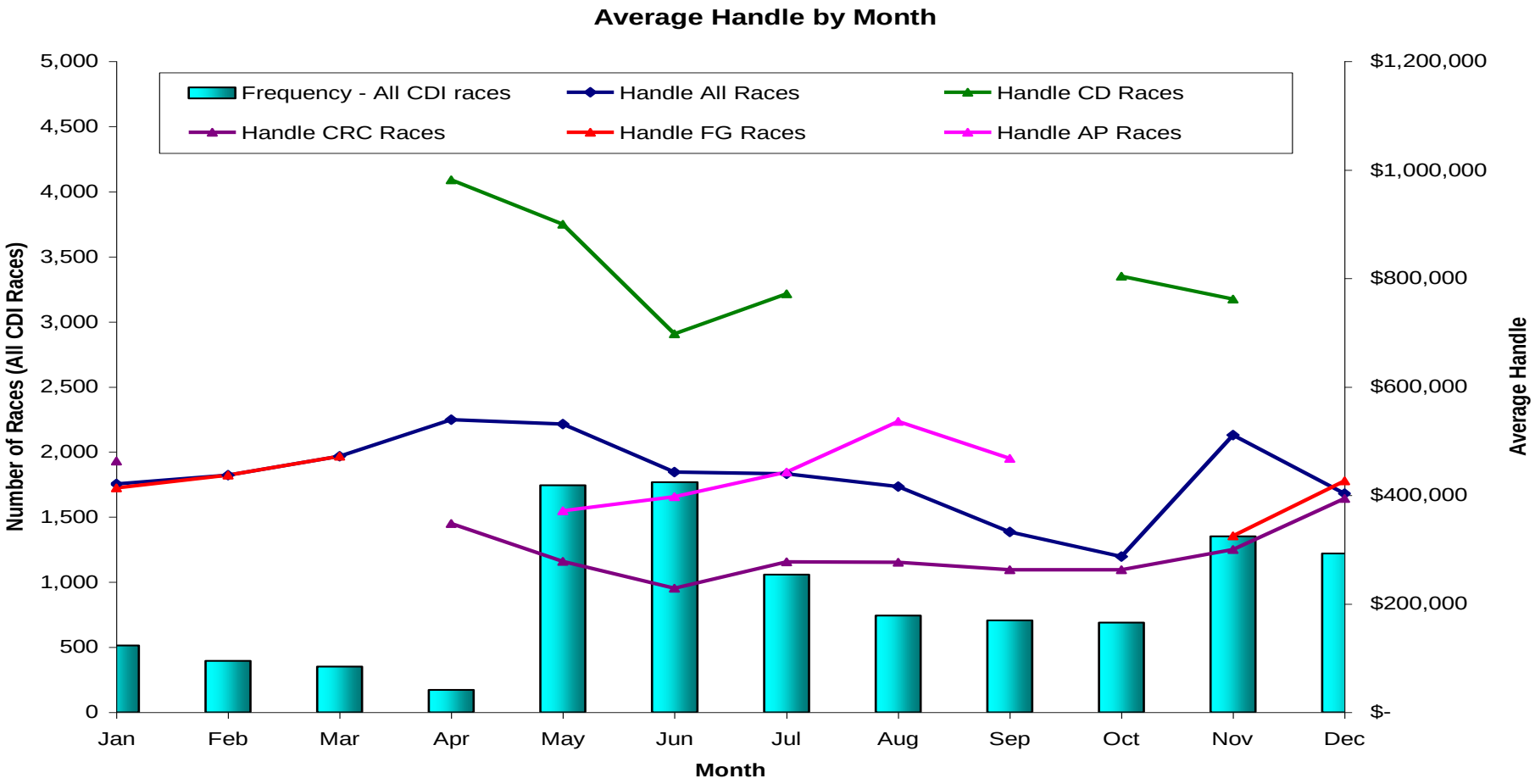


Races with:

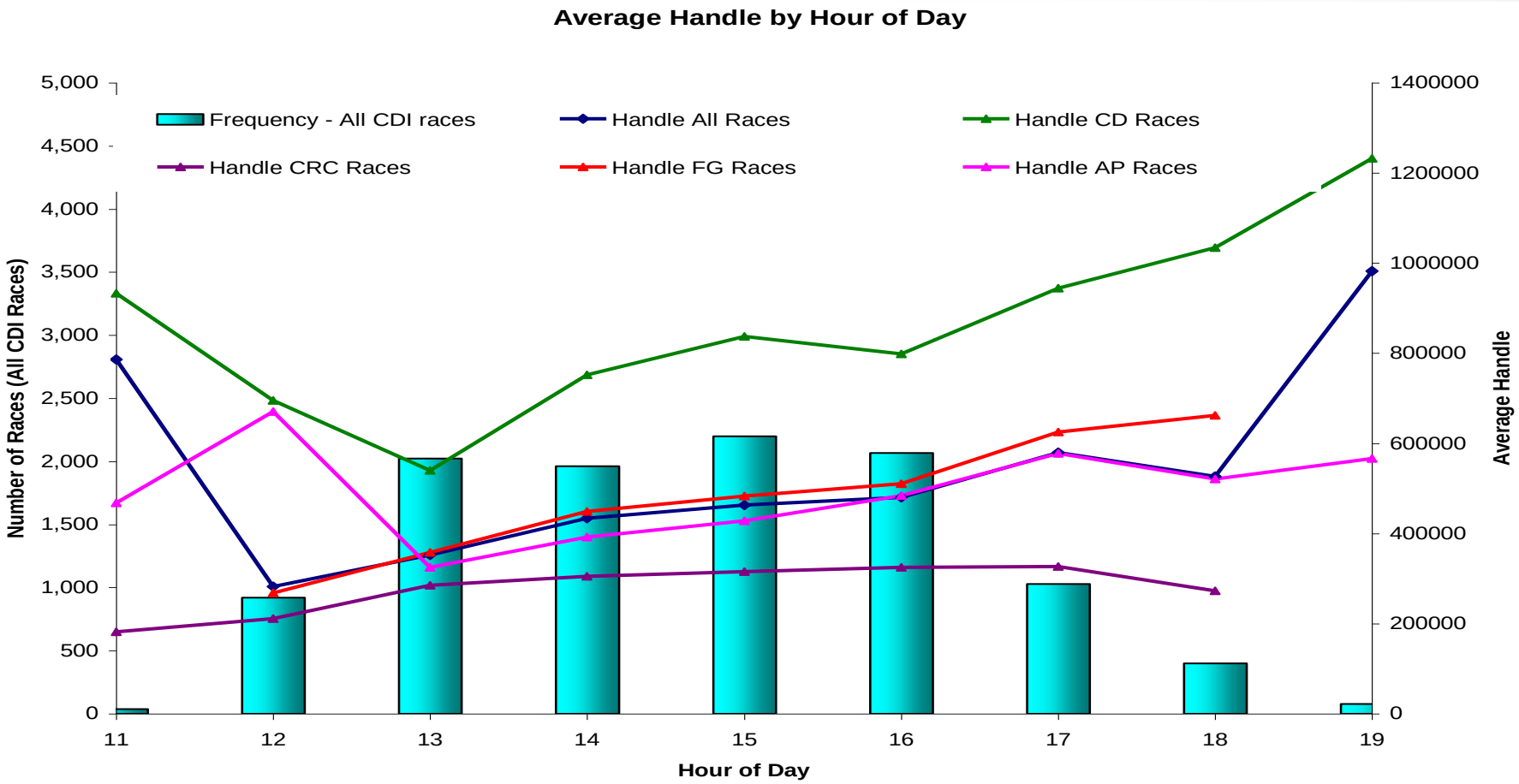
- Turf surface generate high handles
- Dirt surface and more than 1 race happening in 2 minutes generate low handles

Data Exploration

Average Handle by Month

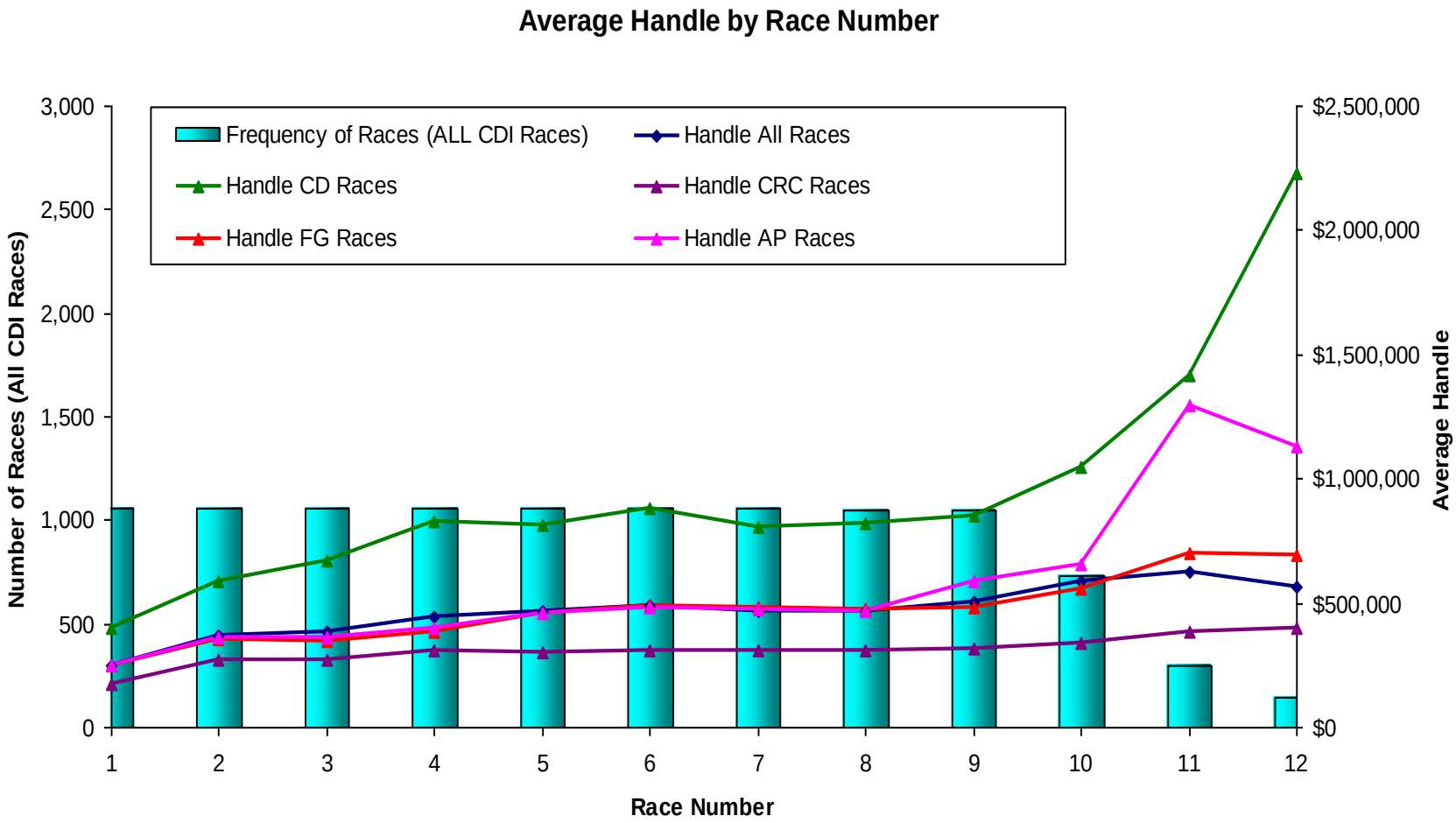


Average Handle by Hour of Day



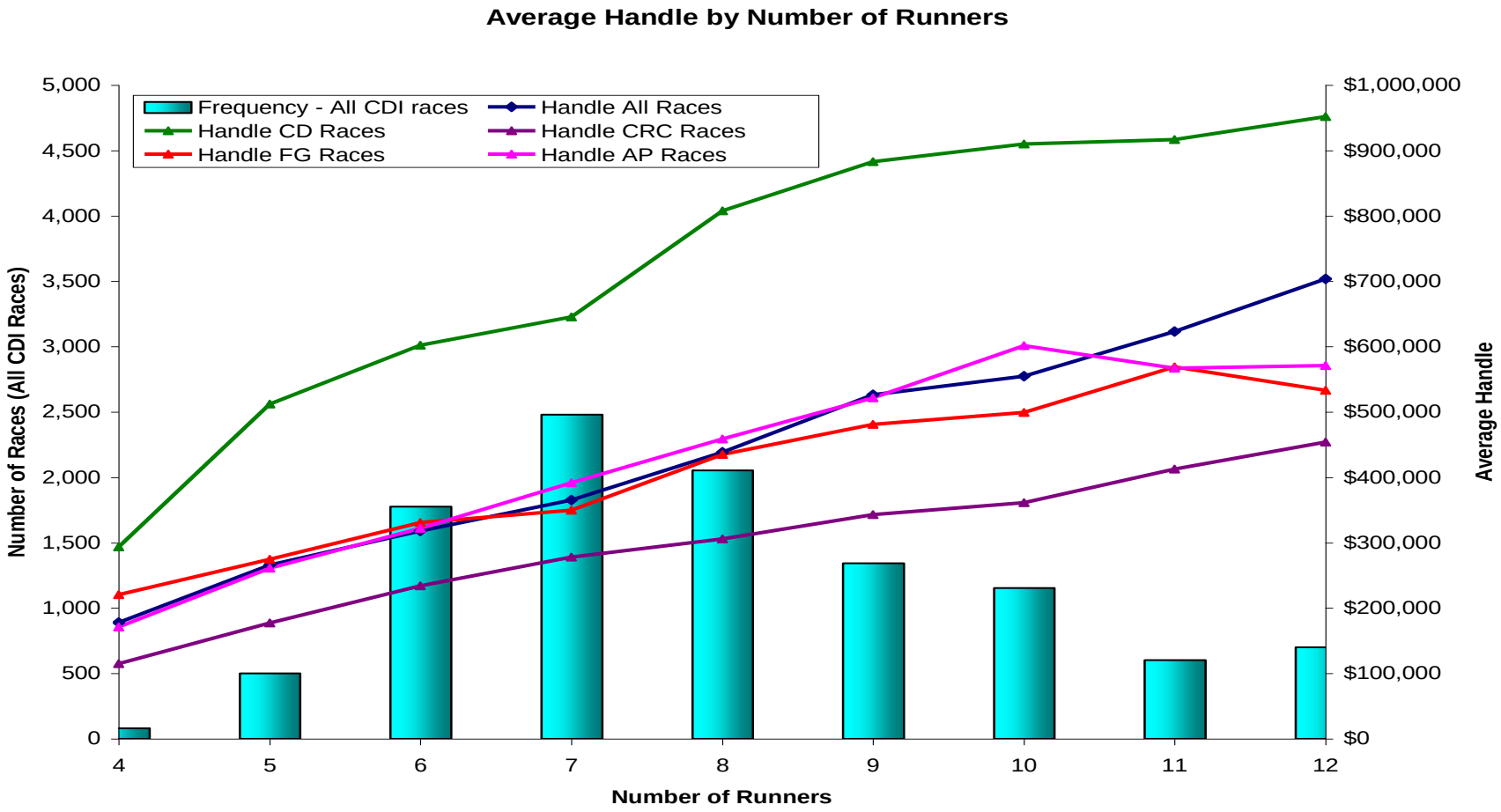
- Races between 1:00 pm and 5:00 pm generate higher handles relative to races held earlier in the morning or later in the evening.

Average Handle by Race Number



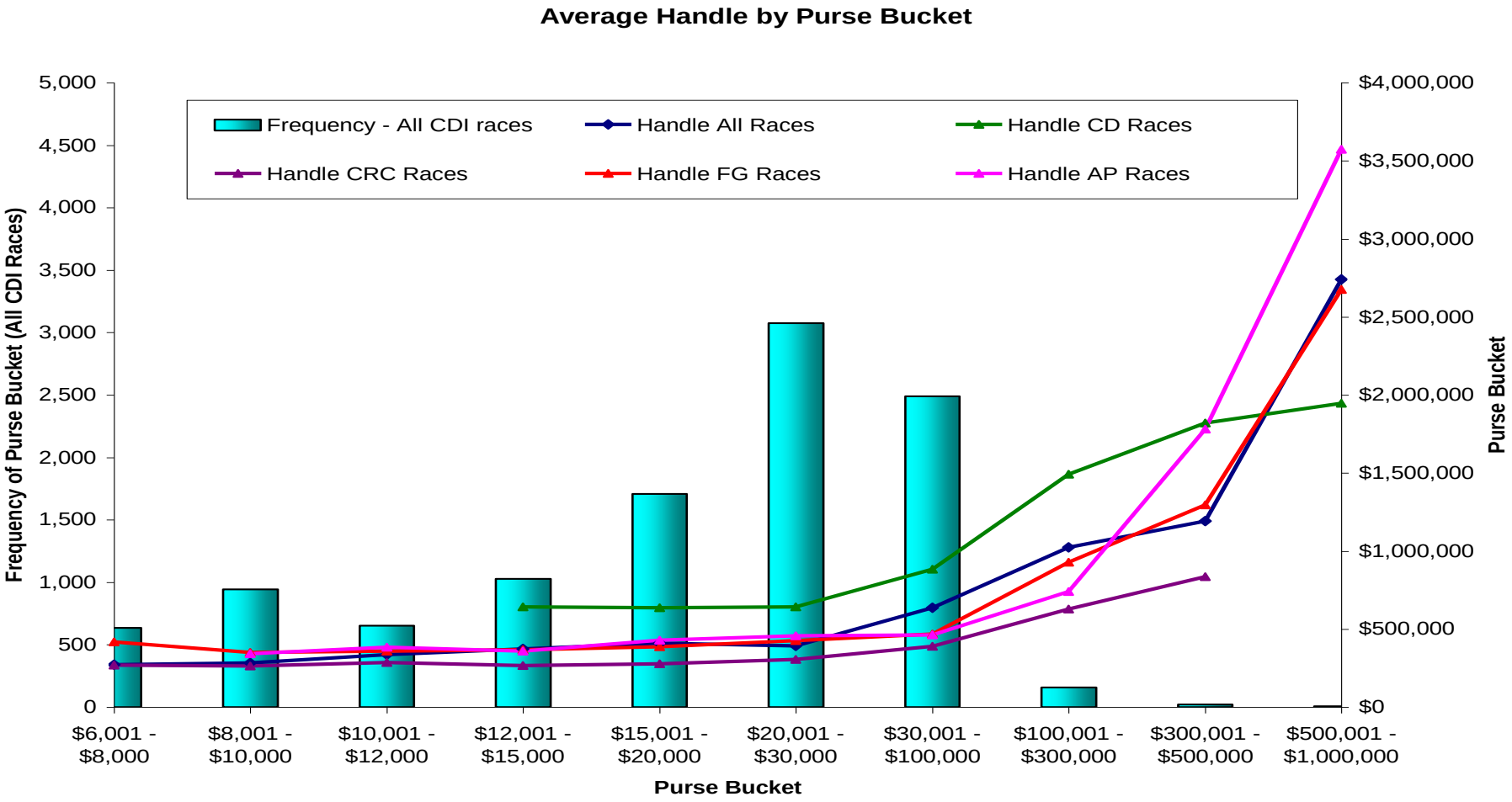
- Later races tend to generate higher handles, though there may be a slight decrease in handle after race number 10

Average Handle by Number of Runners



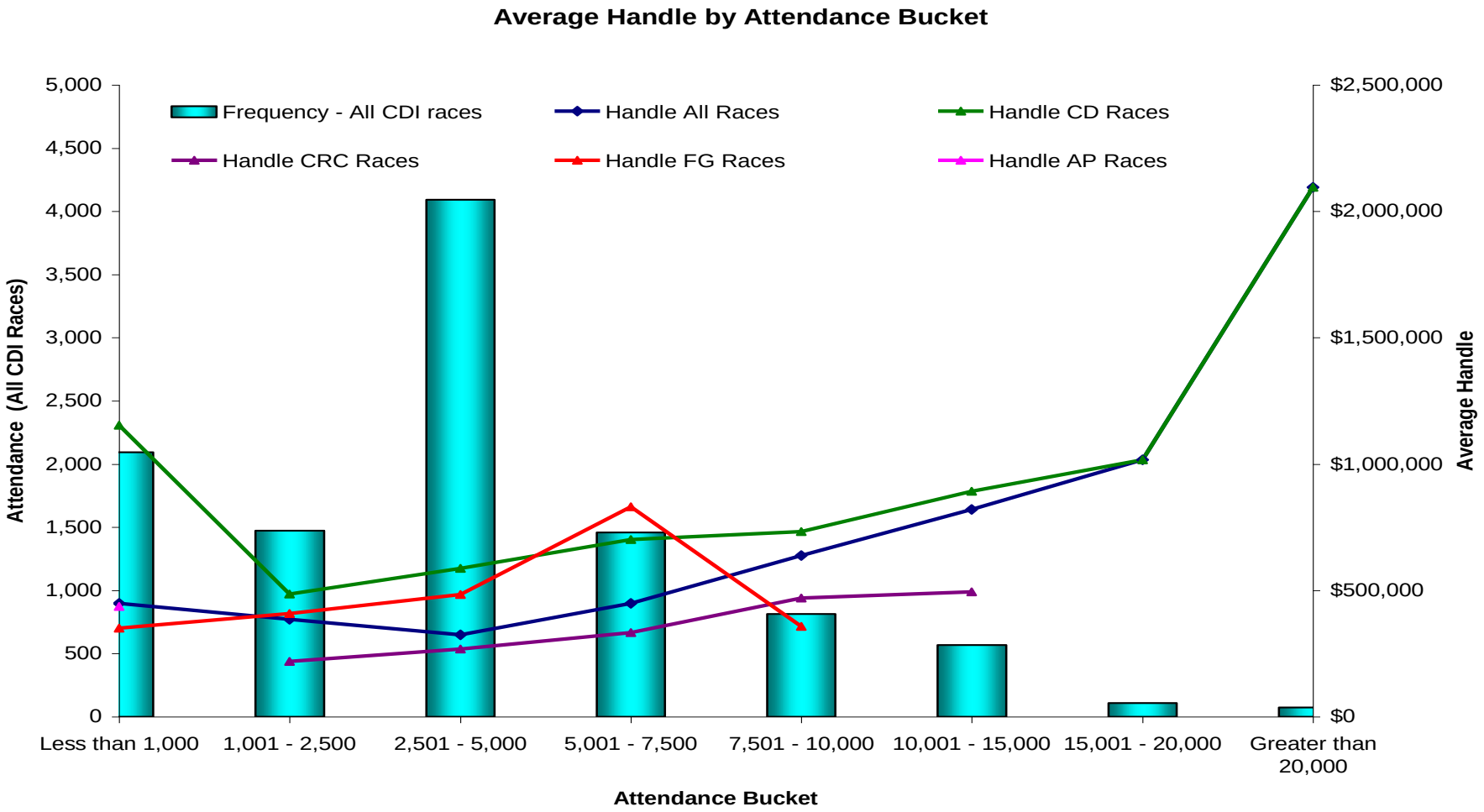
- Average handle increases with increasing number of runners across all XX tracks
- Races with 7 and 8 runners are most frequent across XX tracks

Average Handle by Purse



- Races with higher purse amounts generate higher handles
- The most common purse amount across XX races is between $20,001 - $30,000

Average Handle by Attendance



- Races with higher attendance generate higher handles
- The most attendance bucket across all XX tracks is between 2,501 – 5,000.

Churchill Down Races

Number of Runners

Day of Week	3	4	5	6	7	8	9	10	11	12	13	14	Total
Sun	1	3	15	49	72	57	57	51	40	71	1	0	417
Mon	0	0	2	11	10	12	5	3	4	6	0	0	53
Tue	0	1	4	11	8	12	8	6	8	10	1	2	71
Wed	1	3	12	37	58	63	49	55	25	38	2	2	345
Thu	1	0	12	44	63	62	64	59	28	54	0	2	389
Fri	1	4	16	52	91	69	55	45	30	48	0	3	414
Sat	0	1	20	49	78	64	61	46	35	66	1	0	421
Total	4	12	81	253	380	339	299	265	170	293	5	9	2110

Consider moving these races to weekdays

Consider moving these races to Fri/Sat/Sun?

Races almost equally distributed between Friday/Saturday and Sunday, but maybe move some Sunday races to Friday and Saturday, especially those with higher number of runners?

Race Number

Hour of Day	1	2	3	4	5	6	7	8	9	10	11	12	Total
11	16	8	0	0	0	0	0	0	0	0	0	0	24
12	67	6	13	12	0	0	0	0	0	0	0	0	98
13	104	169	67	1	10	6	0	0	0	0	0	0	357
14	26	1	104	169	67	5	10	4	0	0	0	0	386
15	0	26	26	1	104	167	67	7	10	4	0	0	412
16	0	0	0	26	26	3	104	162	67	8	10	3	409
17	0	0	0	0	0	26	26	8	104	114	6	4	288
18	0	0	0	0	0	0	0	26	25	20	21	0	92
19	0	0	0	0	0	0	0	0	1	26	15	0	42
20	0	0	0	0	0	0	0	0	0	0	2	0	2
Total	**213**	210	210	209	207	207	207	207	207	172	54	7	2110

Can start earlier in the day?

Can finish earlier in the day?

Race Number

# of Runners	1	2	3	4	5	6	7	8	9	10	11	12	Total
3	0	1	0	0	0	0	0	2	0	1	0	0	4
4	1	3	0	0	1	1	1	1	4	0	0	0	12
5	8	23	9	7	3	5	7	4	9	6	0	0	81
6	37	52	46	33	17	6	9	24	21	8	0	0	253
7	62	63	44	39	32	20	36	33	36	13	2	0	380
8	34	24	36	53	33	22	44	32	28	25	8	0	339
9	22	16	24	24	29	39	27	36	40	28	13	1	299
10	14	12	15	17	27	36	35	32	39	29	9	0	265
11	14	8	9	15	21	24	15	18	12	24	10	0	170
12	20	8	26	21	42	49	33	24	18	34	12	6	293
13	1	0	0	0	1	1	0	0	0	2	0	0	5
14	0	0	1	0	1	4	0	1	0	2	0	0	9
Total	213	210	210	209	207	207	207	207	207	172	54	7	2110

Races with high number of runners could be moved to later in the day? (Race # 6?)

These races have fewer number of runners so consider moving them to earlier races?

YY Races

Number of Runners

Day of Week	3	4	5	6	7	8	9	10	11	12	13	14	Total
Sun	1	3	15	49	72	57	57	51	40	71	1	0	417
Mon	0	0	2	11	10	12	5	3	4	6	0	0	53
Tue	0	1	4	11	8	12	8	6	8	10	1	2	71
Wed	1	3	12	37	58	63	49	55	25	38	2	2	345
Thu	1	0	12	44	63	62	64	59	28	54	0	2	389
Fri	1	4	16	52	91	69	55	45	30	48	0	3	414
Sat	0	1	20	49	78	64	61	46	35	66	1	0	421
Total	4	12	81	253	380	339	299	265	170	293	5	9	2110

Consider moving these races to weekdays

Consider moving these races to Fri/Sat/Sun?

Races almost equally distributed between Friday/Saturday and Sunday, but maybe move some Sunday races to Friday and Saturday, especially those with higher number of runners?

Race Number

Hour of Day	1	2	3	4	5	6	7	8	9	10	11	12	Total
11	16	8	0	0	0	0	0	0	0	0	0	0	24
12	67	6	13	12	0	0	0	0	0	0	0	0	98
13	104	169	67	1	10	6	0	0	0	0	0	0	357
14	26	1	104	169	67	5	10	4	0	0	0	0	386
15	0	26	26	1	104	167	67	7	10	4	0	0	412
16	0	0	0	26	26	3	104	162	67	8	10	3	409
17	0	0	0	0	0	26	26	8	104	114	6	4	288
18	0	0	0	0	0	0	0	26	25	20	21	0	92
19	0	0	0	0	0	0	0	0	1	26	15	0	42
20	0	0	0	0	0	0	0	0	0	0	2	0	2
Total	**213**	210	210	209	207	207	207	207	207	172	54	7	2110

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Race Number

# of Runners	1	2	3	4	5	6	7	8	9	10	11	12	Total
3	0	1	0	0	0	0	0	2	0	1	0	0	4
4	1	3	0	0	1	1	1	1	4	0	0	0	12
5	8	23	9	7	3	5	7	4	9	6	0	0	81
6	37	52	46	33	17	6	9	24	21	8	0	0	253
7	62	63	44	39	32	20	36	33	36	13	2	0	380
8	34	24	36	53	33	22	44	32	28	25	8	0	339
9	22	16	24	24	29	39	27	36	40	28	13	1	299
10	14	12	15	17	27	36	35	32	39	29	9	0	265
11	14	8	9	15	21	24	15	18	12	24	10	0	170
12	20	8	26	21	42	49	33	24	18	34	12	6	293
13	1	0	0	0	1	1	0	0	0	2	0	0	5
14	0	0	1	0	1	4	0	1	0	2	0	0	9
Total	213	210	210	209	207	207	207	207	207	172	54	7	2110

Races with high number of runners could be moved to later in the day? (Race # 6?)

These races have fewer number of runners so consider moving them to earlier races?

To be Updated

AA Races

Number of Runners

Day of Week	3	4	5	6	7	8	9	10	11	12	13	14	Total
Sun	1	3	15	49	72	57	57	51	40	71	1	0	417
Mon	0	0	2	11	10	12	5	3	4	6	0	0	53
Tue	0	1	4	11	8	12	8	6	8	10	1	2	71
Wed	1	3	12	37	58	63	49	55	25	38	2	2	345
Thu	1	0	12	44	63	62	64	59	28	54	0	2	389
Fri	1	4	16	52	91	69	55	45	30	48	0	3	414
Sat	0	1	20	49	78	64	61	46	35	66	1	0	421
Total	4	12	81	253	380	339	299	265	170	293	5	9	2110

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Races almost equally distributed between Friday/Saturday and Sunday, but maybe move some Sunday races to Friday and Saturday, especially those with higher number of runners?

Race Number

Hour of Day	1	2	3	4	5	6	7	8	9	10	11	12	Total
11	16	8	0	0	0	0	0	0	0	0	0	0	24
12	67	6	13	12	0	0	0	0	0	0	0	0	98
13	104	169	67	1	10	6	0	0	0	0	0	0	357
14	26	1	104	169	67	5	10	4	0	0	0	0	386
15	0	26	26	1	104	167	67	7	10	4	0	0	412
16	0	0	0	26	26	3	104	162	67	8	10	3	409
17	0	0	0	0	0	26	26	8	104	114	6	4	288
18	0	0	0	0	0	0	0	26	25	20	21	0	92
19	0	0	0	0	0	0	0	0	1	26	15	0	42
20	0	0	0	0	0	0	0	0	0	0	2	0	2
Total	**213**	210	210	209	207	207	207	207	207	172	54	7	2110

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Race Number

# of Runners	1	2	3	4	5	6	7	8	9	10	11	12	Total
3	0	1	0	0	0	0	0	2	0	1	0	0	4
4	1	3	0	0	1	1	1	1	4	0	0	0	12
5	8	23	9	7	3	5	7	4	9	6	0	0	81
6	37	52	46	33	17	6	9	24	21	8	0	0	253
7	62	63	44	39	32	20	36	33	36	13	2	0	380
8	34	24	36	53	33	22	44	32	28	25	8	0	339
9	22	16	24	24	29	39	27	36	40	28	13	1	299
10	14	12	15	17	27	36	35	32	39	29	9	0	265
11	14	8	9	15	21	24	15	18	12	24	10	0	170
12	20	8	26	21	42	49	33	24	18	34	12	6	293
13	1	0	0	0	1	1	0	0	0	2	0	0	5
14	0	0	1	0	1	4	0	1	0	2	0	0	9
Total	213	210	210	209	207	207	207	207	207	172	54	7	2110

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To be Updated

BB Races

Number of Runners

Day of Week	3	4	5	6	7	8	9	10	11	12	13	14	Total
Sun	1	3	15	49	72	57	57	51	40	71	1	0	417
Mon	0	0	2	11	10	12	5	3	4	6	0	0	53
Tue	0	1	4	11	8	12	8	6	8	10	1	2	71
Wed	1	3	12	37	58	63	49	55	25	38	2	2	345
Thu	1	0	12	44	63	62	64	59	28	54	0	2	389
Fri	1	4	16	52	91	69	55	45	30	48	0	3	414
Sat	0	1	20	49	78	64	61	46	35	66	1	0	421
Total	4	12	81	253	380	339	299	265	170	293	5	9	2110

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Races almost equally distributed between Friday/Saturday and Sunday, but maybe move some Sunday races to Friday and Saturday, especially those with higher number of runners?

Race Number

Hour of Day	1	2	3	4	5	6	7	8	9	10	11	12	Total
11	16	8	0	0	0	0	0	0	0	0	0	0	24
12	67	6	13	12	0	0	0	0	0	0	0	0	98
13	104	169	67	1	10	6	0	0	0	0	0	0	357
14	26	1	104	169	67	5	10	4	0	0	0	0	386
15	0	26	26	1	104	167	67	7	10	4	0	0	412
16	0	0	0	26	26	3	104	162	67	8	10	3	409
17	0	0	0	0	0	26	26	8	104	114	6	4	288
18	0	0	0	0	0	0	0	26	25	20	21	0	92
19	0	0	0	0	0	0	0	0	1	26	15	0	42
20	0	0	0	0	0	0	0	0	0	0	2	0	2
Total	**213**	210	210	209	207	207	207	207	207	172	54	7	2110

Can start earlier in the day?

Can finish earlier in the day?

Race Number

# of Runners	1	2	3	4	5	6	7	8	9	10	11	12	Total
3	0	1	0	0	0	0	0	2	0	1	0	0	4
4	1	3	0	0	1	1	1	1	4	0	0	0	12
5	8	23	9	7	3	5	7	4	9	6	0	0	81
6	37	52	46	33	17	6	9	24	21	8	0	0	253
7	62	63	44	39	32	20	36	33	36	13	2	0	380
8	34	24	36	53	33	22	44	32	28	25	8	0	339
9	22	16	24	24	29	39	27	36	40	28	13	1	299
10	14	12	15	17	27	36	35	32	39	29	9	0	265
11	14	8	9	15	21	24	15	18	12	24	10	0	170
12	20	8	26	21	42	49	33	24	18	34	12	6	293
13	1	0	0	0	1	1	0	0	0	2	0	0	5
14	0	0	1	0	1	4	0	1	0	2	0	0	9
Total	213	210	210	209	207	207	207	207	207	172	54	7	2110

Races with high number of runners could be moved to later in the day? (Race # 6?)

These races have fewer number of runners so consider moving them to earlier races?

To be Updated

Data Preparation

Total Number of Races Received	**185,360**
Exclusions: **Breed Type Not Thoroughbred** **Race Types "Canceled", "Simulcast", "Maiden Stakes", "Futurity Final", "Derby Final", "Maiden Starter Allowance"** **Track Conditions Not Missing** **Handle > $5.2 MM**	
Final Number of Races	**151,898**
Final XX Races	**10,715**

Avg. Handle for XX Races :	**$443,226**
Avg. Handle for ALL Races :	**$258,593**