The Coastal Business Journal

Volume 14 | Number 1 Article 3

May 2015

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ISSN: 2163-9280 Spring 2015
Volume 14, Number 1

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ABSTRACT

Since 2004 NASCAR has evolved its championship format in an effort to put more emphasis on wins, thus encouraging drivers to take more risk to get the race win. Past research has shown that drivers taking a conservative approach, by completing laps rather than going for wins, results in championships. This research attempts to determine if previous models are robust in predicting factors that influence individual points accumulation towards winning the championship and if driver consistency, rather than winning, remains the dominant factor in predicting NASCAR's championship standings.

INTRODUCTION

"The big design is to have playoff-type moments that only can be, in any sport, created when there's a lot on the line at any one moment. (Associated Press 2010)" – NASCAR chairman Brian France

NASCAR (National Association for Stock Car Automobile Racing) has a reputation of being one of the most popular sports in the United States. In 2013 it was reported that NASCAR was the second most watched sport on television, behind the NFL (Thompson 2014), and the third favorite professional sport overall behind the NFL and Major League Baseball (Rovell 2014). Nevertheless, TV ratings have been falling, and although NASCAR has not reported attendance figures since 2012 (Ryan 2013), observations have been rampant about a downturn in attendance as well (Bianchi 2014). NASCAR has its roots in North Carolina. The state is home to several currently active NASCAR raceways, including Caraway Speedway, Charlotte Motor Speedway, and East Carolina Speedway, among others. What implications does this decline in interest in NASCAR interest have for the North Carolina economy, since in May 2014, Governor McCrory stated, "Racing and motorsports have helped define our state and drive our economy ("Governor McCrory Proclaims May 'Motorsports Month' in North Carolina" 2014)"?

The concept of industry clustering is well represented by the motorsports industry in North Carolina. The state is home to 1,000 motorsport businesses, teams and tracks, with Charlotte as the epicenter. Approximately 88 percent of the Sprint Cup teams, 72 percent of Nationwide Series teams and 55 percent of Camping World Truck Series reside near Charlotte, in addition to 73 percent of the state's motorsports jobs (*Motorsports Mecca* 2012). During the month of May the Charlotte region experiences an estimated economic impact of $230 million due to two NASCAR Sprint Cup events, the NASCAR Sprint All-Star Race, two NASCAR Nationwide Series events and a NASCAR Camping World Truck Series event ("Governor McCrory Proclaims May 'Motorsports Month' in North Carolina" 2014). Overall (direct, indirect and induced), motorsports in North Carolina contributes $6 billion to the economy and employs over 27,000 people (Connaughton and Madsen 2006). As might be expected, North Carolina has a vested interest in the path NASCAR chooses to take to improve TV ratings and attendance and keep the industry healthy. Hence the evolution of the Chase for the Championship from 2004-2013.

All organizations of professional sports, NASCAR included, place great importance on their determination of an overall champion for a specific season. Championship organizers have significant influence on how much effort will be expended by the participants based on the tournament structure they choose to implement. The purpose of this paper is to show that NASCAR thought it had successfully altered their Championship structure in 2004 by instituting the Race for the Chase to focus more on winning races, and taking the emphasis away from "safe racing," which costs the sport in fan enthusiasm and causal TV viewership. Yet, even with this Race for the Chase format in place, The NASCAR series, and thus Coastal Carolina, were losing fans and associated economic impact based on its championship structure.

Tournament theory offers a rich basis to describe the design and governance of rank-order competitions, such as NASCAR's Chase for the Championship, and gives insight into the strategies that individual participants employ to maximize their chances to win the tournament based on the tournament's structure and rewards (Connelly et al. 2014; Lazear and Rosen 1981). Individualistic sporting contests, such as NASCAR races, conform to the standard contest model, where probability of success depends on the efforts and abilities of the individual athlete (Szymanski 2003). Here we provide quantitative analysis of the factors that influence individual driver championship standings. Previous research has identified variables that help to explain the outcomes of individual races and the number of top ten finishes for a season (Allender 2008; Allender 2009; Pfitzner and Rishel 2005). Given these identified factors, here we test for consistency among the variables as they affect standard measures of success in NASCAR racing. This research focuses on full seasons of NASCAR racing and tests the robustness of the model proposed by Pfitzner, Glazebrook and Rishel (2014) that identifies several independent variables related to NASCAR racing and their effects on Chase standings measured by individual points accumulation. We compare two seasons with the same rules for the Chase competition, the 2011 NASCAR season and the 2012 season, to gauge this robustness, verifying the consistency of important factors affecting point accumulation year to year. To demonstrate the different aspects of consistency across different NASCAR championship structures, we look at a similar model in the final pre-Chase season and compare that to the 2011 and 2012 season (Chase I) models. The analysis of our models show that NASCAR was not successful in altering their structure sufficiently to focus on winning determining the champion throughout the Chase I period. This paper quantitatively demonstrates the necessity of the championship determination overhaul at the start of the 2014 season.

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ISSN: 2163-9280 Spring 2015
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LITERATURE REVIEW

Referring to tournament theory, participants are best motivated to perform when prizes are a function of relative differences in performance (winners and losers) as opposed to absolute differences in performance among the competitors. Participant effort is presumed to be based only on the differences between prize levels, and not the absolute size of the prize purse (Connelly et al. 2014). Expected total effort by each individual driver over all races increases with the spread of the prize among finisher places (Rosen 1986), although incentive effects diminish as the spread increases beyond a certain point for each individual driver (Becker and Huselid 1992). Thus, choosing a championship structure that is sufficiently long to produce the superior team winning the series (Urban 2013), yet intense enough to retain fan (consumer) interest is of paramount importance.

From the inception of the NASCAR series as a professional sport through 2003, champions were determined based on a formula that took into account number of wins, number of Top 5 finishes, and number of Top 10 finishes, among other variables. The issue with this NASCAR championship structure was that the winner was often determined mathematically long before the end of the season, decreasing fan interest and participant effort. The 2003 season exacerbated the situation when the 2003 champion, Matt Kenseth, only won one race and had 25 Top 10 finishes, while Ryan Newman won 8 races, 22% of the 36 races comprising the season. Yet Ryan Newman, with more wins than Matt Kenseth, finished only sixth in the championship standings because of his failure to finish races due to crashes. With respect to the accumulation of points, consistency in racing was clearly valued at this time more than winning, which detracted from the excitement and urgency for drivers to win.

The Chase for the championship structure was introduced in 2004 as a radical new system for crowning the NASCAR champion. Originally 10 drivers competed over the final 10 races of the season, with those drivers chosen by the accumulation of points over the races prior to the Chase. By resetting and compressing the scoring of the top 10 drivers, the chances of each of those final drivers winning the championship was increased, without precluding anyone outside of those 10 with a legitimate chance of winning. The primary impetus behind instituting the Chase was to make winning races as much value as performance consistency. For this research, the championship periods of analysis are divided into the pre-Chase period (2003 season and prior) and the Chase I period (2004-2013 seasons). Over the Chase I period the Chase structure was changed slightly by increasing the number of drivers, adding wildcard drivers, and making minor adjustments to point values to increase the focus on wins. Since the 2014 study did not show an evolution of emphasis on wins due to these changes, the Chase I period will be modeled as a single method of determining a champion.

The first goal of this work is to verify the consistency of the variables that model the Chase I era of championship determination. The choice of comparing the 2011 season to the 2012 season allows us to check for consistency of the model over the same Chase points format. Thus, for this work, we compare the 2011 season to the 2012 season to test the consistency of the factors in the model, as the beginning of the 2011 season marks the last time adjustment to points calculations were put into place prior to the 2014 season. For the new 2014 structure, points are now calculated differently and Chase championship structure has been changed (the Chase II period). The second goal of this work is to compare the pre-Chase period model with the Chase I period model to determine if the changes to the NASCAR championship structure in instituting the Chase were successful in increasing the focus on winning races to make it an equal consideration to racing performance consistency. Our hypothesis is that based on drivers' predicted performance applying tournament theory, NASCAR has had the wrong championship structure set up to focus on winning races, and has thus lost the opportunity to infuse more excitement back into racing for a championship.

A MODEL FOR THE CHASE I PERIOD

A nearly infinite number of factors affect the overall performance of particular car and driver combinations in NASCAR races. Factors that can be controlled by the team are those such as speed and handling of the car, the skill of the driver, and the performance of the pit crew. Factors outside team control that impact point earnings include weather, the number of cautions in a race and the behavior of other drivers. Pfitzner et al. (2014) start with a simple theoretical model that posits several variables that impact NASCAR success, measured by the accumulation of points or money winnings. The model explores how success is functionally related to variable sets reflecting car speed, driver characteristics, team characteristics, performance in prior years, and other factors. In functional notation:

$P = f(S, D, T, Y, O)$,

where:

P = Driver points for a given season
S = Car speed
D = Driver characteristics
T = Team characteristics
Y = Performance in the prior year
O = Other factors.

To be sure, the variable categories listed are not distinct from each other. That is, empirical measures of car speed are certainly related to other categories of variables such as driver and team characteristics. The theoretical model serves to provide a framework for the empirical specification of the model.

Car Speed, Driver Characteristics, and Prior Performance

The effects of car speed on race outcomes are obvious. Faster cars will, on average, finish higher in the race, which results in the driver accumulating more points. Also obvious are the effects of the driver's racing skill and experience on points. If it is possible to proxy for the driver's

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racing skill and experience, such proxies should be related to finish position across races. Prior performance is based on the assumption that success breeds success in NASCAR racing. If a driver/team combination was successful last year, the chances are it will also be successful this year.

Team Characteristics

Team characteristics, in particular team size, require additional explanation. It is an empirical fact that multi-car teams have, in past years, dominated the NASCAR Cup series, and it is commonly believed that multi-car teams have advantages over single car teams. What particular advantages are possible for multi-car teams?

First, the marginal cost of increasing the speed of a car is likely to be very sharply upward sloping (Von Allmen 2001). This is due in part to NASCAR rules regarding car shape, size, aerodynamics, weight, and engine characteristics. While these rules are in place to equalize competition, the existence of this degree of uniformity makes it very difficult and expensive to gain an advantage within the rules. As Bill Elliott, a driver and past owner observes, "It may cost you $5 million to get to the track, but it may cost you an additional $3 million for a few tenths better lap time …." (Middleton 2000, 37). A team with more car/driver combinations can apply any found advantage to each of its cars. Such advantages then are expected to result in better performances for all cars on the team. Second, empirically it is shown that larger teams attract greater sponsorship resources, in part because they are more successful. Third, teams with more sponsorship income are able to offer greater compensation to crewmembers, as well as hire more experienced and specialized team members. Fourth, substantial barriers to success for smaller teams (especially single car teams) may also exist because of scale economies.

VARIABLES USED

This work tests several iterations of the model using a variety of the following independent variable combinations to find the optimal model of the impact of these on championship standings (or winnings). In this research, two sets of multiple regression are estimated to model the dependent variable, points accumulated, for the 2011 season and the 2012 season. Comparisons between the 2011 and 2012 models are conducted to determine how much of the 2012 model reflects the 2011 model of success.

The dependent variable used to represent NASCAR success is championship Cup points accrued by each of the top 43 drivers, tracked throughout the season by points standing. Using point standing rather than money winnings as the dependent variable allows for more effective tracking of the model's year-to-year consistency. There are several more factors involved in money winnings unrelated to driver performance than there are with points. Additionally, we want to get a broader view into whether points accumulation in this Chase I format is reflective of a championship that rewards winning races.

The independent variables included in the original 2012 model are outlined below.

average start = the average starting position for a given car/driver during the 2012 season.

poles = number of pole positions earned during the 2012 season.
laps = number of laps completed for all NASCAR Cup races for the 2012 season.
rookie = a dummy variable equal to 1 if the driver was a rookie in 2012, and equal to zero otherwise.
cars fielded = the number of cars/drivers an owner fields at the NASCAR Cup level.
$points_{t-1}$ = points earned for the prior year (2011).
chase = a dummy variable equal to 1 if the driver qualified for the chase in 2012, and equal to zero otherwise.

The data for this project were collected from publically available NASCAR data, including the following websites:

http://www.nascar.com/en_us/sprint-cup-series/stats.html;
https://en.wikipedia.org/wiki/NASCAR_Rookie_of_the_Year;
https://en.wikipedia.org/wiki/2011_NASCAR_Sprint_Cup_Series; and
http://www.racescorestats.com/Standings.aspx.

Car Speed

The *average start* and *poles variables*, identified in the previous section, correspond to the car speed category. The average starting position is representative of the qualifying positions attained by the driver throughout the season, and the number of poles indicates the number of times a driver successfully qualified his/her car as the fastest. We hypothesize that a lower average starting position (i.e., starting 1st as opposed to 43rd) and/or winning more poles will result in better finishes, translating into more points.

Driver Characteristics

The next two variables, *laps* and *rookie*, are driver (and team) characteristics with the first representing the number of laps completed by a driver in that year's NASCAR races. The variable *rookie* serves as a proxy for lack of racing experience in the NASCAR Cup series. The number of completed laps for the current year represents consistency in starting and completing races, although clearly this variable depends on crew and other team characteristics as well. Some observers have suggested that the NASCAR points system has awarded points to drivers too liberally simply for completing laps. Indeed, such considerations caused NASCAR to change the way points are accumulated throughout the Chase period. By design laps completed will be positively related to points.

A variable representing a driver's rookie season is included as rookies may not have the skill level that active NASCAR Cup drivers have developed over the years, nor will they have the exposure to certain tracks that more experienced NASCAR Cup drivers have competed on in the past. Therefore, if a driver is in his/her rookie season, he/she may be expected to be less successful in terms of points.

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Team Characteristics

The variable *cars fielded* corresponds to the team characteristics category in the model. The cars fielded variable measures the effect of a given owner having multiple cars/drivers in the NASCAR Cup series or a multi-car team. Prior research shows that multi-car teams have advantages over smaller teams (Rishel & Pfitzner, 2006), therefore we anticipate that multi-car teams will have better finishes resulting in more points.

Performance in the Prior Year

The variable, $points_{t-1}$, corresponds to the points accumulated by the driver in the prior season. This variable is included to test for year-to-year consistency. It is likely that points earned in one season are positively related to points earned in the following season.

STRUCTURE OF MODELS

In the 2014 study conducted by Pfitzner et al., the variables listed above were tested, and two regression models emerged. The first model included laps completed and an intercept dummy variable for the chase as the only explanatory variables. This regression represents an almost complete statistical explanation of driver points accumulated over a season, with an $\bar{R}^2$ value of 0.9822. The second regression model tested the significance of the other categories of explanatory variables, controlling for laps completed, by incorporating cars fielded, average start position (a proxy for car speed), and points from the previous year (a check for consistency). The two additional variables, average start position and points from the previous year, were significant. Although the sign for the number of cars fielded was as expected, this variable was not significant. This model increased the value of $\bar{R}^2$ to 0.9941, but more importantly, the standard error of the estimate (SEE) was considerably smaller (reduced by about one-third). Therefore, to evaluate the consistency and robustness of the 2012 models, the regressions developed to analyze the data from the 2011 season utilized the same variables.

Data and Estimation

The summary statistics for the top 43 drivers in both the 2011 and the 2012 NASCAR seasons are presented below in Tables 1 and 2 respectively. The descriptive statistics and the regression for the 2011 season are based on the top 43 drivers for that season and their prior year (2010) points. The descriptive statistics and prior year (2011) points data for the top 43 drivers in the 2012 season were used in the analysis for 2012. The summary statistics displayed in the 2011 Points columns differ between the two tables because the top 43 drivers in 2011 differ from the top 43 drivers in 2012, resulting in a different set of 2011 Points summary statistics for each table.

Table 1: Summary Statistics for 2011 NASCAR Season

Statistic	2011 Points	Cars Fielded	Average Start	2010* Points	Laps Completed
Mean	1079.09	2.35	21.76	3514.54	8217.12

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Standard Deviation	838.37	1.17	9.59	2203.09	3583.60
Minimum	38	1	9.4	83	202
Maximum	2403	4	40.8	6622	10602

* These points are based on a previous points accumulation format.

Table 2: Summary Statistics for 2012 NASCAR Season

Statistic	2012 Points	Cars Fielded	Average Start	2011 Points	Laps Completed
Mean	1075.42	2.35	21.23	1055.49	8038.40
Standard Deviation	836.52	0.95	9.49	864.91	3152.64
Minimum	94	1	8.8	0	804
Maximum	2400	4	39.5	2403	10406

RESULTS

We attempted to estimate a general regression equation with points as the dependent variable and some combination of variables from the explanatory set as the independent variables. Such regressions are of the general form:

$$P_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \ldots \beta_k x_{ki} + \varepsilon_i \; ,$$

where:

P_i = points for the current season being analyzed
x_k = the various explanatory variables
β_0 = the intercept to be estimated
β_k = the slope coefficients to be estimated
ε_i = the standard error term.

The regression results are presented in Table 3. The regression outcomes resulting from the analysis performed on the 2011 data show remarkable consistency with the regression outcomes from the 2012 data, reinforcing the robustness of the model. The first column (2011 Regression 1) in Table 3 represents the regression with laps completed and an intercept dummy variable for the chase as the only explanatory variables. This regression represents an almost complete statistical explanation of driver points accumulated over a season. The $\bar{R}^2$ value of 0.9837 means that less than 2 percent of variation in driver points is left to be explained by factors other than laps completed. The variable *laps completed* embodies many of the determinants identified in the prior section, that driver, team, and car characteristics are important in determining

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the number of laps a given driver completes for the season. Nonetheless, the regression suggests that staying in races so that the driver completes as many laps as possible is a dominant explanation of points. While drivers who complete many laps may also win races, a "stay out of trouble" strategy may also be valuable as it likely leads to a greater accumulation of laps. We can see that the outcomes in the 2012 Regression 1 column exhibit the same characteristics, with less than 2 percent of the variation in driver points being explained by other variables. The signs and magnitude of the coefficients, and the statistical measures are very consistent between the 2011 and 2012 models. If a driver were to complete 100 additional laps in 2011, his/her points accumulation would be expected to increase by approximately 9 points. The almost identical effect is estimated for the 2012 season regression.

Table 3: Regression Results 2011 and 2012: Points Accumulated = Dependent Variable

Explanatory Variable/ Statistic	2011 Regression 1	2012 Regression 1	2011 Regression 2	2012 Regression 2
Intercept	-61.91	-61.77	223.18	306.13
Laps completed	0.0902* (18.00)	0.0904* (15.00)	0.0650* (14.24)	0.0727* (17.91)
Chase dummy	1433.26* (36.24)	1469.80* (35.10)	1332.67* (45.67)	1353.38* (45.81)
Cars Fielded			21.03 (1.67)	0.6498 (0.05)
Avg. Start Position			-8.43* (-5.09)	-11.02* (-6.79)
Previous Year's Points			0.0238** (2.21)	0.0377** (2.15)
$\bar{R}^2$	0.9837	0.9822	0.9941	0.9941
SEE	107.07	111.49	64.65	64.10
F Statistic	1267.63	1162.16	1405.40	1423.17

(t-statistics are in parentheses below coefficients, n = 43 for all regressions.
* = statistically significant at $\alpha < .01$, ** = statistically significant at $\alpha < .05$)

Figures 1 and 2 are the graphical representations of Regression 1 for the 2011 and 2012 NASCAR seasons respectively. The cluster of data points to the northeast in the graph represents the 12 drivers who qualified for the additional points awarded for the chase. The intercept shift dummy implicitly assumes that the effect (line slopes) of the explanatory variable is the same for the drivers who made the chase and those who did not. The data suggest that assumption is appropriate.

Figure 1: Points Accumulated as a Function of Laps Completed and a Dummy Variable for the Chase for the 2011 NASCAR Season

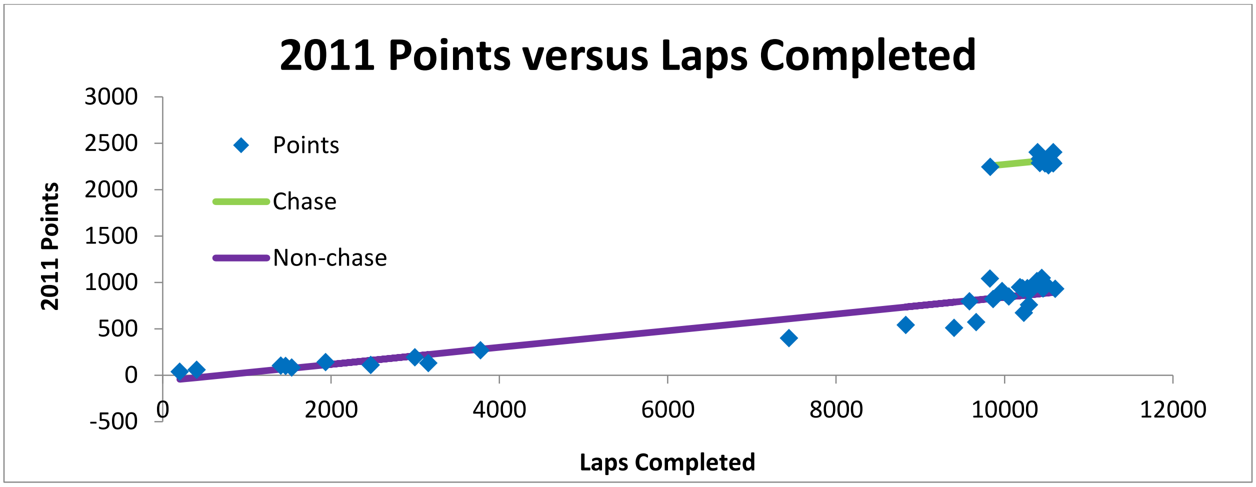
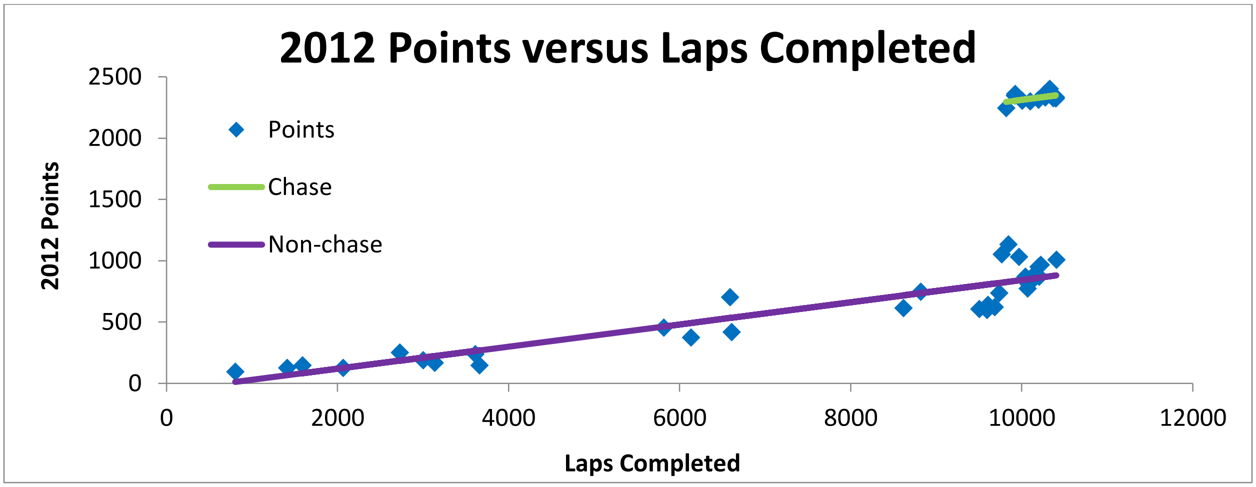


Figure 2: Points Accumulated as a Function of Laps Completed and a Dummy Variable for the Chase for the 2012 NASCAR Season



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Regression 2 is an attempt to test to see if the other categories of explanatory variables evince statistically important effects, controlling for laps completed. Here we add the number of cars fielded, average start position (a proxy for car speed) and points from the previous year (a check for consistency). As illustrated in Table 3, both 2011 and 2012 Regression 2 indicate that car speed does indeed play an important statistical role in explaining accumulated points for drivers. In 2011, drivers would expect their points to increase by 8.43 points for every position they moved up in qualifying (for example, qualifying in the 3rd position is better than qualifying in the 4th position). An 11.02 points increase would be expected for every position gained in qualifying in 2012.

The points a given driver collected in the previous year also plays a statistically important role in explaining points across drivers. In 2011 if a driver accumulated 100 points more in the previous year, he/she could expect to score 2.38 additional points in the current year and in 2012 and additional 3.77 points. Though *statistically* important, these effects are *practically* small. The coefficient for the number of cars fielded is signed in accord with theory, but is statistically insignificant, although the variable exhibits a stronger relationship to points accumulation in the 2011 season than the 2012 season. The remaining variables are comparably significant in both models. Regression 2 raises the value of $\bar{R}^2$ to 0.9941 in both seasons, and note importantly that the standard error of the estimate is considerably smaller (reduced by more than one-third) for Regression 2.

In general we conclude that the empirical formulation of the theoretical model is consistent and robust, providing a nearly complete statistical explanation of the differences in points among drivers for both the 2011 and 2012 seasons. Important effects for laps completed, car speed, and number of cars fielded also shows some consistency from year-to-year. Statistically speaking, it is clear that laps completed is the most important variable in determining points accumulated by drivers.

2003 COMPARISON

The initial version of the Chase format was introduced in 2004. Prior to 2004 the NASCAR points system was criticized for awarding the championship based primarily on the accumulation of points as the result of completing more laps. Since points were awarded for laps completed, drivers might be encouraged to drive conservatively to ensure that they finished the race, rather than take chances in an attempt to win the race. All out attempts to win may result in fewer laps completed, since such risk taking increases the likelihood that a car may be involved in an accident, run out of gas, blow a tire, or an engine. In fact, a strong statistical case was made to support the criticism in Pfitzner and Rishel's 2006 study. In 2004 the Chase format as a championship format was put into place in an effort to more strongly emphasize wins rather than consistency in the run for the championship. How does an analysis of the data from the final pre-chase season, 2003, compare to the regression outcomes from the 2011 and 2012 seasons? The summary statistics for the 2003 season are presented in Table 4.

Table 4: Summary Statistics for 2003 NASCAR Season

Statistic	2003 Points	Cars Fielded	Average Start	2002 Points	Laps Completed
Mean	3411.56	2.58	21.96	3104.95	9147.02
Standard Deviation	1051.42	1.28	6.65	1477.19	1866.06
Minimum	877	1	6.7	0	3072
Maximum	5022	5	35	4800	10621

After evaluating several iterations of the regression model for the 2003 season, it was determined that laps squared is a better fit to the data than other forms of the model. Although heteroskedasticity appears to be present (see Figure 3), the 2006 study found the form of heteroskedasticity to be impure, caused by the omission of relevant variables in the simple regression equation. This is illustrated in Table 5 when comparing the 2003 outcomes for Regression 1 to those of Regression 2. When the square of laps completed serves as the only explanatory variable, 77.89% of the variation in points among drivers is explained. However, when cars fielded, average start position, and 2002 points are added into the regression model as explanatory variables, 92.29% of the variation is explained. In addition, the standard error of the estimate decreases by almost half. All three additional variables have the “correct” sign and are significant, with average starting position contributing the most to the model. The number of cars fielded has the weakest relationship to points accumulation. The Park Test on Regression 2 did not indicate the presence of heteroskedasticity.

Figure 3: Points Accumulated as a Function of Laps Completed for the 2003 NASCAR Season

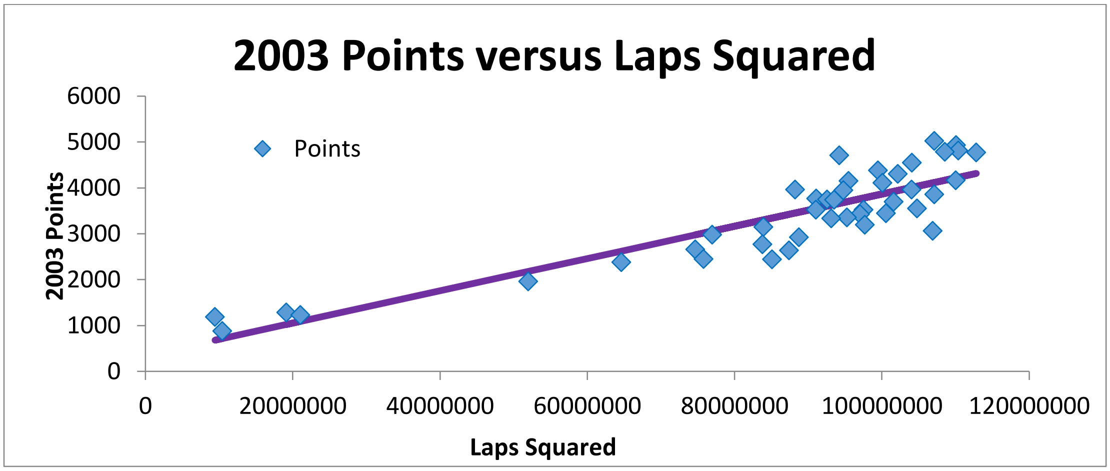

Table 5: Regression Results 2003: Points Accumulated = Dependent Variable

Explanatory	Regression 1	Regression 2

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Variable/ Statistic		
Intercept	352.04	2180.26
Laps Squared	3.514E-05* (12.20)	2.220E-05* (9.57)
Cars Fielded		79.36*** (1.96)
Avg. Start Position		-56.35* (-6.48)
2002 Points		0.1066** (2.70)
$\bar{R}^2$	0.7789	0.9229
SEE	494.45	291.92
F Statistic	148.92	126.71

(t-statistics are in parentheses below coefficients, n = 43 for all regressions. * = statistically significant at α < .01, ** = statistically significant at α < .05, *** = statistically significant at α < .10)

When the regression results for the 2011 and 2012 models are compared to the regression results for the 2003 model, it does not appear that NASCAR has achieved its goal of putting more emphasis on wins and less on consistency. As a matter of fact, laps completed is an even more important determinant of accumulated points, despite the Chase format in effect in 2011 and 2012 for the NASCAR championship. The $\bar{R}^2$ for the 2003 model, using only laps squared as the explanatory variable, was 0.7789 with an SEE of 494.45 while the 2011 and 2012 models using only laps completed had $\bar{R}^2$'s of 0.9837 and .9822, and SEE's of 107.07 and 111.49 respectively (see Table 6). Likewise, the expanded regression models showed similar results.

Table 6: $\bar{R}^2$ and SEE with Explanatory Variables Laps Squared and Laps Completed

	2003 Regression 1	2011 Regression 1	2012 Regression 1
$\bar{R}^2$	0.7789	0.9837	0.9822
SEE	494.45	107.07	111.49

INCORPORATING WINS

We experimented by adding wins as an additional explanatory variable to the 2003, 2011, and 2012 Regression 2 models. In no case was the estimated coefficient statistically different from zero. We conclude that wins offers no additional explanatory power in a regression that includes laps. Laps alone dominate the statistical explanation of points accrued, despite efforts by NASCAR to increase the importance of wins in determining the Chase championship. The regression models and full results are available from the authors upon request.

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CONCLUSIONS AND FUTURE RESEARCH

We found that the results from one year to another within the Chase I format are very consistent, indicative of a robust model. Racing consistency (laps completed) has the largest effect in terms of points accumulation, as opposed to number of wins, in spite of the fact that the Chase championship format was instituted and modified throughout the Chase I period to put more emphasis on and reward for the drivers' winning races. We also found that there were consistent and significant effects for car speed (proxied for by average start position) and year-to-year driver consistency (proxied for by points in the prior year). However, neither number of cars fielded nor wins appear to contribute to the model. This further reinforces the lack of focus on wins in NASCAR's Chase format and the emphasis on consistency as evidenced by the dominance of laps as an explanatory variable.

We do not expect this to be a comprehensive compilation of factors that impact NASCAR success. The field of drivers differing from year to year, drivers changing teams and crew chiefs, teams changing manufacturers and the schedule of race tracks each season differing in number and timing, among others, are all potential factors that are not included in this study but could affect the outcomes. However, these models provide a good basis with which to assess the efficacy of the Chase I structure as the optimal championship structure for the NASCAR cup series.

Having found that the Chase championship outcomes were still dominated by laps completed, NASCAR has modified again the formula for awarding the NASCAR championship for the 2014-15 season to emphasize the importance of race wins and provide more "playoff-type" moments in determining the champion. Future research involves comparing the two latest Chase points format to: a) determine the robustness of the model across Chase I and Chase II (2014-15) formats; b) evaluate the significance and consistency of the variables, and c) test if there has been any increase in the importance of wins in the points standings.

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ISSN: 2163-9280 Spring 2015
Volume 14, Number 1

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