

Driving the Numbers: Analyzing the Financial Engine behind Formula One Racing

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Formula One, the pinnacle of motorsport, combines cutting-edge technology, elite driving skills, and fierce competition. Amidst the captivating battles on the racetrack, the sport's ecosystem, as well as continuity, is determined by an intricate interplay between team performance and its financial revenues. Via an archival correlational study, this paper examines race results and financial performance, hypothesizing that team performance would be positively associated with annual revenue and net profits (H1). This research draws upon relevant industry metrics comprising a vast dataset spanning multiple seasons and constructors' (corporate entities that have competed or intend to compete in the FIA World Championship) financial reports (6 teams). Results revealed a negative correlation between the team standing operationalization and revenue – in this case, a lower number meaning a higher standing; thus establishing that team ranking and revenue were actually positively related. However, standings were not significantly related to net profits, suggesting the relationship between these may be more complex. Overall, Hypothesis 1 was partially supported by the study's findings. This study serves to offer an initial look into archival relationships between performance and revenue, allowing for the implications of this research to extend beyond the confines of the sporting realm. Understanding the relationship between team performance and financial revenue in Formula One not only informs stakeholders within the sport, including team owners, sponsors, and race organizers, but also offers valuable lessons for other professional sports leagues and industries where the interplay of performance and revenue is critical.

Introduction

The sporting industry has made major advancements and progress over the past few decades, giving rise to detailed studies being conducted about sports finance, a significant one being (Rosner & Shropshire's study on *The Business of Sports*)¹. Sports finance is a large body of literature that covers a wide range of financial subjects related to sport. As sports gained popularity, the need for organized sports to secure financial support became apparent and further pronounced, leading to the emergence of factors such as sponsorship deals, broadcasting rights, and ticket sales as significant revenue sources. Sports finance drives the economic engine behind the sports industry, enabling the growth and development of athletes, teams, and sporting events. Therefore, understanding the intricacies of sports finance is pivotal, and even essential for sports organizations, allowing them to navigate financial complexities and maximize the potential for success in this dynamic and ever-evolving field². Considerable studies of sports finance have been conducted in recent years, providing substantial data that allows to connect various stakeholders' finances to a player or team's performance. Such information can play a vital role to all sports, allowing room for refinement and more efficient financial strategies. For example, scholars have studied specific sports such

as Moto GP, NASCAR, and Formula One gaining global traction like in Coates & Teague's paper titled *The Business of Motorsports: The Other Side of the Industry*³, finding a strong positive connection between driver performance and financial returns in Formula One. Formula One, often referred to as the pinnacle of motorsport, has a rich history, spanning several decades of high-speed racing, technological advancement and legendary rivalries. Its beginning can be dated back to the early 20th century, sparked by the growing desire to create a standardized racing category on a global scale. The inaugural season of the Formula One World Championship conducted by the FIA (Fédération Internationale de l'Automobile), featured a series of 7 races held in Europe, with Italian driver, Giuseppe Farina being crowned as the first ever world champion. From Juan Manuel Fangio's dominance in the 1950s to the fierce rivalry between Ayrton Senna and Alain Prost in the late 21st century, the world-renowned drivers have left an indelible legacy in the hearts of racing enthusiasts⁴. Formula One's historical background is a tapestry woven with moments of triumph, tragedy, innovation, and rivalry. From its humble post-war beginnings to the global phenomenon it is today, Formula One has continually evolved, adapting to changing times and pushing the boundaries of technology and human skill. The Golden Age of the 1960s witnessed an era of innovation and daring driving, where Phil Hill became the

first American driver to win a Formula One World Championship. The era also saw the emergence of legendary figures such as Jim Clark and Graham Hill. Clark's domination in the 1963 Belgian Grand Prix, where he lapped the entire field on a treacherously wet track, showcased his extraordinary skill. In an unfortunate turn of events, tragedy struck Formula One in the 1970s, prompting crucial safety reforms. The 1976 German Grand Prix at Nürburgring is forever etched in history due to Niki Lauda's horrific crash and miraculous recovery. This incident prompted safety improvements, including the introduction of mandatory fire-resistant suits and better-designed circuits. As time passed, the turn of the millennium saw Formula One expanding its reach beyond traditional European strongholds. Races in countries like Bahrain, China, and Singapore showcased the sport's global appeal. Today, Formula One continues to garner the attention of millions around the world, captivating them to their screens almost 24 weekends of the year. With its increased popularity, Formula One has earned itself a title of being a multibillion-dollar industry. Its financing is a complex ecosystem that involves a combination of revenue streams, sponsorship deals, broadcasting rights and team budgets. Formula One teams require substantial funding to design, develop and operate competitive cars. These hefty financial resources can be obtained through sources such as sponsorship agreements, with companies that seek to leverage the global exposure and brand association that the sport provides. Additionally, teams generate revenue through merchandise sales, licensing agreements, and hospitality packages for sponsors and VIP guests. Formula One's governing body, the FIA, plays a significant role in its financial landscape by collecting entry fees and various other charges from teams, which contribute to the overall operational budget of the championship. These fees help fund the logistics and planning required to organize and execute races. It is therefore justified that higher driver performance and team popularity grant constructors increased access to financial resources. This allows teams to spend extensively on research and development, enhancing progress for the coming years. Hence, in order to closely examine and understand the complexities of the financial relationships within Formula One, we can further explore the relationships between on track performance and rankings with financial data such as team revenues and profits, to determine the extent to which they are associated. However, it is important to note that change in performance likely influences other factors such as consumer confidence and team operations. This performance even extends to sponsorship revenue, as for example, the clothing brand 'Hackett' has seen an exponential increase in revenue, largely attributed to the fans' popularity and support of Aston Martin's Sebastian Vettel on the Formula One calendar in 2021, as reported by Giltrap-Group in a recent article⁵. Each stakeholder relationship with financial and driver performance is unique, and these relation-

ships have important implications for the fields of finance and sports management. Research in these areas can benefit both the sport and those tied to it by providing opportunities for growth. Furthermore, a well-rounded analysis of these relationships and their variations provides insights into the shortcomings of the current economy of the sport, with possible suggestions to amend them.

Literature Review

In order to better understand the dynamics underlying Formula One team performance and financial revenues, it is important to highlight and comprehensively study preexisting research conducted by scholars about these topics. Formula One racing emerged from the roots of European motorsport in the early 20th century. The prelude to Formula One can be traced back to the late 1920s and early 1930s when automobile manufacturers and racing enthusiasts sought to create a standardized set of regulations to govern international racing events. The formation of the Association Internationale des Automobile Clubs Reconnus (AIACR), which later became the Fédération Internationale de l'Automobile (FIA), marked a significant step in establishing the framework for international racing regulations⁶. The post-World War II era witnessed the gradual refinement of Formula One regulations and technological advancements. The introduction of the Formula One World Championship in 1950 marked a pivotal moment, formalizing the competitive structure of the sport⁷. The 1960s and 1970s saw a surge in innovation, with advancements in aerodynamics, materials, and safety measures. Notably, the introduction of ground effects and the adoption of composite materials revolutionized the construction of Formula One cars⁷. The 1980s marked a turning point with the increasing commercialization of Formula One, as sponsorships and broadcasting rights brought substantial revenue to the sport⁸. The deaths of Ayrton Senna and Roland Ratzenberger in 1994 led to a renewed emphasis on driver safety and circuit design⁹. Technological innovations like the Head and Neck Support (HANS) device and advancements in impact-absorbing materials contributed to enhanced driver protection⁹. The intersection of sports with finance and management has gained significant attention for researchers, as topics for deeper exploration and study. Research by Gladden and Funk¹⁰ emphasizes the importance of revenue diversification and the strategic allocation of resources in sports management. Financial strategies such as ticket pricing, sponsorship agreements, and merchandise sales play a vital role in generating revenue¹¹. Literature by Kesenne¹² explores the influence of digital platforms on revenue generation and fan engagement. Virtual ticketing, online merchandise stores, and data analytics have revolutionized how sports organizations interact with fans and optimize financial operations. Furthermore, the globalization of sports

has brought about new challenges and opportunities in finance and management. International markets offer revenue potential through broadcasting rights, merchandise sales, and global sponsorships¹³. The research by Beech and Chadwick¹⁴ underscores the need for strategic market entry and cultural adaptation in international sports management.

The relationship between financial and driver performance has been a topic that has caught the interest of many scholars. For example, Waern (2018) assessed the relation between financial distribution (prize money) by the Formula One Management (FOM) team and performance of Formula One teams¹⁵ and found that this had an impact on performance of the team even through the following year. Using analytical case studies and comparison of financial records, Waern describes the unsustainable nature of the management's current distribution policy and provides reasoning for the economical discrepancies within the sport. Such research extended to the assessment of Formula One's relationships with other financial stakeholders as well. Cobbs et al. (2017) found that sponsorship revenues were an integral source of finance for most Formula One teams and even the FIA itself¹⁶. This paper analysed and studied both operational and performance-based sponsorships in Formula One. It established the correlation between available sponsorship resources and team survival, and further with driver results and constructors' standings. Furthermore, Van Ours conducted research that quantifies the correlation of budget and performance by analyzing driver and team fixed effects¹⁷, and the degree to which human capital can influence the performance of the constructors. Lastly, Storm and colleagues (2019) examined the tangible effects of hosting a Formula One race on the GDP, tourism industry, and employment in European regions¹⁸. Their research notably suggests that hosting Formula One races does not necessarily have positive economic impacts and may even have negative repercussions.

Methods

A thorough analysis of the aforementioned papers provided extremely useful insights that aided in further proving the proposed hypothesis. The research was continued by conducting a study on the archival records on both driver and financial performance. Driver performance was measured according to their respective standings in the Formula One World Championship. This event follows a highly specific scoring system, awarding drivers points based on their finishing positions in each race (points awarded only to top 10 finishers). In addition to points for race positions, an additional point is awarded for the driver with the fastest lap in the race, as long as that driver finishes in the top 10. Further, the team's championship, known as the Constructors' Championship, is determined by the cumulative points earned by both of the team's drivers

throughout the season. This data was collected by reviewing all available documentation on race results and driver timings officially published by the FIA (Fédération Internationale de l'Automobile)¹⁹, consequently followed by a study of financial statements and accounts for the individual teams sourced through UK government records and public filings²⁰. Specifically, I hand scraped this data from "gov.uk", a public sector information website that provides access to all public company records and filings, to collect financial data (revenue and net profit) for 6 Formula One teams that are based in UK, over the course of 6 years (2016-2022) - a total of 72 observations. This dataset included: Alpha Tauri (Toro Rosso), Alpine (Renault), Haas Racing, McLaren, Mercedes AMG Petronas and Redbull Racing Honda; representing almost 60% of all major Formula One competitors in the past decade. These teams were chosen with an aim to ensure equal representation of high and low performing, along with teams part of the 'midfield' for the study. Furthermore, the reasoning for choosing them extends to their consistency and impact on this dynamic sport, additionally restricted by availability of reliable data. A comprehensive data study was conducted to test the hypothesis that team or driver performance would be positively associated with financial revenue and gains, with constructor standing by year as the independent variable and financial revenue and net profit as the dependent variables. A Pearson product-moment correlation coefficient was then computed to assess the relationship between Constructors' standings and the teams' financial revenue for the fiscal year. Below, I detail the measures for the study.

I. Team Performance:

Team performance was measured through observations of the standings for that year, with a lower number indicating higher ranking, i.e., a standing of 1 would be "first place". Thus, any negative relationships would suggest a positive association between performance of the team and revenue, etc.

II. Financial Performance:

Financial performance was measured in the form of both annual revenues and net profits. Revenue was measured as the amount received for the team in £'000 (Great Britain Pound) over the course of 2016 to 2022. This was placed under a column for revenue and matched with the resultant row for performance that year. A similar system, using the same currency and timeframe, was used to measure net profits for the study, essentially representing the difference between each team's revenues and direct costs. The resultant data set was then input into Microsoft Excel, where statistical functions of the software were applied to calculate the distinct Pearson product-moment correlation coefficient for each consid-

ered factor. Furthermore, the software was able to compute graphs that provided a clear visual representation of the negative correlation.

Results

There was a strong negative correlation between the two variables, $r(34) = -0.590$, $p = .001$. This establishes that as constructor standing decreases (indicating higher performance), there is a subsequent increase in financial revenues for the respective teams. Such a relationship was reflected prominently in the data, especially that of teams like Mercedes AMG Petronas and Red Bull Racing which consistently ranked in the top 3 standings. On the contrary, a similar assessment of the relationship between Constructors' standings and the teams' net profit showed a weak positive correlation between two the variables, $r(34) = 0.55$, $p = 0.748$.

Discussion

The findings of the study indicate a strong negative relationship between team revenue and constructor standings, implying that the teams' financial revenues show a substantial increase, because of lower rankings (higher performance and results) in the World Championship. Consequently, the correlation between net profits and performance is relatively weaker, making these findings especially surprising as they indicate that a decrease in constructor standing or higher performance levels lead to lower net profit figures. A possible explanation for this could be increased costs in order to increase the car's performance efficiency. Additionally, added expenses must be made to financially compensate for upgraded team personnel, equipment and other factors that may provide a competitive edge to the drivers. Therefore, the results obtained denote how significantly higher financial gains incentivize race results and performance. Furthermore, team owners, staff, sponsors, and other financial stakeholders can consider driver and team standings as a reflection of monetary performance, and gain in many ways by understanding this relationship further. Team owners and staff can optimize their strategies by analyzing the correlation and shift their focus on recruiting and retaining high performing drivers, recognizing that their performance on track could lead to increased sponsorships, fan engagement and overall team revenue. Sponsors investing in Formula One to gain exposure and promotion, can understand this relationship to make more informed decisions about their partnerships' financial success, and therefore strategically plan their endorsements. Moreover, teams may also use data on this correlation to make more informed decisions when negotiating their own driver contracts, allowing them to accurately value a driver's contributions with respect

to overall financial returns. These findings may not be restricted to Formula One alone and may be equally as effective in assessing the relationship between player performance and economic progress in many other big sporting leagues around the world. While the parameters for this evaluation may need to be altered to fit the specific sport's format and features, a similar correlation can be drawn in order to analyze such dynamic aspects of sports finance. For example, if this study was to be conducted in the cricketing world, specifically the IPL (Indian Premier League), researchers may take into account a team's winning percentage or cumulative points in the group stage for a particular year with respect to its financial revenues, profits/losses in order to analyze to what extent these factors are correlated.

Limitations

Despite bearing promising results, the study had its own set of limitations. Firstly, due to lack of data availability, the data set was relatively small, spanning only over 6 years and covering only 6 of the 10 teams. This limits the generalizability of these findings when taking into consideration Formula One as a whole and restricts the applicability of the results beyond the sample used. Therefore, caution should be exercised when extrapolating based on these results alone; especially with findings such as the null relationship between performance and net profits. Additionally, a small dataset lowers the statistical power of the research, with random variations having a more pronounced impact on the results. Furthermore, it is essential to acknowledge that correlation is not always causation. For example, while we may observe an increase in revenue as a result of consistently high performance levels in Formula One, these observations are not sufficient to establish that the change in one variable directly causes change in the other. Moreover, mere correlation does not demonstrate a plausible mechanism through which changes in one variable lead to another, making it difficult to declare the relationship between performance and financial returns as purely causal. Hence, it is imperative to exercise caution when interpreting this relationship and to acknowledge the other possible reasons for the correlation, for instance influence by a third variable. Failure to account any confounding variables that may influence both team and financial performance, such as driver health and fitness, penalties/fines, or socio economic status, may have led to some level of inaccuracy or heightening of correlations in this study. Therefore, future studies should look at longitudinal, time lagged data to see directionality, taking into consideration a more expansive data set. Further exploration of the complex relationship with net profits may also be conducted, analyzing the various other factors like costs and expenses that cause the wide disparity between profits and revenues as observed through this research.

Future Research Topics

The prowess of drivers isn't just limited to the racetrack; it shapes the perceptions, emotions, and behaviors of fans, sponsors, and economies around the world, making it a driving force behind the sport's financial success. Therefore, in order to effectively understand and enhance the financial relationships of Formula One, it is crucial to study the effect of team and driver performance on various other prominent factors of decision making such as sponsorship revenues, consumer confidence and host nation economies. These factors have substantial financial implications and hence must be taken into consideration when studying the econometrics of the sport. A detailed analysis of the same provide insights that can guide strategic decisions, optimize revenue streams, attract investments, and ensure the sustained growth and prosperity of Formula One as both a sporting spectacle and a thriving economic entity . However, data regarding sponsorships, consumer engagement and other related factors remains majorly undisclosed, making it difficult to conduct a truly holistic study of the subject. Therefore, future studies could explore topics such as consumer confidence, which would require more direct access to the audience and market of Formula One, making use of behavioral economics and a study of purchasing patterns. Consistent results and high-level performance build brand loyalty and promote increased fan engagement This serves as a possible revenue stream in the form of higher merchandise and ticket sales, improved viewership numbers and more lucrative investments for sponsors. Therefore the following propositions for future research can be made:

Proposition 1:

Driver performance is positively correlated to sponsorship revenue and promotional deals or offers

Proposition 2:

Driver performance is positively associated with consumer confidence and engagement.

Similarly, nations hosting Formula One races share complex financial relations with team performance. This extends to benefits like higher tourism revenues and ticket sales revenue but is accompanied by drawbacks such as increased expenditure on maintenance and legalities. Therefore, unlike other factors:

Proposition 3:

Driver performance shares a circumstantial relationship with host nation economies, with both positive and negative correlations.

The aforementioned propositions can, in my opinion, be great topics for further research, giving an even more well-rounded approach to the study of the relationship between Formula One and its finances. These propositions, if validated or dismissed with concrete results, will allow for greater efficiency in decision making across the sport. Team owners or executives will now have access to substantial data spanning decades, that not only analyzes various stakeholders' financial relationships individually, but also provides a detailed overview of how these factors mesh together to form the broader Formula One landscape.

Conclusion

The results obtained throughout this study point to driver performance sharing positive correlations with almost of Formula One's stakeholders, further proving how important race results are to maintain financial stability within the sport. Furthermore, understanding these relationships allows individual drivers and constructors, along with the FOM (Formula One Management) to make any required improvements to maximize financial gains in the sport. The advantages of being a financially sound team are limitless. Firstly, teams can devote a significant number of resources to R&D when their finances are stable. To analyze data and enhance car performance, teams with substantial financial support can invest in cutting-edge facilities, sophisticated simulations, wind tunnels, and computational tools. The development of improved aerodynamics, improved power-trains, and optimized chassis designs as a result of intensive R&D work gives drivers a competitive advantage on the racetrack.

Moreover, teams with sufficient resources can spend money on extensive testing and practice sessions, both on and off the track. Drivers need to test in order to become familiar with the car's behavior, improve setups, and hone their driving skills. Budget restrictions may affect teams, limiting the amount of testing time available to their drivers. Contrarily, well-funded teams can run more thorough testing programmes, giving their drivers invaluable knowledge of the car's performance characteristics and allowing them to perform better on race day.

Crucially, during Formula One races, team budgets affect tactical and racing strategy choices. Financially secure teams may afford sophisticated data analysis tools, real-time telemetry systems, and knowledgeable strategists who evaluate the course conditions and the performance of rival teams. These teams are adept at managing tire strategy, optimizing pit stops, making data-driven decisions, and taking advantage of racing dynamics. These tactical advantages, which came about as a result of significant financial investments, support improved driver performance and the team's overall competitiveness.

In conclusion, a dynamic and progressive sport like Formula One is highly performance driven. Its existence is heav-

ily backed and dependent on its finances, making it imperative for its resources to be constantly monitored and controlled. In a sport as competitive and cutthroat as this one, each gain in performance coincides with exponential increases in opportunities for growth. Each stake holder hence holds an extremely important and valuable position in determining a Formula One constructor's future in the industry and must be individually accounted for.

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