

SOBIE 2025 Proceedings



**Society of
Business, Industry, and Economics**

25th Annual Academic Conference

**Sandestin Golf and Beach Resort
April 9-11, 2025
Destin, Florida**

SOBIE 2025



Registration – Bayview Foyer

April 9	April 10	April 11
7:00 – 11:00 AM	7:00 – 11:00 AM	7:00 – 11:00 AM

Wednesday, April 9

	Terrace 1	Terrace 2	Terrace 3
7:30 – 8:45	1- Open	2- Open	3- Open
9:00 – 10:15	4- Analytics	5- Pedagogy	6- Student Res
10:30 – 11:45	7- General Business	8- General Business	9- Pedagogy
12:00 -1:15	10- Economics	11- General Business	12- Student Res

Thursday, April 10

	Terrace 1	Terrace 2	Terrace 3
7:30 – 8:45	David L. Black Plenary Breakfast (Bayview Room and Terrace)		
9:00 – 10:15	13- Round Table	14- Student Research	15- Pedagogy
10:30 – 11:45	16- Pedagogy	17- Student Research	18- International
12:00 – 1:15	19- Healthcare	20- Student Research	21- Finance
1:30 – 2:45	22- Round Table	23- Student Research	24- Sports
3:00 – 4:15	25- Round Table	26- Student Research	27- General Business
4:30 – 5:45	28- General Business	29- Open	30- Student Research

Friday, April 11

	Terrace 1	Terrace 2	Terrace 3
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9:00 – 10:15	34- Economics	35- Student Research	36- Accounting
10:30 – 11:45	37- Management	38- General Business	39- Student Research
12:00 – 1:15	40- General Bus.	41- Open	42- General Business

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The Role of Precious Metals for Bitcoin

Baek Chung[§]

Abstract: We examine if precious metals can play a role as a safe haven for bitcoin. Our study compares precious metals' safe haven properties across the pre- and post-COVID-19 pandemic periods and also, investigates their safe haven properties for a short-term period immediately after the outbreak of COVID-19 pandemic and the Russia-Ukraine war. We find that all precious metals play a role as a safe haven for bitcoin immediately after the pandemic while only palladium plays a role as its safe haven immediately after the Russia-Ukraine war. However, it is discovered that precious metals' safe haven properties are inconsistent over a long period of time.

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Economic Freedom and Employment Outcomes in Sub-Saharan African Countries

Colin Cannonier[§], Bradley D. Childs[‡], Howard H. Cochran^ζ

Abstract: This study examines the relationship between economic freedom and labor market outcomes in Sub-Saharan African countries from 1995 to 2021. While extensive research has explored economic liberalization policies across developing regions, specific effects on labor market transformation in Sub-Saharan remain understudied. Using panel data from the Fraser Institute's Economic Freedom Index and the World Bank, we employ fixed effects regression models to analyze how varying levels of economic freedom influence employment patterns across sectors. Our findings indicate that higher economic freedom is associated with significant structural shifts in employment—specifically, a decrease in the share of workers in the agricultural sector, an increase in industrial sector employment, and growth in wage and salaried work. Notably, when examining sub-components of the economic freedom index, these effects are primarily driven by trade reform policies. However, we find no significant impact on broader labor market indicators such as labor force participation, employment ratio, or unemployment rates. These findings align with Sustainable Development Goal 8 (Decent Work and Economic Growth) and Goal 9 (Industry, Innovation, and Infrastructure), suggesting that economic liberalization policies can facilitate sectoral transformation while highlighting the need for complementary interventions to enhance overall employment outcomes in the region.

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The Impact of Active Learning Activities in a Large Section Course

Larry Faulk[§]

Abstract: Classes with very large enrollments are not uncommon especially for core courses. While we are able to convey a wealth of information to a significant number of students, it is much more difficult to engage the students compared to a smaller class. One method of engaging students is through active learning, but this is challenging with a large class. A large, public university's business school in the southwest United States attempted to address this challenge by breaking up classes with over 200 students into smaller sections one out of the three meetings a week to hold discussion sessions over that week's lecture topic. These discussion sessions were led by teaching assistants with 25-30 students in a variety of activities. The goal was to increase student engagement and learning. To gauge the success of the effort, exam scores were compared over a two-year period during which 1291 students had an active learning experience and 1821 did not. Students in the Active Learning sections did have the expected higher scores on the first two exams, the non-Active Learning sections had higher scores on the final and there was no statistically significant difference in overall exam grades. The mean differences ranged from .51 to .83 %. While there was a slight increase in exam scores, a more significant impact was on retention when there was an active learning component with 41% fewer students dropping the class.

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Country of Origin and Brand Strategy: Focusing on Marketing Communication

Sungwoo Jung[§], Jihye Lee[‡]

Abstract: In today's highly competitive global and local markets, the distinction between locally originated and foreign brands is becoming increasingly blurred, particularly among consumers in emerging economies. This study explores the phenomenon of brand origin confusion by identifying its causes and implications. As international brands adopt local aesthetics and local brands incorporate global or foreign elements, consumers struggle to distinguish between them. This growing conflict between a brand's local and nonlocal identity leads to greater consumer confusion. As a result, global and foreign brands face diminishing competitiveness in emerging markets.

The role of branding and marketing communications in contributing to consumer confusion regarding brand origin should be emphasized. As multinational companies expand and hybrid products become more prevalent, the accuracy of country-of-origin information has increasingly blurred. It is suggested that brand origin will play a crucial role in shaping consumer perceptions and evaluations of brands in the future. However, ineffective communication strategies in building international brands within emerging markets further distort consumers' understanding of a brand's origin. Consumers frequently misattribute brand origins, often relying on brand names, which can lead to inaccurate assumptions about a brand's country of origin.

This phenomenon has significant implications for global marketers pursuing localization strategies in emerging markets. Foreign brands are often associated with authenticity and superior quality. While localization strategies offer advantages, it is crucial not to overlook consumers' preference for brands that embody global or foreign consumer culture. Marketers must carefully balance localization efforts with the need to maintain a clear global identity. The cost of losing the distinct appeal of being perceived as a foreign brand should be weighed against the potential benefits of localized positioning. By adapting to local tastes without creating brand confusion, global marketers can still leverage consumer attraction to the exotic.

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MBA Classroom Without Walls: A Case for Immersive Outdoor Leadership Education

Judith Scully Callahan[§], D. Scott Kiker[‡]

Abstract: The authors present the development and execution of an immersive, experiential, skills-based pedagogy used to develop an MBA leadership course. The course design allows students to learn, practice, and reflect on effective servant leadership behaviors while learning a novel set of primitive survival skills. Servant leadership was utilized because it is a follower-focused leadership theory, and servant leadership behaviors are correlated with important affective and behavioral follower outcomes. The course requires students to exit their comfort zone and enter their learning zone as they team up with strangers to learn primitive survival skills while camping in a national forest for five days and four nights. The learning environment removes distractions and facilitates a deeper understanding of, and opportunities to practice, servant leadership. The authors describe the learning environment, course requirements, and the servant leadership behaviors supported by each of the primitive skills activities. Student reactions are synthesized. In conclusion, the authors strongly encourage other instructors tasked with providing leadership education to cultivate an immersive, outdoor, skills-based course.

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A Resource-based Model of Organizational Change for Firms Failing to Meet Investors' Expectations

J.L. "Bert" Morrow, Jr.[§], Sara H. Robicheaux[‡]

Abstract: This study examines the issue of what type of strategy a firm should use to correct a decline in firm performance as measured by investors' expectations. More specifically, the research question posed in this study is: Among firms that are failing to meet financial market expectations, what are the performance effects of different types of changes? We used a resource-based approach (Barney, 1991; Barney et al., 2021) to reconcile the opposing views of organizational change suggested by population ecology (Hannan & Freeman, 2020) and strategic choice theorists (Bettis & Prahalad, 2020; Child & Faulkner, 2021). To achieve an increase in investors' expectations, this model of organizational change suggests that a firm is free to change in any way the manner in which it organizes or deploys its resources, but it cannot change the firm's resources themselves at all, at least not in the short run. Propositions are offered to empirically test the theoretical model.

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Student-Driven Strategic Insights: Enhancing University Planning with Mind Mapping and SWOT Analysis

Jennifer Pitts[§], Fonda Carter[‡], Robin L. Snipes^ζ

Abstract: This mixed-method study analyzes the results of a student-led SWOT analysis at Columbus State University (CSU) to identify key themes that reflect students' perceptions of the university's strengths, weaknesses, opportunities, and threats. The study consists of two phases. In Phase 1, more than 100 undergraduate project management students conducted individual SWOT analyses using mind-mapping techniques and proposed technology-based projects aligned with CSU's strategic plan. This process fostered critical thinking and problem-solving skills by requiring students to assess institutional challenges and propose actionable solutions. A qualitative content analysis of the Phase 1 data revealed recurring themes in the SWOT responses, offering initial insights into students' perspectives on significant institutional issues. Additionally, the initial phase of the study enhances student engagement and promotes a sense of agency in institutional development by involving students in examining and addressing issues that directly affect their university experience. Additionally, it reinforces essential project management skills such as strategic analysis, decision-making, and solution-oriented thinking. Phase 2 will involve surveying a broader student population to evaluate the perceived importance of and satisfaction with the key themes identified in Phase 1 through gap analysis. This approach aims to reveal discrepancies between importance and satisfaction levels, providing university administrators valuable insights into areas needing strategic improvement. The results will also provide data for accreditation and continuous improvement efforts, aiding administrators in prioritizing projects that address high-importance, low-satisfaction issues to better align strategic initiatives with student needs and institutional goals. This structured, problem-based learning assignment illustrates how student engagement can enhance learning outcomes and institutional decision-making.

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Tone Matters

Tony Vrba §

Abstract: Over the past decade, education has transitioned from being predominantly in-person, brick and mortar institutions to online, video instruction and hybrid models. Along with this shift in educational platforms, the student population has become increasingly diverse encompassing multi-cultural and multi-generational learners. This diversity has led to the increasing complaints that instructors are harsh and often unapproachable. Effective communication by instructors is essential to ensure open dialogue and for faculty to understand how their communication impacts students. Not only is the tone of language important it is essential that instructors articulate the rationale behind the workload, learning outcomes, assessments and deadlines thus creating a more open and empathetic environment that students feel more open to. The purpose of this research is to systematically investigate these issues and to identify solutions to improve instructor communications with students focusing on the tone of communication and feedback in the classroom.

Recruiting the Future: Insights from Millennials on Best Practices and Strategies for Firefighter Recruitment and Retention in Mississippi

Lestonio Yarbrough §

Abstract: Fire departments face challenges in recruiting and retaining Millennials for the fire service. As older generations of firefighters retire, an increasing number of vacancies are emerging. Because the Millennial generation is known to depart from their current positions impulsively, this study was completed to understand Millennial firefighters' perspectives and to help improve recruitment and retention for the fire service in Mississippi. Millennials have a reputation for job-hopping or moving freely from company to company. This research aimed to understand the problem by examining Millennial firefighters' preferences and experiences, which will provide practical recommendations on how to attract this generation to the fire service. This study was also completed to understand Millennial firefighters' expectations and the most compelling motivational practices that will retain them for this public service profession. This qualitative phenomenological research study explored Millennial firefighters' perceptions and key motivators needed to attract and retain Millennials in the fire service. The study found that fire departments that want to recruit and retain Millennials should consider providing attractive pay packages that allow Millennial firefighters to at least meet basic financial needs, develop career counseling and streamlined career advancement plans, and encourage a conducive and cooperative work environment that will help Millennials experience a positive and inviting culture.

An Analysis of Experiential HR Cases Reported by Full-Time Working Graduate Students

Kristena Gaylor[§], Susanne Toney[‡]

Abstract: Upon a review of over ninety experiential cases, a significant number of workplace issues are related to workplace discrimination, diversity, sexual harassment and retaliation work-related issues. Diversity, Equity, and Inclusion issues are relevant critical in both academic and professional settings, particularly for graduate students who balance full-time employment with their studies. This research explores experiential cases reported by graduate students working full-time at local companies, highlighting the challenges they face in these environments. Through data analysis and case study analysis, we examine themes such as workplace discrimination, sexual harassment, and academic inclusivity, and barriers to career advancement. Additionally, we assess how employers address these concerns and the effectiveness of existing HR policies. The presentation concludes with actionable recommendations to foster more equitable and supportive academic and professional spaces for workers.

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Two Perspectives on Commitment in the Accounting Profession

Han-Sheng Chen¹, Susan Coomer Galbreath², Mark Jobe³, Marcy R. Binkley⁴, Allen Jinnette⁵, Brandon Lanciloti⁶, Karen C. Miller⁷, Audrey Scarlata⁸

Introduction

In recent years, the accounting profession has experienced challenges with retaining and hiring accounting staff. These staffing challenges result from multiple factors, including a declining number of accounting graduates, an aging workforce, and lower numbers of CPA Exam candidates. This crisis is exacerbated by the growing demand for and increased complexity of accounting services which requires knowledgeable and skilled accounting professionals. The American Institute of Certified Public Accountants and the National State Boards of Accountancy have made efforts to address the staffing challenges by focusing on the pipeline issues and encouraging the accounting profession to address many of the underlying causes. In the meantime until these issues are fully addressed, accounting programs and accounting firms are left to carry on with their normal activities while the accounting student and professional staff numbers decline.

When staffing challenges like these exist, understanding the level of organizational commitment of accounting professionals and the level of professional commitment of current accounting students can be informative for organizations willing to adapt. To examine the extent of these two perspectives of commitment (organizational and professional), this project surveyed 397 accounting professionals regarding their level of organizational commitment and 76 accounting students regarding their level of professional commitment. The results of this research will help the accounting profession in general by identifying any areas of concern with both the level of organizational commitment of current accounting staff and with the level of professional commitment of future accounting staff. More specifically, this research should help accounting firms and accounting programs in middle Tennessee better understand the current level of organizational and professional commitment within their market areas. This understanding should be helpful in drafting plans to address the accounting staffing and pipeline crisis.

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Literature Review

The literature review for this paper covers three related areas: accounting staffing challenges, generational differences, and organizational and professional commitment.

Literature Review

Turnover is expensive. Anytime it occurs organizations lose. They suffer the loss of institutional knowledge and skill sets, some of which can only be obtained through experience, and they also incur the expense of hiring, training, and onboarding replacements. When there is a staffing crisis, as is the current case in the accounting profession, turnover is even more costly given the limited pool of replacement accountants available. In these cases, the losses a firm experiences during turnover are not limited to the expense of the turnover itself but may also include the impact on overall revenue if staffing levels no longer permit the addition of new clients or the full servicing of its current client base. Given this great cost, firms must monitor the organizational commitment of their current employees in order to reduce turnover and retain experienced, satisfied accounting professionals.

At the same time accounting firms are experiencing a staffing crisis of experienced labor, they are also experiencing a decline in new staff hires. Accounting programs across the country have also seen declines in enrollment. According to the 2023 Trends: A Report on Accounting Education, the CPA Exam and Public Accounting Firms' Hiring of Recent Graduates report, 2021-22 bachelor's degrees earned was down 7.8% from the previous years, representing a decline of about 47,000 undergraduate students. On the master's level for the same period, enrollment declined by 6.4%, representing 18,238 fewer master's students. It is important to note that these enrollment declines follow preceding years of declining enrollments since 2015 (AICPA, 2023).

The decline in accounting student enrollment is a priority factor in the pipeline work that the American Institute of Certified Public Accountants (AICPA) and the National State Boards of Accountancy (NASBA) have initiated to address the insufficiency of accounting professionals. Important to this concept is the level of professional commitment within the current accounting student body. If these current accounting students don't have a strong commitment to the accounting profession, then there are real risks that they may not matriculate directly into the accounting profession or may, at best, only take an accounting position to stay the minimum time needed to gain the required experience for licensure. For example, accounting students with lower levels of professional commitment to accounting who double major or minor in complementary fields, such as finance and data analytics, are more likely to be diverted during the recruiting process into other fields other than accounting. And, this threat of talent flight is not just hypothetical. Hagy (2025) observes that "accounting starting salaries have not kept pace with neighboring professions and industries, like finance and technology." Galbreath, et. al., (2023) further caution that, "if lower growth rates in accounting salaries persist over time . . . this may contribute to employees self-selection to leave the profession." This pay disparity is a double blow for the profession because it not only hampers the ability of firms to meet current staffing needs in terms of seasoned professionals but also serves to divert new accounting graduates, who might otherwise have entered the profession, into alternative career paths.

Generational Differences

The beginning of modern day research about generational differences is credited to Karl Mannheim (1952), who first used the term “generations” to describe how different age groups impact and influence social movements in a particular culture as one (younger) age group enters the social system and another (older) age group exits the system. Managing multiple generations with differing perspectives, expectations, and values in the workplace can create any number of challenges for employers that, if not addressed, may impact hiring and retention efforts.

Recent research has focused on differences in the current generational cohorts in the workplace, such as Boomers, Gen X, Gen Y, and Gen Z, and how their approach to life and work differ. A 2018 review of the previous 15 years of generational research found younger generations reported lower work commitment, increased turnover intention, and decreased job satisfaction when compared to older generations (Aziz, et. al., 2018). Jäckel and Garai-Fodor (2022) found generational differences such as younger generational cohorts prefer remote work options, show more flexibility in changing jobs, desire mentoring from older colleagues, and often characterize older generations as bossy and trying to control them.

Other research provides more comprehensive comparisons of the generational cohorts in the workplace. Gravett and Throckmorton (2007) provides resources, examples, and real-life cases for managers who find themselves leading multi-generational teams that have different perspectives and values. Rikleen (2016) builds on her previous work on generational differences in the workplace in this research by providing updated case studies to help managers strengthen their multi-generational teams and develop future leaders in their companies.

Regardless of the approach, all of these resources support the existence of and provide resources for managing the divergent perspectives, values, priorities and expectations that exist across the generational cohorts. Leaders who ignore these differences will likely face difficulties in achieving business goals and in recruiting and retaining staff.

Organizational and Professional Commitment

Organizational commitment, or the lack thereof, can have a tremendous impact on effective management and recruiting and retention strategies. Mowday, Steers, & Porter (1979) validated an instrument to measure called the Organizational Commitment Questionnaire (OCQ). The OCQ is a tested and validated instrument that can be used across genders and organizations to determine employee commitment to the organization. As described later in this paper, this study used the OCQ to rate employee commitment and a modified version of the OCQ to rate students’ professional commitment.

Recent research has linked organizational commitment with generational differences. Lin, et. al., (2024) found that the Gen Z generational cohort has a weaker organizational commitment than prior cohorts. These authors posit that this is likely the case because while Gen Z is similar to previous generations in prioritizing personal growth and job satisfaction, prior generational cohorts also valued moral duty to stay with their employer, which Gen Z lacks.

Similar to organizational commitment, professional commitment, or the lack thereof,

can have a tremendous impact on the recruiting and retention efforts of a given profession. Research on professional commitment of nursing undergraduates found that professional commitment for nursing students was lower for students who did not voluntarily choose nursing as a major and for those who had less satisfaction with their clinical experience (Zhang, et. al., 2023). Understanding the professional commitment of accounting majors may provide important insights for the profession's ability to recruit and retain accounting professionals.

Survey Process and Methods

Results reported are from a survey conducted from September 6 to October 15, 2023, of alumni and students from five middle Tennessee universities.¹ Each university distributed the survey instruments via email to their respective alumni and student participants. At the end of the survey window, 397 alumni and 76 students responded² to the organizational commitment questions. Of the alumni respondents, approximately 34.5% were female, 43.6% were male, and 21.9% declined to provide their gender. For the students, approximately 26.3% were female, 35.5% were male, and 38.2% declined to provide their gender. At the time of this research analysis, the generational cohorts were classified in the following age groups: Boomers age 60 or older, Gen X ages 45-59, Gen Y ages 30-44, and Gen Z age 29 or younger.

Organizational and Professional Commitment Measures

To gain an understanding of the level of organizational commitment of accounting professionals, the alumni were asked a series of questions based on the OCQ (Mowday, Steers, and Porter, 1979). This questionnaire defines organizational commitment "as the relative strength of an individual's identification with and involvement in a particular organization" (p. 226). Table 1 illustrates the organizational commitment questions in the accounting professional column that were asked of current accounting professionals. These respondents provided responses to the 12 statements using a 5-point scale³ anchored from Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, and Strongly Agree. Thus, the minimum organizational commitment score for the accounting professionals is 12 and the maximum score is 60, with a theoretical mean of 36.

Table 1: Measures of Commitment

Accounting Professionals Organizational Commitment*	Students Professional Commitment*
I would be very happy to spend the rest of my career with this organization.	I would be very happy to spend the rest of my career in the accounting profession.
I really feel as if my organization's problems are my own.	I really feel as if the accounting profession's problems are my own.
I think that I could easily become as attached to another organization as I am to this one.	I think that I could easily become as attached to another profession as I am to the accounting profession.
I am not afraid of what might happen if I quit my job without having another one lined up.	I am not afraid of what might happen if I quit an accounting job without having another one lined up.
It would be very hard for me to leave my organization right now even if I wanted to.	It would be very hard for me to change my major right now even if I wanted to.
One of the major reasons I continue to work for this organization is that leaving would require considerable personal sacrifice as another organization may not match the overall benefits I have here.	One of the major reasons I would continue to work in the accounting profession is that leaving would require considerable personal sacrifice as another profession may not match the overall benefits the accounting profession offers.
I do not believe that a person must always be loyal to his or her organization.	I do not believe that a student must always be loyal to his or her original major choice.
If I got another offer for a better job elsewhere, I would not feel it was right to leave my organization.	N/A--question not included on the student survey
I was taught to believe in the value of remaining loyal to one organization.	I was taught to believe in the value of remaining loyal to one organization.
Things were better in the days when people stayed with one organization for most of their careers.	Things were better in the days when people stayed with one organization for most of their careers.
If I got another offer for a better job outside the accounting profession, I would not feel it was right to leave the accounting profession.	If I got another offer for a better job outside the accounting profession, I would not feel it was right to leave the accounting profession.
Knowing what I know about the accounting profession today, I would recommend an accounting major to college students.	Knowing what I know about the accounting profession today, I would recommend an accounting major to college students.

For the students, Table 1 also presents the slightly modified questions based on the OCQ (Mowday, Steers, and Porter, 1979) to address the students' level of professional commitment rather than their level of organizational commitment. This modification was made to measure the strength of the student's identification with and involvement in the accounting profession. Similar to the accounting professionals, student respondents provided responses to the statements using a 5-point scale anchored from Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, and Strongly Agree. However, the students were tasked to answer only 11 questions because one question was deemed inapplicable to the students group. Thus, the minimum professional commitment score for students is 11 and the maximum score is 55, with a theoretical mean of 33.

Organizational and Professional Commitment

Table 2 reports the overall organizational commitment scores by generational cohort for the accounting professionals in the upper panel and the professional commitment scores for the accounting students in the lower panel.⁴ There are some interesting observations in the results. First, considering the organizational commitment in the top panel of Table 2, there are generational differences consistent with prior research (Mannheim 1952; Aziz, et. al., 2018; Jäckel and Garai-Fodor 2022). Boomers (ages 60 or older) and Gen X (ages 45-59) report being more committed to their organizations as illustrated with average organizational commitment scores of 3.29 and 3.19, respectively, than the two younger cohorts, Gen Y (ages 30-44) and Gen Z (ages 29 or younger), which have lower organizational commitment scores of 3.00 and 2.96, respectively. Also, when the organizational commitment of each age group is compared to the organizational commitment of all the other age groups, Gen X is significantly higher than the other three age groups taken together, and Gen Z is significantly lower than the other three age groups taken together. The finding that older employees have higher organizational commitment and younger employees have lower organizational commitment is consistent with the findings of Lin, et. al., 2024 and Aziz, et. al., 2018.

Table 2: Commitment by Age Cohort

Organizational Commitment					
Cohort	Mean	SD	N	T-stat	P-value
Boomers	3.29	0.59	11	1.31	0.2195
Gen X	3.19	0.56	72	2.28	0.0250*
Gen Y	3.00	0.50	94	-1.27	0.2042
Gen Z	2.96	0.54	134	-2.47	0.0140*
Professional Commitment					
Students	3.20	0.48	76	N/A**	

*Significant at .05.

**Since there is only one student group, comparative statistics by group are not available.

While these results support the differences often seen between the generational groups, it is Gen Z's lower level of organizational commitment (which is significant at .05 level) that presents the most pressing concern. This younger group represents the future accounting workforce. If their lower levels of organizational commitment persist, firms can expect to incur more turnover and loss of knowledge as these employees mature in their career. Unfortunately, recent research indicates that finding ways to shore up or strengthen the organizational commitment with the Gen Z group is not as easy as it may have been for previous generational cohorts (Lin, et. al., 2024).

The bottom panel of Table 2 presents the professional commitment measures for students. The students rated their professional commitment using a modified version of the organizational commitment survey as presented in Table 1. When compared to the average professional mean of 3.00, the students show a higher-than-average professional commitment of 3.20. While there is not a significance test for the student group, students having a professional commitment above the average of 3.00 is a good sign for the profession. While the student age group for our study consists of students of all ages, traditional students currently belong to the Gen Z group as they were born between 1997-2012. Therefore, this younger age group having an above average professional commitment is an encouraging indicator for the future of the accounting profession and is something these authors plan to examine in more detail in future research. Whether this professional commitment will translate to higher organizational commitment once employed is still a question. Employers will want to cultivate their relationship with these younger employees to strengthen their commitment.

Organizational and Professional Commitment

Table 3 presents the organizational commitment of alumni (accounting professionals). The top panel presents the organizational commitment by employer type. Reviewing all the employer types, the highest level of organizational commitment was reported by those working for nonprofit employers. This result may not be surprising given the passion, motivation, and dedication that many nonprofit employees often have for the mission of their organizations. It may also reflect the presence of better working conditions and or hours that exist in this sector.

Table 3: Organizational Commitment by Employer Type

Employer Type	Mean	SD	N
Big 4 Firm	3.14	0.63	21
Non-Big 4 Firm	2.99	0.63	20
Regional Firm	2.90	0.75	12
Local Firm	3.20	0.51	31
Education	3.07	0.63	13
Finance	3.05	0.58	23
Government	3.12	0.48	34
Healthcare	2.93	0.45	51
Manufacturing	3.03	0.54	28
Nonprofit	3.33	0.24	7
Other	3.08	0.55	157
Public Accounting	3.06	0.61	84
Non-Accounting	3.06	0.52	313

When considering the reported organizational commitment levels of the four public accounting employers listed in the top panel, employees from Big 4 and Local Firms report organizational commitment levels above the 3.00 average as compared with employees from Non Big 4 and Regional Firms who report organizational commitment levels just below 3.00. This may indicate that smaller firms and Big 4 firms are adapting more quickly to the new realities in the marketplace and thereby achieving slightly better levels of organizational commitment than other middle-tier (Non Big 4 & Regional) public accounting firms.

The bottom panel of Table 3 presents the organizational commitment by categorizing the employers into either public accounting and non-public accounting groups. The level of organizational commitment is essentially the same between these two broad employer categories.

Understanding the cause or reasons for differing levels of organizational commitment at different employer types is beyond the scope of this study. However, identifying key factors that lead to higher levels of organizational commitment should benefit employers

who are interested in mitigating turnover and enhancing recruitment and retention within their organizations. One obvious place to begin this search is with benefit packages. Chen et. al., (2024, 18) specifically focuses on key employer-provided benefits and suggests that “in the battle to attract new talent, first-mover advantages will go to proactive organizations that take the lead in identifying and closing existing negative satisfaction gaps on the most important factors.”

Organizational Commitment by Busy Season

Busy season, which for most public firms is a period of heavy workload occurring during the first quarter of the year, has historically been a common experience in the accounting profession. However, the existence of typical busy seasons is anecdotally linked to increased employee dissatisfaction and its subsequent negative effect on retention. As a result, examining organizational commitment alongside the existence of a busy season is a relevant research question. Table 4 presents the level of organizational commitment for accounting professionals categorized by either the absence or presence of a busy season in their current employment. Interestingly, accounting professionals whose work includes a “busy season” report significantly higher levels of organizational commitment than those without a busy season (3.09 and 2.97, respectively). The difference is statistically significant at the 5% level. This finding is counterintuitive to the anecdotal evidence often heard that busy seasons or hours worked are a leading negative factor in accounting positions. Additional research is needed to examine the underlying factors for this finding and to see if the differences we observe in Table 4 in are primarily driven by employer type. The most likely explanation for this paradox may be the presence of busy season work within nonpublic entities.

Table 4: Organizational Commitment by Busy Season

Busy Season	Mean	SD	N	T-stat	P-value
Without Busy Season	2.97	0.53	137	1.97	0.0500*
With Busy Season	3.09	0.55	174		

*Significant at .05.

Conclusion

The accounting profession has a commitment problem. With pipeline issues plaguing the profession and a steady tide of CPAs leaving for greener pastures, it is a problem that must be addressed and addressed quickly. While the AICPA and numerous state-boards of accountancy are actively working to increase the inflow of new talent by lowering barriers, their efforts will likely fall short if the profession fails to adequately address the key factors negatively impacting employee commitment. To use a sailing analogy, putting more people on a sinking ship does not plug the leaks. The profession, in general, and firms, specifically, need to revisit the past to understand what made the profession so attractive for so long. And, if it has lost its luster in recent years, ask why. This research focuses on professional commitment of accounting students and organizational commitment of accounting professionals in an attempt to find answers to some of these questions or at a minimum to at least better understand the current state of the market in middle Tennessee. Our findings from Table 2, where we examined generational cohorts, reveal a similar pattern as seen in prior research. That is to say, the Gen Z and Gen Y accounting cohorts have lower-than-average organizational commitment scores than Boomers and Gen X accounting cohorts. The usefulness of this finding for accounting firms is that common mitigation techniques have already been developed to help companies address the different generational needs of their varied employees. And since accounting professionals show the same generational trends, firms will not be forced to develop unique solutions but should rely, to a greater extent, on the larger body of knowledge already in place for bridging generational divides in the workplace.

Table 3, examined the accounting professional's level of organization commitment by employer type. Our findings indicate that non profit employees reported the highest overall level of organizational commitment. Something in between enjoying a better work-life balance and aligning one's job with a calling likely explains the allure of work in this sector and the reported commitment score. Of the four public accounting employer types investigated, only "Local Firm" and "Big 4" employees reported commitment scores above 3.00. This suggests that the flexibility of smaller firms and perhaps the great resources of the Big 4 are helping each group outperform firms which fall in the middle (Regional and Non Big 4). In fact, Regional and Non Big 4 employees reported the two of the lowest three measures of organizational commitment scores out of all 11 employer types. This likely foreshadows even greater challenges on the horizon for mid-sized accounting firms.

Next, we examined the impact of a busy season on organizational commitment levels and discovered a counterintuitive result – busy season work was positively associated with greater levels of organizational commitment. This finding, although statistically significant, is likely misleading. Table 3 reports the scores from 84 public accounting firm employees, yet in Table 4 a grand total of 137 professional accountants reported the presence of a busy season. The numerical difference, 53 responses, came from employees working outside of the public accounting field and these employees doubtlessly had a much more positive experience during their busy season than what is typical for the majority of public accounting firm employees. It would benefit firms to take our findings from Table 4 with caution.

Ending on a positive note, panel 2 of Table 2 reveals that accounting students posted higher-than-average levels of professional commitment. The challenge for firms and the

profession as a whole will be to build upon this foundation with the goal of increasing both types of commitment for all accounting professionals.

Future research may include the following:

- Review data to see if there are differences in organizational commitment based on weekly hours worked in busy season and non-busy season
- Examine ways to strengthen organizational commitment, especially with the Gen Y and Gen Z generation cohorts
- Examine ways to strengthen professional commitment for accounting students perhaps by examining their satisfaction with internship experience and/or academic experiences
- Look at students' professional commitment by age cohort (if there are enough responses in each age cohort) to see if any prof commitment differences in students based on age--most are likely Gen Z.

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Wages and Differences in Cost-of-Living in China

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Introduction

In recent decades, China has undergone economic reforms, marked not only by rapid growth and urbanization but also by gradual liberalization of its labor market. While the household registration (hukou) system and employment rigidities once tightly constrained labor mobility, a series of policy reforms, particularly since the early 2000s, have loosened these restrictions, which enabled greater interprovincial migration and allowing market forces to play a larger role in wage setting. These institutional shifts raise a fundamental question: as labor becomes more mobile, to what extent do regional wage differences reflect compensating differentials for variations in cost of living and quality of life?

This paper examines spatial wage disparities across China's provinces by investigating whether workers in high-cost regions are compensated through higher nominal wages, and whether these wage adjustments vary across firm ownership types. We pay special attention to the contrast between state-owned enterprises (SOEs) and foreign-invested enterprises (FIEs)—two distinct segments of China's labor market that differ in wage-setting practices, exposure to competition, and geographic concentration. By combining provincial-level data on average wages, housing prices, and a composite quality of life index, we estimate wage regressions separately for SOEs and FIEs to assess how living costs and amenities shape wage structures.

Literature Review

This study builds on the spatial equilibrium framework pioneered by Rosen and Roback, and closely follows the empirical strategy of Winters (2009), who investigates whether nominal wages in U.S. metropolitan areas compensate for differences in local housing prices and amenities. Winters finds that workers are not fully compensated for cost-of-living differences, implying that real wages vary significantly across space.

In the context of China, Combes, Démurger, and Li (2015) analyze wage disparities and labor mobility, highlighting the persistent role of the hukou system in shaping regional wage differences. While their study focuses on the institutional barriers to labor migration and does not explicitly model amenities or housing costs, it underscores the importance of ownership types and structural segmentation in the labor market. Our study complements theirs by directly examining cost-of-living adjustments and quality of life indicators in relation to wage outcomes.

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Methodology and Data

We follow Winters (2009) closely, who estimates individual wage equations and then regresses regional fixed effects on housing prices and amenities. Due to data limitations, we do not have access to individual-level microdata. Instead, we use provincial-level average wages, average housing prices, and a composite quality of life index to estimate wage regressions directly at the aggregate level.

While this approach limits our ability to control individual-level heterogeneity, it aligns with the theoretical structure of spatial equilibrium models, which emphasize comparisons of average outcomes across locations. The benefit of using aggregate data is that it facilitates the integration of regional characteristics and avoids measurement error and idiosyncratic variation present in microdata. However, this also introduces potential omitted variable bias and the risk of ecological fallacy.

We use two dependent variables: average nominal wages in state-owned enterprises (SOEs) and in foreign-invested enterprises (FIEs). Explanatory variables include the log of average housing prices (to capture cost of living), a composite quality of life index (to proxy for non-wage amenities), and control variables such as population growth rate and household income. By estimating separate models for SOEs and FIEs, we test whether compensation patterns differ across ownership types.

Model Specification

We estimate two separate wage equations—one for state-owned enterprises (SOEs) and one for foreign-invested enterprises (FIEs)—to examine how housing prices and amenities affect nominal wages.

Model 1: Wages in State-Owned Enterprises (SOEs)

$$\ln(w_p^{SOE}) = \alpha^{SOE} + \beta^{1SOE} * \ln(HPrice_p) + \beta^{2SOE} * QoL_p + X_p' \gamma^{SOE} + \varepsilon_p^{SOE}$$

Model 2: Wages in Foreign-Invested Enterprises (FIEs)

$$\ln(w_p^{FIE}) = \alpha^{FIE} + \beta^{1FIE} * \ln(HPrice_p) + \beta^{2FIE} * QoL_p + X_p' \gamma^{FIE} + \varepsilon_p^{FIE}$$

Where:

- $\ln(w_p)$: Log of average nominal wage in province p
- $\ln(HPrice_p)$: Log of average housing price in province p
- QoL_p : Quality of Life index in province p
- X_p : Vector of control variables
- ε_p : Error term

Regression Results and Conclusion

Table 1: Descriptive Statistics

	FIE	GROWTH OF POP	HOUSE PRICE	INCOME	QOL	SOE
Mean	21855.91	0.012363	3421.25	10304.43	54.50393	27107.18
Median	20620	0.019197	2841.5	9133	53.465	22614
Maximum	45508	0.034189	8627	16884	64.07	55547
Minimum	16344	-0.047563	1821	7626	50.11	18720
Std. Dev.	5766.182	0.021453	1672.78	2643.154	3.282226	9697.792

Table 2: Regression Results

Variables	Coefficient of SOE	Coefficient of FIE
ln(house)	0.417**	0.42**
QoL	0.029*	0.03*
Income	-0.0003	-0.0006
Growth of Pop	-0.04	0.667

** : 1% statistically significant and * indicates 5% statistically significant

Table 1 and 2 provide descriptive stats and regression results. The estimated coefficients on log housing price are 0.417 for SOEs and 0.42 for FIEs. These findings indicate a positive and nearly identical elasticity of wages with respect to living costs across firm types. The coefficients on the Quality of life (QoL) are 0.029 for SOEs and 0.03 for FIEs are both statistically significant and again nearly identical, indicating that better amenities are associated with slightly higher nominal wages in both sectors.

In conclusion, we find that both SOEs and FIEs adjust wages similarly in response to housing costs and quality of life, suggesting a common wage-setting response to regional cost-of-living and amenity differences. Despite institutional differences, both firm types appear to operate within a broadly shared spatial labor market framework.

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An Examination of the U.S. Truck Driver Shortage: Facts, Causes, and Potential Solutions

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Abstract: The health of the transportation sector is a strong predictor of the health of the overall U.S. economy. In addition, since the motor carrier mode of freight carriage transports over 72.6% of the nation's freight, the availability of truck drivers is critical to U.S. economic health. The overall age of the motor carrier workforce and the demands and hazards of the job have made it difficult to hire and retain enough qualified drivers. Further challenges were introduced during the COVID-19 pandemic with the shift to more online shopping, which increased the need for additional drivers. For this research, a summary analysis of pay, benefits, and job requirements for the motor carrier labor force will be presented, segmented by carrier type. This analysis will then be used to compare long-haul vs. parcel truck employment, in an effort to test whether a shift to parcel truck operation explains the long-haul driver shortage. Also, new technologies and routing strategies will be evaluated as potential solutions to this problem. A pony express routing strategy will be introduced as a strategy for mitigating the disadvantages of long-haul trucking, and an initial optimization model for this routing approach will be presented.

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Introduction

Transportation – of goods, people, even information – is essential to the vibrancy of a nation, allowing commerce to flourish and improving the health and wellbeing of the nation’s citizens. Freight in the United States is carried primarily by five modes: Rail, motor carrier (truck), air, water, and pipeline, with intermodal carriage gaining traction as a potential sixth mode (source). While 20.1 billion tons of freight, valued at \$18.7 trillion were transported within the U.S. in 2023, carriage by truck dominates the other modes, carrying over 72% of the nation’s freight (BTS (1), 2024) with the 3.54 million truck drivers employed within the U.S. that year (McCareins, 2025). Table 1, below, provides a by-year modal comparison of total ton-miles of freight carried in the U.S., from 2019 to 2022.

Table 1: U.S. Ton-Miles of Freight (Millions, 2019 – 2022)

Year	Air	Motor Carrier	Rail	Water	Pipeline	Total
2019	16,413	2,246,971	1,614,498	565,153	1,036,944	5,479,979
2020	18,760	2,194,559	1,439,814	539,470	978,981	5,171,584
2021	20,152	2,143,213	1,533,869	554,309	1,008,297	5,259,840
2022	19,367	2,174,889	1,533,416	561,500	1,064,943	5,354,115

As Table 1 illustrates, motor carriage dominates the other modes for finished goods carriage, for several reasons. Trucks can go virtually anywhere, execute last-mile delivery in partnership with other modes (intermodal), and provide relatively smooth transit for delicate goods (Novack, Gibson, and Suzuki, 2024)).

The motor carrier industry is threatened, however, by an ongoing shortage of truck drivers, which has been in place since at least 2005 (Costello, 2017). The American Trucking Association (ATA) calculates the driver shortage each year as the “difference between the number of drivers currently in the market and the optimal number of drivers based on freight demand (ATA, 2022). Figure 1, below, illustrates the trucker shortage by year since 2015.

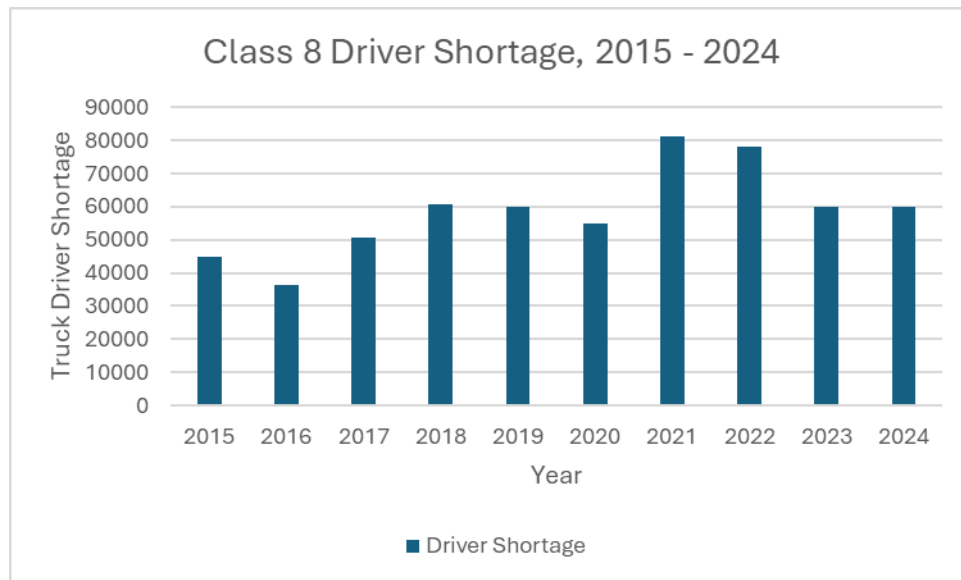


Figure 1: Shortage of Truck Drivers by year (Costello, 2017; Costello and Karickhoff, 2019; ATA (2), 2021; ATA (3), 2022; ATA(1), 2025)

There are several reasons for this deficit:

- *Aging workforce.* As of 2024, the average age of truck drivers was 46 (McCareins, 2025), while the average age of new driver trainees as of 2019 was 35 (McNally, 2019).
- *Driver turnover.* The driver churn rate (the percentage of drivers who quit a carrier within a year) for full truckload (TL) carriers has been over 100% for several decades (Novack et al., 2024), while the driver turnover rate was 89% for large TL carriers and 73% for small TL fleets as of 2018 (Costello and Karickhoff, 2019).
- *Small number of female drivers.* As of 2023, women made up just 12.1% of professional drivers who hold CDL licenses and drive heavy-duty trucks (Women in Trucking, 2023).
- *Few qualified applicants.* Carriers struggle to find drivers that meet minimum age, background check, and drug screen requirements (Novack et al., 2024).
- *Difficult working conditions for TL drivers.* Working conditions for TL drivers include long periods away from home, inadequate facilities/parking for trucks while on the road, hours of service (HOS) regulations, and safety concerns (ATA, 2021).

Therefore, motor carriers are constantly challenged with finding ways to attract and keep key driving talent.

Another threat to long-haul driver retention may be related to the advent of e-commerce. The relatively recent escalation in e-commerce, as shown in Figure 2, below, has changed how and where retailers position inventory, which has in turn changed the type of motor carriage services needed.

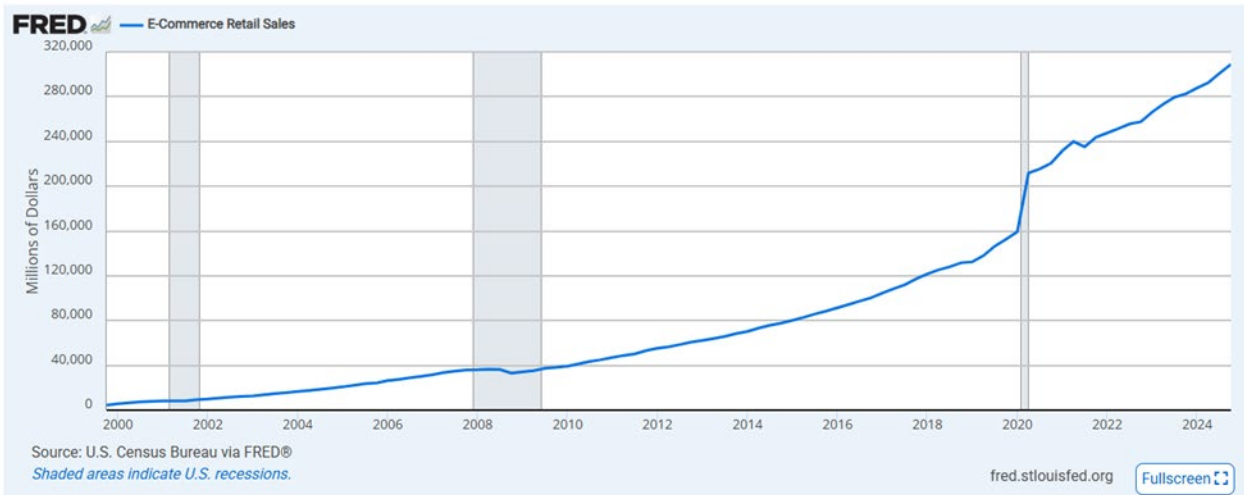
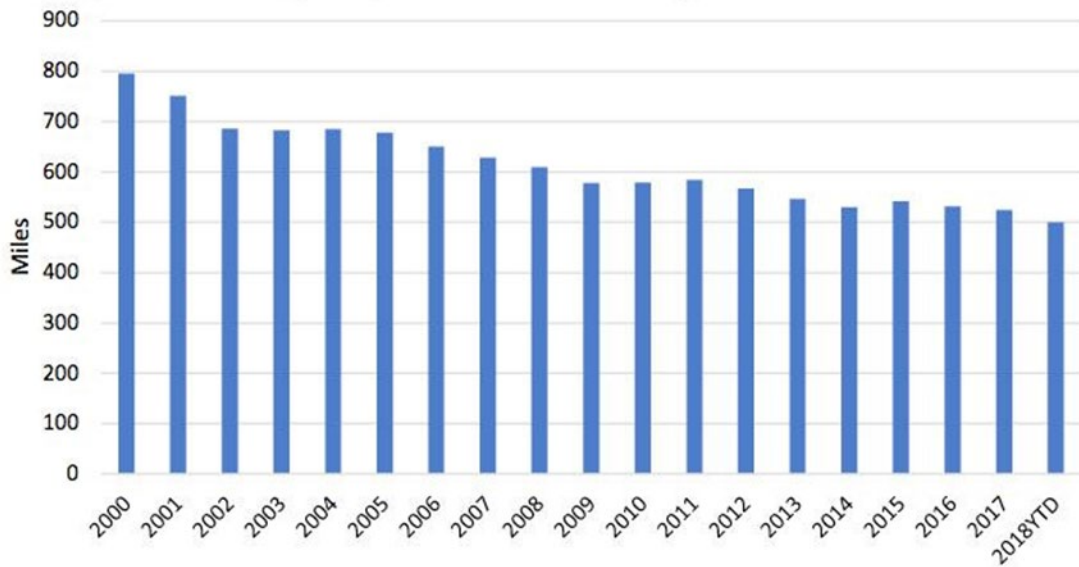


Figure 2: E-Commerce Retail Sales (ECOMSA) (FRED, 2025)

For example, online shopping has led retailers to switch to a more regional supply chain approach that embraces a decentralized inventory positioning strategy, where product is positioned closer to the final customer. This has increased the need for shorter, more regional deliveries to local distribution centers by tractor-trailer drivers, as well as more local last-mile delivery routes by parcel carriers (Lockridge, 2019). Since shorter, localized routes are preferred by drivers for quality-of-life reasons, among others, the e-commerce transportation model has the potential to impact the number of available drivers for the long-haul routes. In fact, even before the COVID-19 pandemic, the average truckload length of haul was shortening year-over-year, as seen in Figure 3, below.



ATRI says e-commerce is one reason for the shortening of the average length of haul.

Graph: American Transportation Research Institute

Figure 3: Average Length of Haul, 2000 – 2018 (Lockridge, 2019)

The beginning of 2025 revealed a marked shrinkage of the outbound average length of haul, as shown in Figure 4. According to FreightWaves (2025), load lengths at the beginning of 2025 were 7% shorter than 12 months previous, which they attribute both to increasing demand for route lengths less than 100 miles and decreasing demand for long hauls (trips over 450 miles).

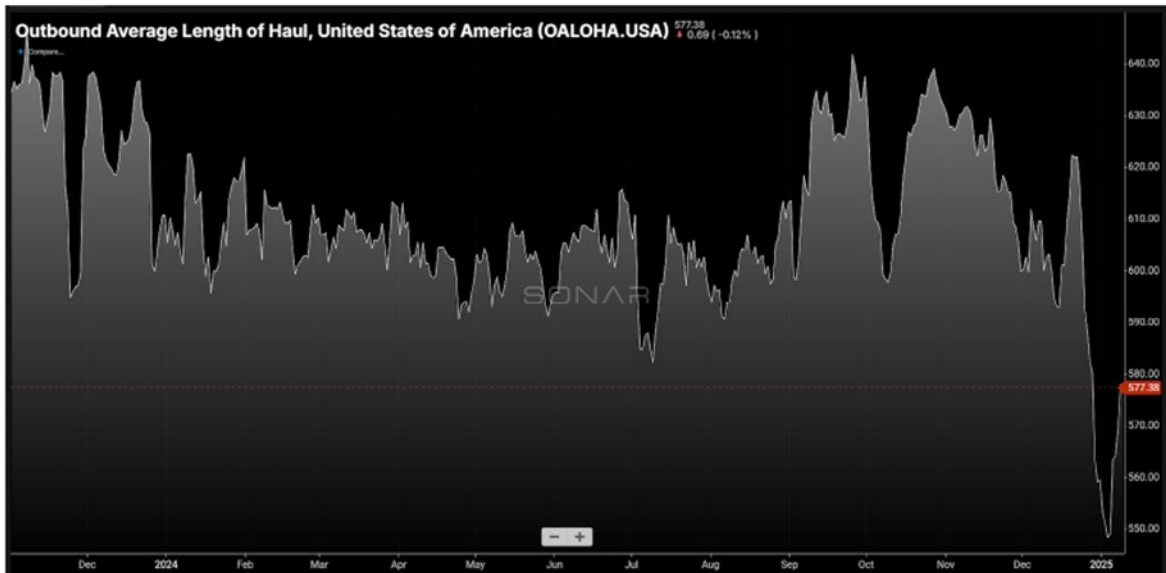


Figure 4: Outbound Average Length of Haul: 2024 (Strickland, 2025)

New technologies, routing strategies, and transportation modalities may make it possible to redesign TL routes such that they shorten further, thus making long-haul trucking a more attractive employment option for those drivers holding CDL licenses.

Based on the identified trucker shortage as shown above, as well as the discussion of potential reasons for, and solutions to, this shortage, the following research questions will be addressed:

Research Question #1: Are long-haul truck drivers incentivized to switch to parcel delivery driving, thus reducing the pool of long-haul drivers?

Research Question #2: Can the appeal of long-haul truck driving be increased through new routing strategies?

Before evaluating the two research questions, a distinction will be made between the different types of carriage within the motor carrier industry and the associated types of truck driving jobs within each carriage type.

Categories of Motor Carriage, Categories of Drivers

The motor carriage industry can be segmented in several different ways, ways that affect the types of truck driving employment jobs that are available. The first distinction is between for-hire and private carriers. According to the FMCSA, a for-hire motor carrier “transports passengers, regulated property or household goods owned by others for compensation” (FMCSA (1), 2025). In contrast, a private motor carrier “transports its own cargo, usually as a part of a business that produces, uses, sells and/or buys the cargo that is being hauled” (FMCSA (2), 2025). For-hire carriers cover broad segments of the transportation market, including full truckload (TL), less-than-truckload (LTL), and last-mile, parcel delivery services (BTS, 2025). They may also operate as common, contract, and/or exempt operators. The common carriers must provide transportation services to the general public at rates that are reasonable and fair, whereas contract carriers “serve specific shippers with whom the carriers have a continuing contract” (Novack et al., 2024).

The full truckload (TL) carriers haul shipments over 10,000 pounds over long distances. They typically pick up a load at the shipper’s location and transport it directly to the recipient of the freight (the consignee), so that the freight remains in the same trailer throughout transit. Less-than-truckload (LTL) carriers carry less than a truckload (or less than 10,000 pounds) for a single shipper and thus must combine two or more smaller loads into a single full truckload for the line haul portion of the carriage. This requires that LTL carriers operate terminals to both consolidate and break-bulk freight, which results in increased costs, and thus higher fees, for LTL carriage. Finally, parcel shipping is used to ship individual packages (usually boxed) that weigh under 150 pounds each and don’t require material handling equipment to load or unload. This type of shipping is typically associated with last-mile, business-to-consumer deliveries, which are often e-commerce orders (CLS, 12 Dec 2023).

The types of driving assignments within the three categories of carriers mentioned above – TL, LTL, and parcel – depend upon several factors, including the length of haul, the type of freight being carried, the equipment used to carry the freight, and whether a Commercial Driver’s License (CDL) is required of the driver. It might also be stated that driving assignments are dependent upon whether the driver is an owner-operator. According to the Federal Motor Carrier Safety Administration (FMCSA), there are three classes of CDL licenses, which are based on the types of loads hauled. Drivers must hold the respective class of CDL license (or Commercial Learner’s Permit (CPL)) based on these classifications:

- “Class A: Any combination of vehicles which also has a gross combination weight rating or gross combination weight of 26,001 pounds or more, whichever is greater, inclusive of a towed unit(s) with a gross vehicle weight rating or gross vehicle weight of more than 10,000 pounds, whichever is greater.
- “Class B: Any single vehicle which has a gross vehicle weight rating or gross vehicle weight of 26,001 pounds or more, or any such vehicle towing a vehicle with a gross vehicle weight rating or gross vehicle weight that does not exceed 10,000 pounds.

- “Class C: Any single vehicle, or combination of vehicles, that does not meet the definition of Class A or Class B, but is either designed to transport 16 or more passengers, including the driver, or is transporting material that has been designated as hazardous under 49 U.S.C. 51503 and is required to be placarded under subpart F of 49 CFR Part 172 or is transporting any quantity of a material listed as a select agent or toxin in 42 CFR Part 73.” (FMCSA (3), 2025)

Figure 5, below, illustrates the types of equipment that is used for motor carrier freight carriage.

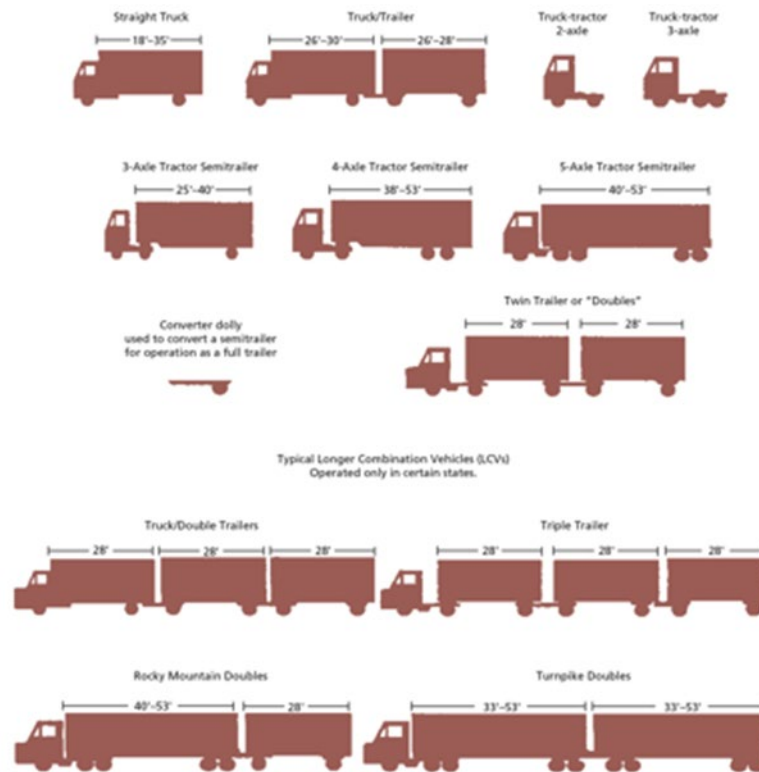


Figure 5: Motor Carrier Equipment types (ATA, 2016)

Parcel drivers may or may not be required to hold a CDL license, based on the type of equipment they are driving. For example, of the two dominant parcel carriers, UPS and FedEx, UPS parcel delivery drivers are not required to hold a CDL license, but FedEx drivers of 14' or 22' straight trucks must hold an unrestricted class B (or class A) CDL (FedEx, 2025; UPS, 2025).

Evaluation of Research Question #1: Are long-haul truck drivers incentivized to switch to parcel delivery driving, thus reducing the pool of long-haul drivers? Methodology and Data

Research Question #1 can be addressed by evaluating employment trends for both OES Code 53-3032 (Heavy and Tractor-Trailer Truck Drivers and OES Code 53-3033 (Light Duty (Parcel) Truck Drivers). Data was compiled from the Bureau of Labor Statistics, Occupational Employment and Wage Statistics, for both OES codes, and that data is provided below.

Table 2: Wage Data for 53-3032: Heavy and Tractor-Trailer Truck Drivers (BTS(4), 2025)

Year	Employment	Empl. RSE	Empl. SE	Mean hourly wage	Mean annual wage	Wage RSE	Wage SE
2019	1,856,130	0.6%	11136.78	22.52	46,850	0.2%	93.7
2020	1797710	0.7%	12583.97	23.42	48710	0.2%	97.42
2021	1903420	0.5%	9517.1	24.2	50340	0.3%	151.02
2022	1984180	0.9%	17857.62	25.52	53090	0.3%	159.27
2023	2044400	0.7%	14310.8	26.92	55990	0.3%	167.97
2024	2070480	0.4%	8281.92	28.08	58400	0.3%	175.2

Table 3: Wage Data for 53-3033: Light Truck Drivers (BTS(4), 2025)

Year	Employment	Empl. RSE	Empl. SE	Mean hourly wage	Mean annual wage	Wage RSE	Wage SE
2019	923,050	0.8	7384.4	18.52	38520	0.4	154.08
2020	929470	0.9	8365.23	19.74	41050	0.4	164.2
2021	1010040	0.7	7070.28	20.5	42630	0.3	127.89
2022	1059840	0.7	7418.88	21.65	45020	0.3	135.06
2023	1003960	0.5	5019.8	22.16	46090	0.2	92.18
2024	994410	0.7	6960.87	23.05	47950	0.3	143.85

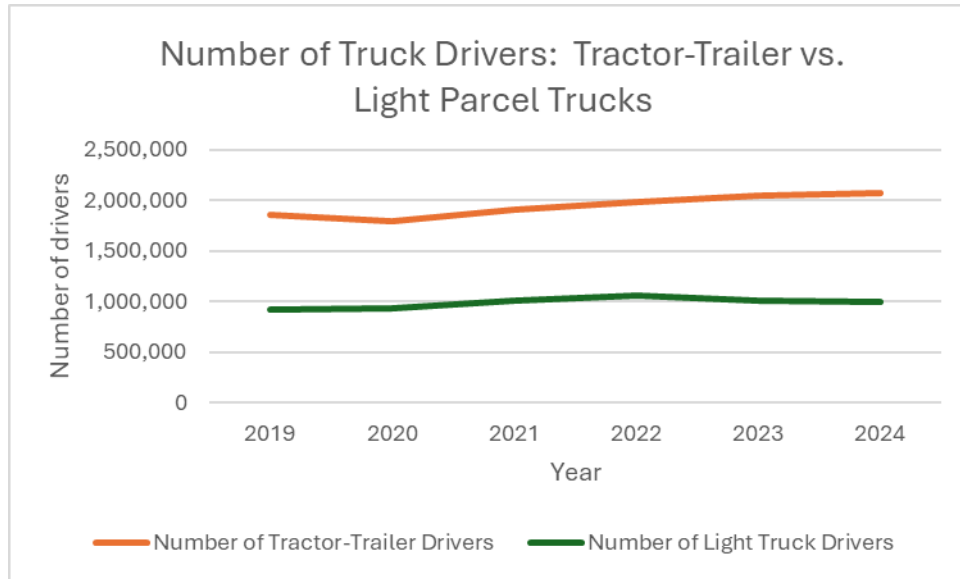


Figure 6: Number of U.S. Drivers: Tractor-Trailer vs. Light Parcel Trucks (BLS, 2025)

Linear regression analysis was used to determine if the number of light parcel truck drivers can be predicted from the number of heavy-duty tractor-trailer drivers. These results, shown below, indicate that this relationship is not significant at the 5% level. Therefore, annual employment data for both does not support the supposition that changes in the number of heavy-duty TT drivers are the result of those drivers switching to light-duty parcel driving, or vice versa.

Table 4: Summary Output of Linear Regression Results, Number of Tractor-Trailer Drivers as a predictor of Number of Light Truck (Parcel) Drivers

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.763686574
R Square	0.583217183
Adjusted R Square	0.444289578
Standard Error	43320.97247
Observations	5

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	7.88E+09	7.88E+09	4.197993	0.132904342
Residual	3	5.63E+09	1.88E+09		
Total	4	1.35E+10			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	122077.6672	421741.6	0.289461	0.791081	1220092.261	1464248	1220092	1464248
Number of Tractor-Trailer Drivers	0.450244492	0.219749	2.048901	0.132904	0.249095901	1.149585	-0.2491	1.149585

The lack of significant relationship between employment levels in these two groups can be partially explained by the difference in mean annual wage for the two groups. Figure 7, below, illustrates that heavy-duty TT drivers are paid a significantly higher wage than light duty parcel truck drivers. This conclusion was confirmed by a hypothesis test to evaluate for significant differences in mean annual wage between the two groups, using data from 2019 to 2024.

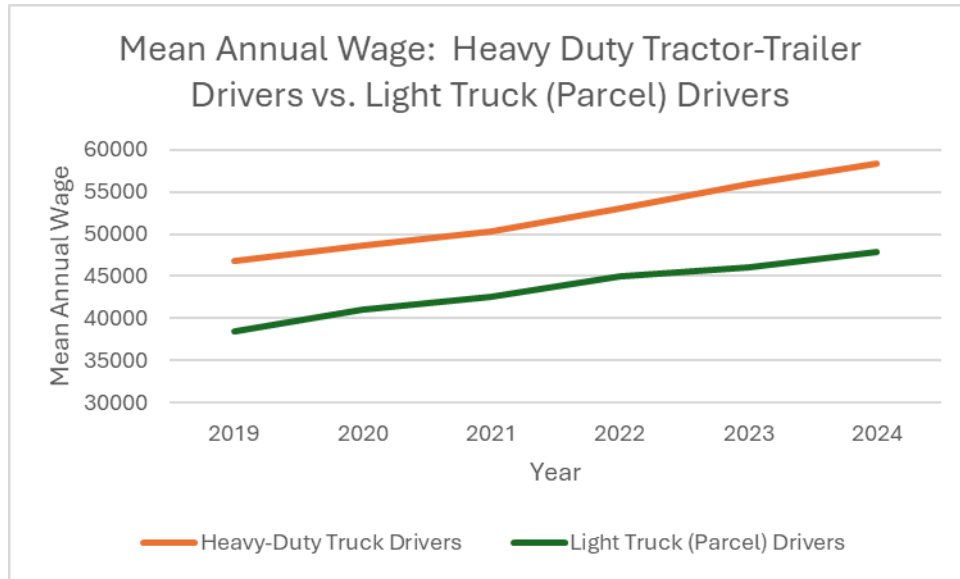


Figure 7: Mean Annual Wage, Heavy-Duty TT Drivers vs. Light Truck Parcel Drivers, 2019 – 2024 (BLS, 2025)

Other factors may also contribute to the choice between tractor-trailer driving and parcel truck driving, as is shown in Table 6.

Table 6: Comparison of Job Characteristics, Compensation, and Benefits

Job Characteristics	Long-Haul, TL Drivers	Parcel Drivers
Mean annual wage	\$58,400 (BLS, 2025)	\$47,950 (BLS, 2025)
CDL license	Class A	Unrestricted Class B or lower
HOS Regulations	Required to follow	Not applicable
Time away from home	Significant	Not significant
Job hazards	Higher	Lower
Job freedom	Higher	Lower

Besides the difference in wages, the other factors listed above may significantly impact a driver’s choice between long-haul and parcel-truck driving.

CDL Certification: Drivers are required to obtain the appropriate class of CDL certification based on the amount or class of cargo they haul. Tractor-trailer drivers must hold a Class A license, while parcel carriers need only a regular driver’s license, or at most an unrestricted Class B (FedEx, 2025).

Hours of Service regulations: The Federal Motor Carrier Safety Administration (FMCSA) regulates the number of hours a driver may drive at a time. According to the FMCSA, “Hours of Service” refers to the maximum amount of time drivers are permitted to be on duty including driving time, and specifies number and length of rest periods, to help ensure that drivers stay awake and alert. In general, all carriers and drivers operating commercial motor vehicles (CMVs) must comply with HOS regulations found in 49 CFR 39” (FMCSA (4), 2025). For property-carrying drivers, the following HOS regulations are in place:

- **“11-Hour Driving Limit:** May drive a maximum of 11 hours after 10 consecutive hours off duty.
- **“14-Hour Limit:** May not drive beyond the 14th consecutive hour after coming on duty, following 10 consecutive hours off duty. Off-duty time does not extend the 14-hour period.
- **“30-Minute Driving Break:** Drivers must take a 30-minute break when they have driven for a period of 8 cumulative hours without at least a 30-minute interruption. The break may be satisfied by any non-driving period of 30 consecutive minutes (i.e., on-duty not driving, off-duty, sleeper berth, or any combination of these taken consecutively.”
- **“60/70-Hour Limit:** May not drive after 60/70 hours on duty in 7/8 consecutive days. A driver may restart a 7/8 consecutive day period after taking 34 or more consecutive hours off duty.”
- **“Sleeper Berth Provision:** Drivers may split their required 10-hour off-duty period, as long as one off-duty period (whether in or out of the sleeper berth) is at least 2 hours long and the other involves at least 7 consecutive hours spent in the sleeper berth. All sleeper berth pairings MUST add up to at least 10 hours. When used together, neither time period counts against the maximum 14-hour driving window.” (FMCSA (4), 2025)
- **Overnight Travel:** Light parcel truck drivers drive local or regional routes, allowing them to avoid overnight travel.
- **Cost Structure of TL Carriers:** The motor carrier industry cost structure is low-fixed, high-variable costs because the government provides the roadways and other infrastructure. For those drivers that drive long-haul routes, their primary fixed cost is the truck itself. Because of this, the number of owner-operator truck drivers is staggering: As of March 2024, over 95.5% of trucking companies operate 10 or fewer trucks (ATA (1), 2025). This suggests that having control over their schedule and job freedom are important considerations for long-haul drivers.

Evaluation of Research Question #2: Can the appeal of long-haul truck driving be increased through new routing strategies?

As has been shown above, long-haul truck driving is not an attractive job choice for many because of the long hours, time away from home, lack of parking and other amenities while on the road, and other considerations. The growth of e-commerce in recent years has led to more opportunities for either local or regional routes, or for parcel delivery driving options, but the pay differential between the two hasn't motivated a switch from TL to parcel driving. The problem of the long-haul trucker shortage remains.

Several potential strategies for mitigating the long-haul trucker driver shortage have been proposed in the literature. These include the increased use of intermodal carriage, remote driving, full autonomous trucking, and new routing strategies. Intermodal transportation uses a combination of two or more different modes of transportation to move

freight from origin to destination. (Novack et al., 2024). In this option, piggyback service would be used for the longer line haul portion of the trip, with the tractor-trailer providing only regional and last-mile delivery. For global freight transport or long-distance carriage within the U.S., this approach could alleviate the need for long-haul drivers by shifting the line haul portion of the carriage to water, rail, or air carriage. At present, load and unload times at railyards, ports, and intermediate stops slow total shipping time, but improvements in scheduling, in partnership with the partner carriers, could improve this process.

Remote driving is another option for line haul carriage. In late 2020, Einride launched its Einride Remote Interface, which allows truck drivers to drive their tractor-trailers from an office setting. While fully autonomous trucking is still in the future based on current technology and safety concerns, partial autonomous trucking or remote trucking allows truckers to “drive” the truck from a command center in their current location for the line haul portion of the trip. This allows them to drive remotely and share responsibilities for loading/unloading with other terminal partners. Einride claims that remote driving “will be safer, involve more regular hours, and provide a more hospital work environment” and has the potential to create 2,000 new jobs (Einride, 2021). Implementation of this technology has been limited to specific freight lanes at present, and regulatory hurdles still have to be overcome before this technology is implemented on a widespread basis. Issues related to refueling or mitigating equipment failure continue to be an issue at present.

Fully autonomous trucks have been utilized on a limited basis on U.S. roadways since 2021 and hold the best promise for addressing the driver shortage from a technology perspective. They are able to travel longer distances without the Hours of Service restrictions, allowing carriers to cover longer routes and reap the resulting higher revenues (Bridgelall et al., 2023). Over time, autonomous motor carriers will have the low variable/high fixed cost structure of rail carriers, which will likely add barriers to entry for the smaller owner-operator carriers that currently dominate the motor carrier space. At present, autonomous trucks are limited to repeatable, predictable routes suitable to automation (Clevenger, 2024). Public concerns over safety, potential cyberattacks, and lack of human intervention when mechanical issues arise have inhibited the public’s acceptance of this technology so far (Engholm et al., 2021; Interfor Intl., 2024).

Research question #2 addresses whether the truck driver shortage may be alleviated through new routing strategies. If routing could be redesigned so that overall route length is shortened, even for previous long-haul routes, drivers could reap the benefits associated with both long-haul and parcel route driving: Higher pay, yet more localized driving and more time at home. This would be particularly beneficial for owner-operators, who don’t have the advantages of large private fleets in terms of route and schedule optimization among its team of drivers.

For this research, a Pony Express routing approach is proposed for owner-operator drivers. During the formative years of the expanding continental United States, the Pony Express system was used to carry mail from St. Joseph, Missouri to Sacramento, California in only 10 days – a monumental feat for its time. The mail would be carried from rider to rider along the route, so that no one rider (and horse) had to travel an excessive distance (National Pony Express Association, 2025). This same approach could be utilized for line-haul trucking for owner-operators, where two partnering drivers coming from opposite ends of the origin-destination route would switch trailers mid-route. They would then carry

their partner's load back to their own origin point. This approach would shorten each driver's total drive time and allow the required Hours of Service rest period to occur at their home base, rather than on the road.

Pony express routing would be an attractive option for owner-operators who prefer less time away from home and seek to eliminate empty backhaul miles. Freight brokers would likely be needed to assist in route paring with other owner-operators along the same route. This approach provides many benefits to the participating drivers, but it would require commitment, collaboration, and trust between the driving partners.

Initial Model to Optimize Pony Express Routing

The following initial model is proposed to optimize the design of a pony express routing strategy, with the goal to reduce line haul drive time for both drivers while taking into account the Hours of Service regulations to which they must adhere. Consider two owner-operator drivers who cover the same origin i to destination j route, with the first driver's homebase at location i and the 2nd driver's homebase at location j . They desire to collaborate in a pony express routing strategy, whereby they will switch loads mid-route and carry the partner's load back to their own homebase city. Their initial goal is to minimize the total trip time for both drivers, subject to the constraints related to the Hours of Service regulations. Per the HOS regulations, the longer route distances will still require driver rest periods, but the goal with pony express routing is to minimize total time away from homebase. ChatGPT (OpenAI, 2025) was utilized to develop an initial model structure for one-driver routing with HOS constraints. This model was modified by the author to address the objectives in pony express routing for two-driver partnerships.

For this problem, the following variables were used for model development:

- x_{ij}^d : Binary variable = 1 if driver d drives from location i to location j ; 0 otherwise
- t_d^{start} : Start time of shift for driver d
- t_d^{drive} : Total drive time for driver d during a 24-hour shift
- t_d^{on} : Total on-duty time (includes driving and other work-related activities) for driver d
- t_d^{break} : Time of break taken by driver d
- x_{kj}^e : Binary variable = 1 if driver e drives from location k to location j ; 0 otherwise
- t_e^{start} : Start time of shift for driver e
- t_e^{drive} : Total drive time for driver e during a 24-hour shift
- t_e^{on} : Total on-duty time (includes driving and other work-related activities) for driver e
- t_e^{break} : Time of break taken by driver e
- t_d^{off}, t_e^{off} : Total off-time time between consecutive drives for drivers d and e

- $t_{d\&e,j}^{switch}$: Total time to switch trailers at location j

With the goal to minimize total trip time for both drivers, the following objective function and constraints are as defined below:

Objective function: $\text{Min } At_d^{on} + Bt_e^{on}$

Subject to

$$t_d^{drive}, t_e^{drive} \leq 11, \forall d, e$$

$$t_d^{on} \leq 14 \text{ and } t_d^{drive_start} \leq t_d^{off} + 10$$

$$t_e^{on} \leq 14 \text{ and } t_e^{drive_start} \leq t_e^{off} + 10$$

$$\text{If } t_d^{drive} > 8 \Rightarrow t_d^{break} \geq 0.5$$

$$\text{If } t_e^{drive} > 8 \Rightarrow t_e^{break} \geq 0.5$$

$$\sum_{k=1}^7 t_d^{on}(k) \leq 60 \text{ (or) } \sum_{k=1}^8 t_d^{on}(k) \leq 70$$

$$\sum_{k=1}^7 t_e^{on}(k) \leq 60 \text{ (or) } \sum_{k=1}^8 t_e^{on}(k) \leq 70$$

$$t_d^{on} = t_d^{drive} + t_d^{break} + t_{d\&e,j}^{switch}$$

$$t_e^{on} = t_e^{drive} + t_e^{break} + t_{d\&e,j}^{switch}$$

The model presented above considers only one objective: The minimization of total combined trip time for both drivers. Other objectives could be considered in future work, such as the maximization of profit for both drivers (with constraints included for fuel and other variable costs), or the determination of the optimal load switch location, considering additional constraints related to traffic, the equipment used and the classification of freight hauled.

Conclusions and Recommendations

The shortage of qualified tractor-trailer truck drivers will continue to plague U.S. freight carriers for the foreseeable future, so carriers must be open to the consideration of innovative technologies and routing strategies that may alleviate this problem. This research has shown that, although there has been an increase in demand for regional and parcel drivers in recent years, the pay differential between long-haul tractor-trailer and parcel drivers disincentivizes long-haul drivers from switching to local parcel driving. Therefore, the increase in e-commerce, and the subsequent increase in local parcel driving options, has not exacerbated the trucker shortage. Autonomous trucking has the potential of alleviating the shortage of long-haul truck drivers, but its full acceptance is years away, and owner-operators will find this option cost-prohibitive. New routing strategies, such as the pony express strategy profiled here, should be considered by the smaller owner-operators to increase the appeal of this career for potential new drivers.

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The Impact of ESPNBet's Entry on the Totals Market During the 2023-2024 College Football Season

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Abstract: ESPNBet launched during the second half of the 2023-24 the National Collegiate Athletics Association (NCAA) College football season. We examine the impact of ESPNBet's entry as a bookmaker on the NCAA football totals market, in particular whether this entry results in "price" competition in terms of lower totals. Additionally, we investigate whether a simple betting strategy, i.e. betting the over, is profitable in light of the potential price competition.

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Introduction

Following the Supreme Court's ruling in *Murphy v. National Collegiate Athletic Association*, 584 U.S. 453, 138 S. Ct. 1461, (2018), which struck down federal prohibitions on sports gambling in most U.S. states, has led to a massive increase in sports wagering nationally. This, in turn, has prompted new entrants into various sports wagering markets.

One such entrant is ESPNBet, which was soft launched in New York only in September 2023, and was available in 17 states in November 2023. (Rumsey and Perez, 2023) ESPNBet aimed to leverage its brand and programming to attract large numbers of "square bettors," (non-professional gamblers who wager recreationally). (Rumsey and Perez, 2023). Such bettors are, in general, more likely to wager on overs than unders in totals bets (Miller and Davidow 2019).

In this study, we evaluate the impact of ESPNBet's entry into the totals market, whether or not it impacted the lines of other linemakers, and whether or not it generated profitable wagering strategies. We also investigate whether ESPNBet's behavior is consistent with attracting casual bettors.

Data

The data used for this study are publicly available from www.collegefootballdata.com, a popular website for data and analytics related to college football. The data set constructed by the authors contains all games involving an FBS team from the 2022-23 and 2023-24 college football seasons. We examine all such games that have both a closing line for the game total (over/under), and also are not "pushes" (bets that end in a tie). This sample yields 1,774 games that fit those criteria.

Literature and Methodology

We use two likelihood ratio tests, one for a “fair bet” or market efficiency and the other for profitability, in the analysis that follows. The test of efficiency we use employs the methodology of Gandar (1988).

[Equation]

A “fair bet” in the context of football wagering is one in which generates a .5 probability of covering for both over and the under. We test the joint hypothesis of “fairness” that $[Equation] = 0$, and $[Equation]$, which would mean no-profit.

In addition to applying the methodology of Gandar et al (1988), shown in Equation (1), we also utilize the log likelihood efficiency test employed by Even and Noble (1992), as shown below:

$[Equation]$, where n is number of covers, N is number of matchups, and \hat{q} is ratio of covers to matchups.

Because this method assumes that an efficient market means that $q=.5$, we substitute .5 for $[Equation]$, which yields the following likelihood ratio for the null hypothesis:

[Equation]

We also tested for profitability, using the aforementioned method of Paul and Weinbach (2005):

[Equation]

Where n is number of covers, N is number of matchups, and $[Equation]$ is ratio of covers to matchups.

Summary Statistics

In Table 1, we report the summary statistics of the over/under bets and total scores from games in the 2022-23 and 2023-24 seasons. It is interesting to note that actual scoring decreased by slightly more than a point between seasons.

Table 1: Summary Statistics

	Both Seasons		2022-23		2023-24	
	Actual	Total	Actual	Total	Actual	Total
Mean	54.252	53.997	54.787	54.978	53.73	53.039
Std. Dev.	17.369	8.091	17.65	8.259	17.084	7.81
N	1778		878		900	

In Table 2, we report the summary statistics for 2023, prior to ESPNBet's entry into the market. The mean Total is very similar between the much smaller Bovada (in terms of market share) and the larger DraftKings.

Table 2: Summary Statistics Prior to ESPNBet's Entry

Bovada						
Variable	Obs	Mean	Std. Dev.	Min	Max	
Total	517	52.5184	7.4129	30.5	74.5	
Actual	517	53.1799	16.7591	6	104	
Under wins	517	0.4971	0.5005	0	1	
Over wins	517	0.5029	0.5005	0	1	
DraftKings						
Variable	Obs	Mean	Std. Dev.	Min	Max	
Total	449	52.5290	7.5399	30.5	73.5	
Actual	449	53.4031	16.8059	6	104	
Under wins	449	0.4766	0.5000	0	1	
Over wins	449	0.5234	0.5000	0	1	

In Table 3, we report the summary statistics for the 2023 season after ESPNBet’s entry into the market. We discuss the impact of ESPNBet’s entry on the market participants in the last section of the paper, i.e. the Conclusion.

Table 3: Summary Statistics After ESPNBet’s Entry

ESPNBets					
Variable	Obs	Mean	Std. Dev.	Min	Max
Total	296	51.4797	8.68	25.5	78.5
Actual	296	53.5439	17.6616	10	114
Under wins	296	0.4831	0.5006	0	1
Over wins	296	0.5169	0.5006	0	1
Bovada					
Variable	Obs	Mean	Std. Dev.	Min	Max
Total	305	51.6541	8.4800	26	77.5
Actual	305	53.8623	17.6611	10	114
Under wins	305	0.4787	0.5004	0	1
Over wins	305	0.5213	0.5004	0	1
DraftKings					
Variable	Obs	Mean	Std. Dev.	Min	Max
Total	184	52.4212	8.5077	29.5	76.5
Actual	184	52.7935	17.8990	10	109
Under wins	184	0.5000	0.5014	0	1
Over wins	184	0.5000	0.5014	0	1

Results

In Table 4, we report the results of the tests for fairness, efficiency, and profitability each season, and both combined. We discuss the profitability of betting the over for the 2023-2024 season in the Conclusion as well.

Table 4: Efficiency Results of Both Seasons

Combined	Over covers	Games	Over Win %	Fair bet	No profits
	919	1774	51.804	2.309	N.A.
2022-23 Season	Over covers	Games	Over Win %	Fair bet	No profits
	443	879	50.398	0.056	N.A.
2023-24 Season	Over covers	Games	Over Win %	Fair bet	No profits
	476	895	53.184	3.633*	0.232

Conclusion

The difference between actual scoring and the lowest total (over/under) lines was 0.184 points on average for the 2022-2023 season. However, this difference increased to 1.893 points on average for the 2023-2024 season.

Bookmakers offered similar average totals in the 2023-2024 season prior to ESPNBet's entry in the market (approx. 52.5 points). However, after ESPNBet's entry the average decreased with ESPNBet providing the lowest average total (51.48) followed by Bovada (51.65) then DraftKings (52.42). By setting its total on average lower than the other books, ESPNBet acted as hypothesized – it was offering lines more likely to attract casual “over” bettors.

Additionally, the average difference between actual scoring and the total lines before and after ESPNBet's entry increased for Bovada from 0.662 to 2.21 points. However, DraftKings decreased from 0.874 to 0.3723 points. This result suggests that DraftKings, with a much larger share of the market, may be using a price umbrella strategy, with a relatively higher price or total, with the smaller bookmakers needing to charge lower prices to attract customers. Nevertheless, this result is consistent with our hypothesis that ESPNBet's entry would lead to increased price competition.

Finally, line shopping for the lowest totals for betting the over was profitable in the 2023-24 season - likely due to price competition. The results indicate an inefficient market (p-value of 0.057) but profitability was not statistically significant at the 10% level.

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Understanding Influence of Fed Rates on Stock Index Performance

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Abstract: In business, investors are concerned about selecting options that have maximum returns. The stock market is among the potential alternatives that may help such players in achieving their goals. However, their success is influenced by their level of knowledge, awareness, and expertise in analyzing stocks and prevailing trends within the external environment. Most investors may have limited insights into these factors, which may affect the profitability of their portfolios. To overcome this challenge, they should leverage data analytics as a tool for exploring the correlation between external environmental forces and stock market performance. Historical insights are used in evaluating past patterns concerning changes in returns and observed economic trends. Data analytics is among the approaches that can provide sufficient insights into the past outputs of a given stock or index to determine the best options for investors. It provides an evidence-based model for understanding the correlation between fed rates and stock index returns. The rationale for the topic selection is that it offers a foundation for understanding the implications of the changes occurring within the economy on the performance of firms. Examining the available data will provide a high-level overview of the influence that these factors exhibit.

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Introduction

In business, investors are concerned about selecting options that have maximum returns. The stock market is among the potential alternatives that may help such players in achieving their goals. However, their success is influenced by their level of knowledge, awareness, and expertise in analyzing stocks and prevailing trends within the external environment. Most investors may have limited insights into these factors, which may affect the profitability of their portfolios. To overcome this challenge, they should leverage data analytics as a tool for exploring the correlation between external environmental forces and stock market performance.

We will employ data analytics using historical insights in evaluating past patterns concerning changes in returns and observed economic trends. Data analytics is among the approaches that can provide sufficient insights into the past outputs of a given stock or index to determine the best options for investors. It provides an evidence-based model for understanding the correlation between various variables. Obviously, researchers may use different tools to create such relationships.

In this project, the core goal is to leverage such approaches in determining the correlation between fed rates and stock index returns (Swanson, 2021). The rationale for the topic selection is that it offers a foundation for understanding the implications of the changes occurring within the economy on the performance of firms. Examining the available data will provide a high-level overview of the influence that these factors exhibit.

Objective and Problem Definition

In the corporate environment, numerous factors may affect the capacity to achieve the intended outcomes. The core goal is to maximize returns by creating an avenue that supports profit generation. External factors like interest rates may affect the overall operations, leading to low returns. Investors consider the stock price trends as critical determinants of the wealth likely to be generated through a firm. When the share price reduces, it may indicate a low intrinsic valuation.

It is essential to mention that some of the variables are external and cannot be controlled by internal players of a company. For example, it is not possible to regulate the changes in interest rates from a firm's perspective. These trends are shaped largely by the changes in the economy and governmental decisions.

Investors may benefit from predictions made on the interest rates to determine the potential influence that they may have on stock prices. Such knowledge is vital for ensuring optimum investments by targeting timelines where such rates are favorable. This project examines the influence of interest rates on stock returns, which can be used as a foundation for developing a prediction model. The project's objective to examine the influence of interest rates on stock market returns can be summarized as shown below.

Methodology

This project uses a quantitative approach to examining the relationships between the two variables. In this case, the strategy was selected because it will help in comparing the effects that one occurrence may have on the other. In this model, the primary focus is to gather data about the changes in the stock market and interest rates to create a common analysis platform for comparing their potential relationships. This approach was selected because it offers a framework for understanding the connection between the dependent and independent variables.

Preliminary information was gathered from Yahoo Finance and the Fed websites to achieve this goal—the former provided details about the stock market trends where historical prices of the S&P 500 were documented. The Fed source offered recorded changes in interest rates. These values were filtered to reflect monthly trends. This decision ensured consistency and that the gathered values were sufficient to ensure accuracy and conclusive findings.

Research Questions and Hypothesis

The following research question was developed to support the analysis. It defines the relationship between these variables. Awareness of such insights will support conclusive decisions where investors select the most profitable stocks according to the prevailing interest rates. They will learn the best time to venture into the markets by predicting the duration with which the Fed will implement a favorable interest rate.

RQ1: What influence do interest rates have on stock market performance?

H1: Fed rates have no impact on stock market returns.

H0: Interest rates have a positive influence on the performance of stock markets.

The Target Research Variables

The core hypothesis is that there is a direct relationship between interest rates and stock prices. When the values increase, the prices decline. This statement implies that stock valuation is inversely proportional to the federal interest rates (Zakhidov, 2024).

In developing a potential solution for enabling investors to understand the influence of existing market trends, this research will use historical data to create connections between the two concepts. Two primary variables are selected to achieve this goal. Interest rates represent the independent variable since they influence the outcomes recorded concerning share performance (Jarociński & Karadi, 2020). The stock price is the dependent variable since the respective changes are affected by the trends in the former.

While existing literature shows that these elements are related, there is a lack of empirical evidence that could help investors determine the best time to venture into stock markets to improve their wealth. Therefore, this project will provide an avenue that leverages statistical evaluations to determine correlations between them. Likewise, a strategic tool named Active Data will be used to facilitate the examination process.

Identifying Relevant Data and Acquisition

This analysis will use raw facts from different sources to complete the project. The first dataset comprises the stock prices for the S&P 500 index. The rationale for this is that it captures the performance of multiple companies, which can be used to represent the overall patterns across diverse industries. The second source contains information on the Fed interest rates. The insights will be presented in Microsoft Excel for easy tabulation and further evaluation.

Data Preparation/Transformation

The preliminary interactions with the selected data involve ensuring accuracy, completeness, and outlier management. In this context, the core goal is to ensure that the resulting dataset can be used to support a comprehensive analysis, including descriptive statistics to provide a high-level summary of the relationships between the variables. The goal of this exercise is to prepare the test information for the development of the overall model that can be used to enhance decisions. In achieving this outcome, the first part involved acquisition from different websites. The interest rates were obtained from the Federal Reserve Bank's resources. On the other hand, the dataset on the historical stock performance was from Yahoo Finance.

It is observed that there are no missing values from the selected timelines. The second part was to eliminate the necessary columns. Once the data was collected, two separate sheets were obtained. It was essential to combine such details to ensure easy examination and comparison. Therefore, the workbooks were merged to create a common platform for comparing the results and generating the necessary graphs. No unreasonable values were observed. Normal trends and recordings were captured and recorded. This outcome shows that the historical stock price aligned with the expected levels with no unexplained variations. No significant outliers were recorded within the dataset. However, varying deviations were documented in separate columns. The resulting sheet contained data that aligned with the prevailing expectations and historical performance patterns.

Model Building/Method and Tool

Active Data was used in the analysis processes. The evaluation aimed to use the available test data to respond to the presenting problem and hypothesis. This outcome was accomplished through descriptive statistics as the primary strategy in examining the presented data. Throughout the evaluation, different outcomes were generated.

Data Analytics and Report

The first step was to generate a descriptive statistic summary of the two columns. The results are shown in the table below.

Table 1: Descriptive Statistics

ColumnName	Price	FED Rate
NetValue	705,787.78	1,620.71
TotalPositive	705,787.78	1,620.71
TotalNegative	0.00	0.00
Absolute Value	705,787.78	1,620.71
Mean	1,485.87	3.42
Median	1,186.69	3.09
Mode	1,130.20	0.09
PopVariance	1,461,173.71	7.60
PopStdDev	1,208.79	2.76
MeanMinus2PopStdDev	-931.71	-2.09
MeanPlus2PopStdDev	3,903.45	8.93
MeanMinus3PopStdDev	-2,140.50	-4.85
MeanPlus3PopStdDev	5,112.24	11.69
SampleVariance	1,464,256.35	7.62
SampleStdDev	1,210.06	2.76
MeanMinus2SampleStdDev	-934.26	-2.10
MeanPlus2SampleStdDev	3,906.00	8.94
MeanMinus3SampleStdDev	-2,144.32	-4.86
MeanPlus3SampleStdDev	5,116.06	11.70
Minimum	179.83	0.00
Maximum	5,592.18	9.85
ZeroValueItems	0.00	0.00
PositiveItems	475.00	474.00
NegativeItems	0.00	0.00
TotalItems	475.00	474.00
BlankItems	0.00	1.00
Errors	0.00	0.00

The outcomes can be categorized into five primary sections depending on the measurements in the context. They are the net value evaluation, central tendency, dispersion examination, confidence evaluation, and quality assessment. In the first part, it was observed that the total value of the price column amounts to 707787.78 while the net value for the interest rate is 1620.71. All the values are positive, with no negative prices and Fed rates. In the second category, the aim is to determine the various measures for central tendency.

The selected metrics are the mode, average, and median. It was reported that the mean price and interest rate were \$1485.87 and 3.42. The median was \$1186.69 and 3.09. This case shows that the interest rate is higher than the mean. The price, on the other hand, is lower than the average. One conclusion is that the variables are slightly skewed towards the right. The dataset reveals that \$1130.20 is the commonly appearing price, with 0.09 being the most frequent interest rate.

Dispersion assesses the distribution of the values based on the standard deviation and variance from the mean. The standard deviation for the price and interest rates were 1208.79 and 2.76. The former shows a high variation, while the fed rate represents minimal variability. The confidence category shows that the values are within the expected range. However, this condition applies only to the price.

The Fed rates have values that are beyond the normal range, which shows that there are possibilities for outliers. The quality assessment reveals that the price column has no missing values, errors, or negative entries. The interest rates have a single missing value, which represents the most recent entry for August 2024. Overall, the missing mark was ignored since it would not have a significant impact on the quality of the assessment.

Overall, the analysis shows that the Fed rates have an inverse influence on the stock pricing trends. This statement implies that when the government increases the levels, companies report a decline in their valuation. This pattern is associated with the overall impact on the costs of financing operations. For example, high trends translate into increased costs of debt. Firms may, therefore, record expensive external financing options, which may undermine their abilities to support their investments. Such a pattern affects the profit generation patterns (Siegel, 2021).

On the other hand, low interests create an opportunity for business growth. Companies can access affordable loans, which make it easy to accumulate the necessary financial resources to support investments. This occurrence leads to positive profitability due to the favored growth. As indicated in Figure 2, the country's interest rates have recorded fluctuations.

Figure 1: Changes in Interest Rates

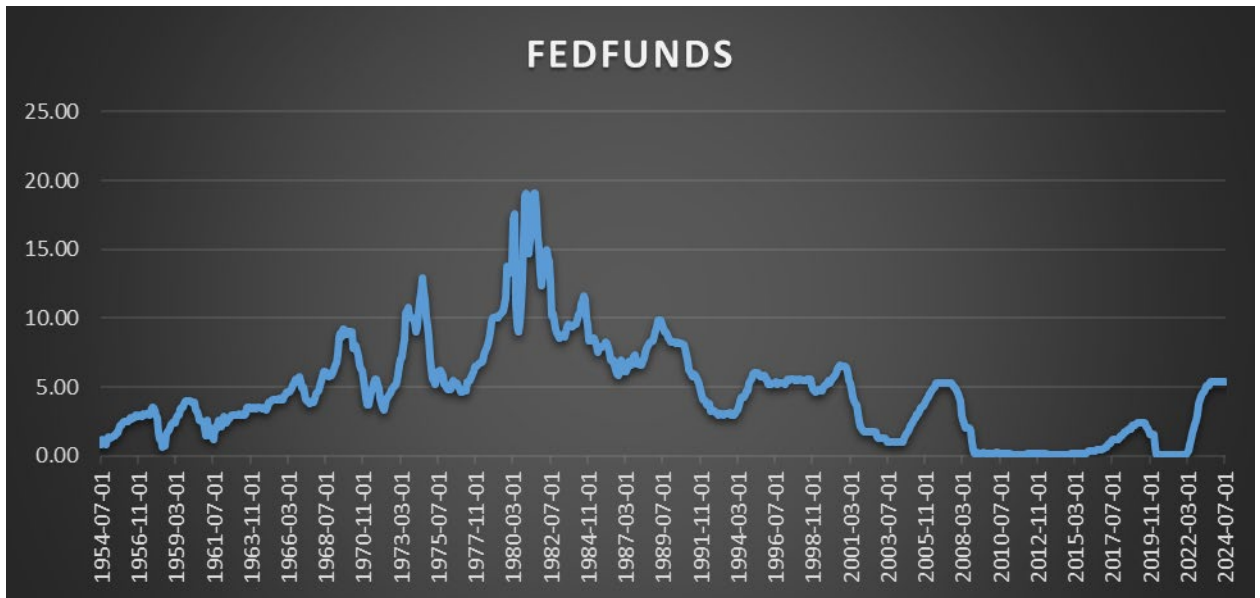
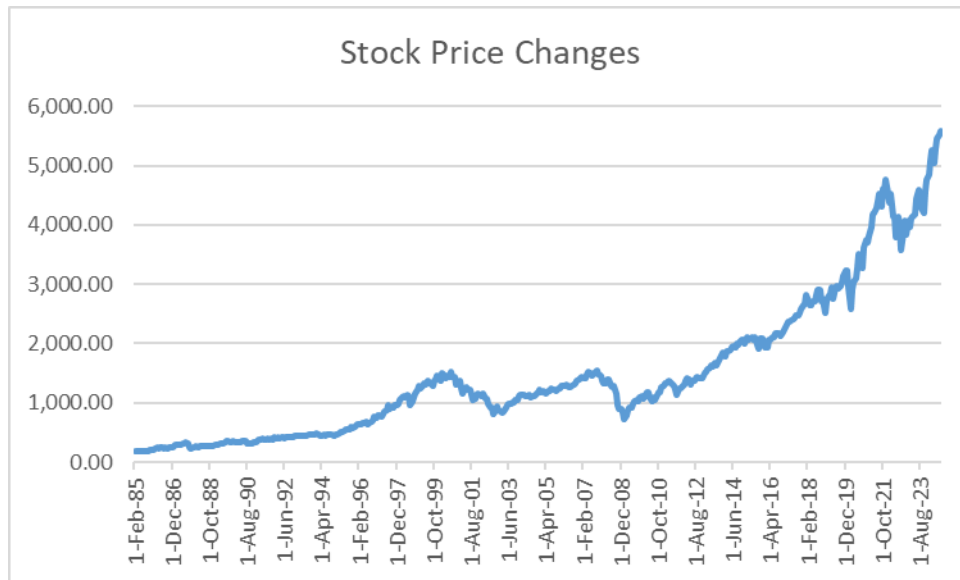


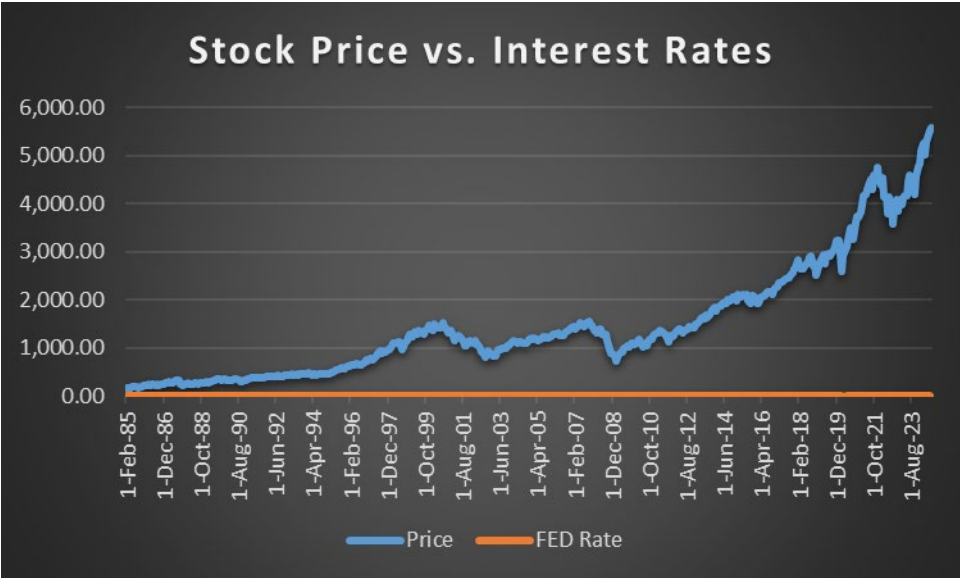
Figure 2 indicates the changes in the stock prices for the S&P 500 index. This trend has fluctuated with significant observations during the great depression, the financial crisis of 2008, and the COVID-19 pandemic durations (Ahmed, 2020).

Figure 2: Stock Price Changes



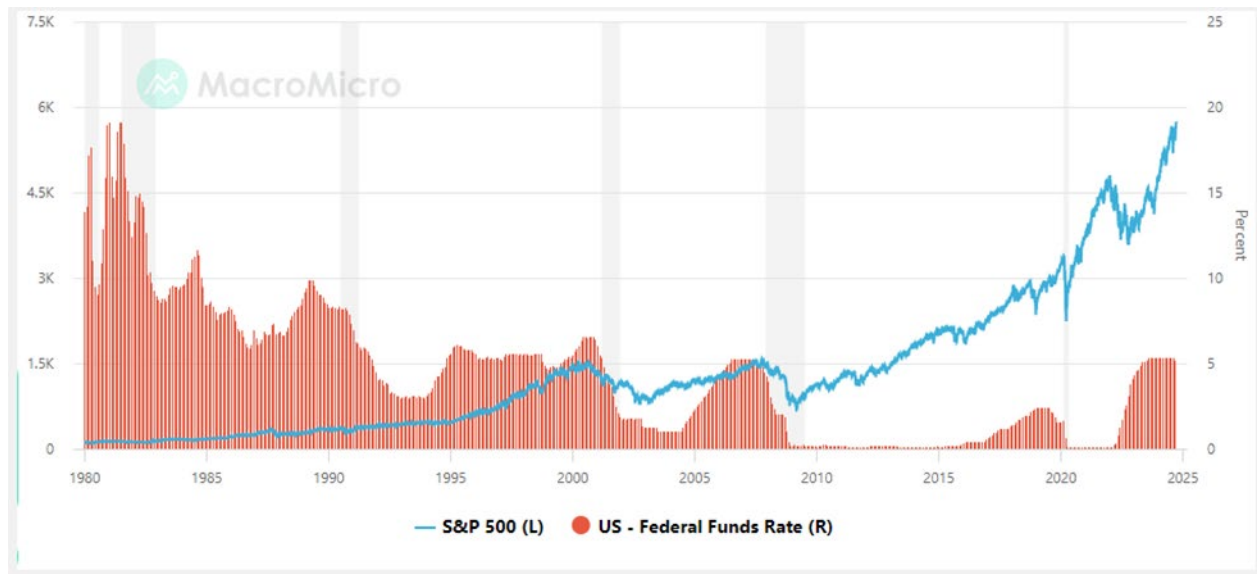
In Figure 3, the primary conclusion is that there is an inverse relationship between the two variables. This trend implies that when the government raises the rates, businesses record a declining valuation. This outcome is explained by the influence that each governmental decision may have on the environment from an economic dimension.

Figure 3: Interest Rates and Stock Performance



Likewise, figure 4 shows the comparative evaluation of these variables.

Figure 4: Comparative Analysis of Interest Rates and Stock Returns (Macro Micro, 2024)



Discussion

Throughout the evaluation, the core focus has been on examining the effects that changes in federal rates may have on the stock performance. It is observed that diverse factors cause such trends. While other environmental variables like economic growth may shape the valuation of a firm, interest rates have a significant impact. This assessment found that an inverse proportionality exists between these variables.

On the same note, it is essential to mention that potential outliers have been identified within the datasets. However, the overall decision was to use these values as they are presented. The rationale for this inclusion is that they have minimal impacts on overall computations and expected results. For example, the deviations from the mean, according to the calculations, have negligible effects on the outcomes since these values are minimal. A different column has been created to include outliers for the two elements.

Past data were selected for the model development process. This information was used as the training and test data, which helped evaluate the fit and accuracy of the resulting model. This analysis confirms the initial hypothesis, which is that interest rates have an inverse relationship with market performance. This statement implies that when the government increases this rate, the firms' value may decrease. It shows that investors earn the highest when the Federal rates are at the lowest. This outcome is associated with the expansionary and contractionary effects that such a decision may have on the economy. The maximum returns are likely to be earned when the economy has low fed rates.

Conclusion

This project is based on the need to examine the effects that government actions concerning interest rates may have on company performance. A statistical approach was used. Descriptive statistics defining common metrics like central tendency and dispersion were used to evaluate the relationships between the variables. It was concluded that the price has high variability. The sample has a normal distribution. The attributes are inversely proportional. This conclusion means that an increase in interest rates is linked with a decline in a firm's internal valuation.

The outcomes can be used as a foundation for developing a complex prediction model that will help investors forecast the best time to buy and sell stock to improve their returns. Such awareness is critical since it reduces the risks of losses. The results agree with the existing literature based on the correlation between the two variables.

However, this analysis has not considered additional factors that may influence the accuracy. For example, the stock price of a firm is not affected solely by the changes in interest rates. Instead, diverse aspects like pandemics and unforeseen events may have various impacts. Therefore, future models should be based on a multivariate analysis to obtain accurate conclusions.

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“520 Percent” Miller: The Real First “Ponzi Scheme”

Amanda Vandergrift[§], Tommie Singleton[‡], Mark Lawrence^ζ

Abstract: Most people have heard of a “Ponzi Scheme”, and many to most of them know it was taken from a fraudster named Charles Ponzi who conducted such a scheme on victims in the Boston area in the 1920’s. However, he was not the first to conduct that particular fraud scam. There was a man named William Miller who did the same scheme but preceded Ponzi by over 20 years. This paper takes a look at the history of Ponzi schemes and shows Miller and his scheme were the likely origins of what became known as a Ponzi scheme.

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Introduction

The first Ponzi scheme noted in the history books was likely the one perpetrated by William Miller in 1899. Miller was convicted of the fraud but it was not until some twenty years later that Charles Ponzi took the scheme to a higher level increasing the amount of money lost by investors and by gaining widespread media attention. The public's heightened awareness of the scam and their connection to Charles Ponzi led to it being termed a Ponzi scheme. Since Charles Ponzi, countless others have perpetrated the same scheme on thousands of people. For example, Bernie Madoff in 2008 was discovered to have defrauded hundreds of victims of about \$65B over a period of 30-40 years (Heydenburg, 2015).

The Origins of Miller's Scheme

The life of William Miller was much like that of white-collar fraudsters today. From a social standpoint Miller portrayed himself to be an honest man with a brilliant business plan. His problem was he always believed he could win a prospective return on the uncertainty of stock returns. In his day, people would gather on the street and make small wagers on stock markets and make earnings or lose it all, similar to gambling. He lost a lot more money than he could afford on this street gambling.

So Miller developed another venture. He was only thirty-six years old when he developed this plan (Zuckoff, 2005). At that time, he worked as an office clerk in a brokerage-house making only \$5 a week (Zuckoff, 2005). His plan was to invite investors to give him \$10 to invest. He would promise a ten percent return each week based on his (special) knowledge about investments in markets. And if he could not produce that return, he would make a full refund of the \$10. His claim for being able to pay such large returns was that he had insider tips about Wall Street and large businesses (Zuckoff, 2005). It seems he really believed he could make that return based on his street gambling experience and strong belief in his trading abilities. However, he always lost money on the streets doing a similar thing.

Miller, being an active member in his church and holding the position as the President of the Christian Endeavor Society, used this position and group to take the opportunity to recruit his first investors ("Miller Must Go to Jail", 1902). One older German was overheard saying that "Miller's all right. He can have anything he wants in this section. We would send him to the Legislature, if he wanted to go" ("Franklin Syndicate Gone", 1899). The positive reputation Miller made for himself and his new business soon earned him the nickname "520 Percent Miller," which was based on yearly dividend promises (Zuckoff, 2005).

His vision of profits plummeted in the first week when he could not reach the ten percent threshold. When he approached his church friends, expecting to refund all investments, and not having the money to do so, he was distraught. However, the response was surprising when one person said, "keep mine and here is some more money to invest". Others followed with same response.

Miller began to realize he could use money from future investors to pay current investors and have some left over for himself, and not risk anything on the markets. So he

came up with a scheme where he would pay returns to early investors with the money received from newer investors (which is what he did that day). Early investors included not only his fellow church members but quickly expanded to notable leaders in the neighborhood such as policemen, detectives, firemen and postal workers (“Franklin Syndicate Gone”, 1899). To back up the claim, he was not open on Saturdays stating that was his day to consult with his brokers and experts (“Franklin Syndicate Gone”, 1899).

Another appealing element of his business venture was the opportunity to help the lower class, who generally could not afford the costs of investments such as stock markets, to invest and make high percentage profits (Hill, 1904). Men, women, professionals and laborers all respected and believed in Miller’s investment strategy.

Miller set up shop on Floyd Street, right in the heart of Brooklyn’s German District (“Franklin Syndicate Gone”, 1899) as “The Franklin Syndicate” and began to solicit investors nationally (Zuckoff, 2005). During his time on Floyd Street, Miller had deceived his neighbors into believing that he was an honest man with a true desire to “make money for all” (“Franklin Syndicate Gone”, 1899). To connect with their lifestyle, Miller’s business on Floyd Street was opened in a modest house with only basic furnishings (“Franklin Syndicate Gone”, 1899). Miller even used “his low-rent office as a selling ploy: “Your money buys neither mahogany desks nor oil paintings. It is put to work for you at 10 percent a week. Our running expenses are small, our profits enormous and sure” (Zuckoff, 2005).

The Scope of the Scheme Expands

As profits grew, Miller commenced a national circular campaign which promised a 10 percent per week return on investments (“William F. Miller Arrested”, 1899). It is unknown whether out-of-state investors were only paid monthly dividends. However, a local circular contained the following:

My ambition is to make the Franklin Syndicate one of the largest and strongest syndicates operating in Wall Street, which will enable us to manipulate stocks, putting them up or down as we desire, and which will make our profits five times more than they are now. As to that I have no doubt, for it benefits its investors by paying weekly dividends and doubles their money in a very short time. (“520 Per Cent. Miller Exposed In Court”, 1914)

An Adams Express wagon driver commented that Miller was “doing a great business...in the past four months [he had] left at least \$100,000 here, and [he guessed] the driver of the National Express has left as much or more in that period” (“Franklin Syndicate Gone”, 1899). At this point word of 520 Percent Miller had spread and investments were coming in from the west (“Franklin Syndicate Gone”, 1899).

As word spread and more people sent Miller their money, he opened a second branch of the Franklin Syndicate in Boston (Zuckoff, 2005). At the pinnacle of his scheme when investors were enjoying immense returns, one account stated that a “patron who invested \$100 and who reinvested the 10% at the end of twenty-five weeks found himself with a credit in the Franklin Syndicate of \$1,029, all on the original investment of \$100. Inasmuch as Miller refused to carry accounts of more than \$1000, this customer was compelled to reinvest in the name of other members of his family” (Hill, 1904).

The Beginning of the End

Miller's crafty plan began a downward turn when E.L. Black of the On Charge financial paper began "attacking Miller and his methods, and he also sent out "warning" cards advising people to leave Miller" ("William F. Miller Arrested", 1899). When questions of his practices started, most investors fully supported Miller and had no doubt that "Miller's business ability...was the best that ever happened" ("Franklin Syndicate Gone". 1899).

However, after receiving one of the warning cards, one investor from Media, Pennsylvania did write Miller inquiring about his practices ("William F. Miller Arrested", 1899). Miller replied calling Blake a "blackmailer and that Deputy Sheriffs from three counties had been unable to locate him or his office." The Media man sent this letter to Blake ("William F. Miller Arrested", 1899). Blake filed a civil suit against Miller for \$50,000 in damages for slander for which Miller was arrested for on November 22, 1899. Miller was released on \$5,000 bail and left town ("William F. Miller Arrested", 1899). At this point most investors still believed in Miller and felt that his business would "pull through all right" ("Franklin Syndicate Gone", 1899).

Oddly enough, Miller was not arrested for his fraudulent activities but for slandering a journalist. But not wanting to face imprisonment, and worried about his scheme coming undone, he fled to Canada to get protection from the adversity of both.

Fraud Charges

The arrest and fleeing of Miller spawned an investigation into the Franklin Syndicate which revealed that Miller received \$620,000 from investors in **the month** preceding the raid (Hill, 1904). His intake of investments was an incredible figure for the times. Records found transactions from Ohio, Pennsylvania, and Washington plus entries showing Miller paid an average of \$40 per day for stamps to pay these long-distance investors. The records indicated approximately 150 investors received dividend payments each day ("Franklin Syndicate Gone". 1899). Despite all this news and exposure, there was no run on the syndicate (Hill, 1904).

The State Superintendent of Banks stated that due to Miller being an individual acting as a banking business, no papers were required to be filed with the Banking Department nor was Miller subject to the rules of an incorporated savings institution ("Franklin Syndicate Gone", 1899). Nonetheless, on November 27, 1899, thirty-five writs of attachment against Miller and the Franklin Syndicate were signed by the Supreme Court Justice (Hill, 1904). At this time, the scheme was declared fraudulent by federal authorities.

The successful but short-lived scheme cheated over one million dollars from investors when it collapsed in 1899 (Zuckoff, 2005). Miller once stated to a New York Evening World reporter that the "syndicate was started with only \$50 capital and at least \$1,500,000 has passed through the enterprise" (Hill, 1904).

Miller's Flight From Justice and Arrest

Having been absent from New York for several months, word was received that Miller was in Montreal, Canada. Captain Reynolds of the New York Police Department followed this lead which led him to Miller by chance. Captain Reynolds went to Montreal to try to locate Miller and bring him back to face charges of fraud. According to Captain Reynolds' account, he happened upon Miller while walking down a street in Montreal ("Syndicate Miller Behind the Bars", 1900). He approached Miller and introduced himself and exchanged casual conversation ("Syndicate Miller Behind the Bars". 1900).

The two spoke of returning to New York and Miller stated he was "anxious to see his wife and child" ("Syndicate Miller Behind the Bars", 1900). It was decided they would leave at once, so both men boarded a train for New York ("Syndicate Miller Behind the Bars", 1900). Upon arrival at the Grand Central Station, Captain Reynolds informed Miller that he was placing him under arrest providing Miller with a copy of the arrest warrant ("Syndicate Miller Behind the Bars", 1900).

Until this moment no word of Miller's situation was exchanged between the two men ("Syndicate Miller Behind the Bars", 1900). Miller complied with the arrest and went willingly to Police Headquarters ("Syndicate Miller Behind the Bars", 1900). The arrest took place on February 8, 1900. Miller was indicted on two accounts on grand larceny in the first degree and one of grand larceny in the second degree of which he pleaded "not guilty" ("Syndicate Miller Behind the Bars", 1900).

Convicted and Sentenced

On April 16, 1900 William Miller was convicted of grand larceny, Assistant District Attorney Littleton stating that "in every act that Miller had committed... he had shown that his business was a sham" ("Syndicate Miller Guilty", 1900). On April 30, 1900, Miller was sentenced to the maximum penalty of the law, ten years in Sing Sing Prison ("W.F. Miller Sentenced", 1900). Sing Sing Prison was a maximum-security prison located in Ossining, New York (Wikipedia, 2009).

During Miller's imprisonment he assisted the New York District Attorney in subsequent convictions of similar schemes and confessed that his entire work at the syndicate was a fraud. He admitted that the dividends on stock "came out of the money received" and that none of the dividends were ever paid out of profits ("Miller Confesses Fraud", 1903). Because of this, a pardon recommendation was made to Governor Higgins by the District Attorney ("W.F. Miller Is Pardoned". 1905). Clients of the Franklin Syndicate ultimately recovered about twenty-eight cents on the dollar for their investments (Zuckoff, 2005).

Released From Prison and His Life After

On February 13, 1905, Miller received a pardon after serving just less than five years of his ten-year sentence. Upon release he was greeted by his father and given a ticket to New York City. It is thought that Miller made a stop in Albany, New York to thank Governor Higgins for his pardon (“520 per cent Miller to be free on Monday.” 1905). After being released Miller opened a grocery store on Long Island where he earned a new nickname, “Honest Bill” (Zuckoff, 2005).

Years later when Charles Ponzi was the front-page story, a New York World reporter interviewed Miller to gain his thoughts of Ponzi (Zuckoff 236). “Shaking his head over what he had read in the papers about Ponzi, Miller said, “I may be rather dense, but I cannot understand how Ponzi made so much money in so short a time in foreign exchange.” Though he admired Ponzi’s fearlessness, he said he would not change places with Ponzi for \$10 million. “I would much rather own this grocery store, where I have few worries and breathe God’s free, pure country air” (Zuckoff, 2005)

Conclusions

The story of Miller is fascinating in some ways but is the blueprint for a Ponzi scheme. The strange thing about a “Ponzi” scheme is that Miller did not initially develop the scheme as a crafty fraud. It happened by luck and coincidences. The response to his failure to achieve the ten percent a week earnings was more money and no demands for refunds. Instead, people asked him to reinvest what they had including the earnings and even gave him more money to invest. He quickly realized the opportunity to make a fortune for himself and keep investors satisfied.

Miller’s story shows the basic tenants of a “Ponzi” scheme. First, the reward has to be “too good to be true”. Certainly, ten percent a week is an extraordinary return (Ponzi promised large returns on pennies invested in postage stamps using arbitrage, Madoff same promise as Miller for same reason). Second, the fraudster appeals to an affinity group. Miller appealed to his close friends in his Bible study (Ponzi appealed to Italian immigrants, being one; and Madoff to Jews, being one). People trust those in their affinity group, so fraudsters do not need to provide convincing evidence for their investment claims. Third, the first group gets paid as promised using proceeds from the second group that invests. That is, no money is really ever invested into anything substantial but is used by the fraudster personally and used to pay prior investors to keep the appearance of being legitimate.

This too good to be true returns is the main way Ponzi schemes get exposed. Either a journalist or suspicions observer begins to publicly draw attention (true for Miller and Ponzi), or an economic downturn reduces new investors to a level that causes the fraudster to be unable to pay the promised returns. For the latter, investors start to ask to cash out their investments which causes the scheme to crash (true for Madoff and others).

The story also points out that the scheme is misnamed as a “Ponzi” scheme. It is likely that Ponzi did not learn it from Miller, though he may have read some of the many newspaper exposes, but rather learned it from his employer in Canada who used a Ponzi scheme at the bank where Ponzi worked. Regardless, Miller is not likely the first person to

perpetrate one, but he is likely the first at such magnitude of volume and thus get publicity that exposed it. So should it have been named a “Miller” scheme or “520 percent” scheme? And last, if it sounds too good to be true, it probably is!

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