Seasons in Finance: Semester vs. Vacation

CS 210 Course Project Report

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30799

A. Introduction

This project endeavors to unravel the intricate relationship between academic semesters and expenditure dynamics. Leveraging a comprehensive dataset obtained from the official webpage of Akbank, the analysis focuses on discerning whether there exists a discernible impact of semesters on the increase in expenses.

The dataset, encapsulated within a structured .xlsx file, comprises crucial financial parameters such as transaction date, time, cost, balance, as well as detailed information on transactions and receipts. Obtained from the Akbank webpage, where users can conveniently download their individual transactions as .xlsx files, this dataset serves as a rich source for extracting insights into financial behaviors. Through meticulous exploration of this dataset and the application of custom Python scripts developed in previous stages, the project aims to shed light on the nuanced patterns that may emerge in expenditure trends during different academic semesters.

As the financial landscape continually evolves, understanding the potential influence of semester-based factors on spending behaviors becomes paramount. The project's findings are anticipated to provide valuable insights for individuals seeking a deeper comprehension of how academic timelines may correlate with fluctuations in financial outlays.

a. Timeline Framework & Goal of the Project

In this comprehensive analysis, the temporal context of the dataset is meticulously examined, considering the academic calendar of Sabancı University. The dataset spans transactions until January 17, 2024, with key academic milestones serving as crucial temporal anchors.

- Fall 2022-2023: Considered for December 2022 and January 2023 in the dataset, marking the commencement of the data collection.
- Spring 2022-2023: Featured online classes post the earthquake incident on February 6, 2023, with face-to-face finals held from June 1 to June 11, 2023.
- Summer 2022-2023: Initiated on July 10, 2023, with midterms on August 1, 2023, and concluding finals from August 26 to August 29, 2023.
- Fall 2023-2024: Commencing on October 2, 2023, it encompasses midterms spanning November to December 2023 and finals taking place from January 6 to January 19, 2024.

In adopting this meticulous classification based on the academic calendar of Sabancı University, the primary aim is to precisely distinguish expenditure frequencies within corresponding academic terms. This strategic categorization sets the stage for a targeted analysis, specifically aimed at investigating

whether the academic semester exerts a discernible influence on the increase in expenditure amounts. By aligning the analysis with the academic schedule, we seek to unravel intricate financial patterns that may be influenced by the distinctive rhythms of academic life, thereby providing deeper insights into the dynamics of expense fluctuations during semesters and vacation periods.

B. Hypothesis of the Project

Expenditures will demonstrate a more pronounced increase during academic semesters held in face to face compared to vacation periods.

C. Data Collection and Processing

The initial step in this project involved downloading the raw dataset in .xlsx format from the Akbank website. To ensure compliance with the Law of Personal Data Preservation and maintain privacy, transactions involving other individuals were identified and subsequently removed from the dataset. The dataset exclusively includes personal transactions with companies and entities. Following the translation of the dataset into English, the data was meticulously organized. To enhance clarity in the visualizations, costs were standardized by using absolute values. The transition from the .xlsx file to the .ipynb file was executed seamlessly using the Pandas library.

a. Costs in Time Fragments

i. Monthly Expense Fluctuations: The initial analysis involved creating a graph illustrating the total expenditures for each month within the specified time interval, offering insights into monthly fluctuations.

ii. Semester-wise Categorization: Transactions were categorized based on semester names using transaction dates and time period boundaries. The subsequent graph displayed separate summations of expenses during vacation periods and each semester, providing a comprehensive comparison of total costs across different time frames.

	Transaction Date	Time	Cost	Balance	Transaction	Receipt
0	17.01.2024	12:03	-184.50	15377.27	134 SIMIT SARAYI SABANCI	160013
1	16.01.2024	22:56	-68.00	15561.77	064 EKMOT GIDA ANONIM SI	787078
2	16.01.2024	18:40	-74.00	15629.77	046 STARBUCKS İST SABANC	131636
3	16.01.2024	03:00	-0.02	15703.77	YDS TWITCH	472183
4	16.01.2024	03:00	-10.33	15703.79	YDS TWITCH	472183

Figure 1 - – A snapshot of the dataset before semester-wise categorization

	Transaction Date	Time	Cost	Balance	Transaction	Receipt	Semester Name
0	2024-01-17	12:03	-184.50	15377.27	134 SIMIT SARAYI SABANCI	160013	Fall 2023-2024
1	2024-01-16	22:56	-68.00	15561.77	064 EKMOT GIDA ANONIM SI	787078	Fall 2023-2024
2	2024-01-16	18:40	-74.00	15629.77	046 STARBUCKS İST SABANC	131636	Fall 2023-2024
3	2024-01-16	03:00	-0.02	15703.77	YDS TWITCH	472183	Fall 2023-2024
4	2024-01-16	03:00	-10.33	15703.79	YDS TWITCH	472183	Fall 2023-2024

Figure 2 – A snapshot of the dataset after semester-wise categorization

iii. Online vs. Face-to-Face Semesters: An in-depth analysis of semesters included a graph comparing an online semester with a face-to-face semester, offering insights into spending variations.

iv. Machine Learning Prediction: A machine learning model was trained to predict the balance on the last day of the dataset, January 17, 2024, providing a forward-looking perspective.

b. Most Frequent Transactions in Fall 2023-2024

The focus on analyzing Fall 2023-2024's data is driven by its noteworthy position in total expenses among the academic periods. This semester, characterized by its distinct timeframes, including the start on October 2, 2023, midterm interval from November to December 2023, and finals from January 6 to January 19, 2024, offers a unique window into spending patterns. By honing in on this specific semester, the analysis aims for a targeted exploration of transactional trends, providing a detailed examination of the most frequent transactions and their monthly distribution. This approach ensures a nuanced understanding of financial behavior during a specific academic term, contributing to a more insightful interpretation of the data.

i. Top 5 Most Frequent Transactions: The analysis of Fall 2023-2024 focused on identifying the top 5 most frequent transactions and listing them alongside their frequencies to observe regularities.

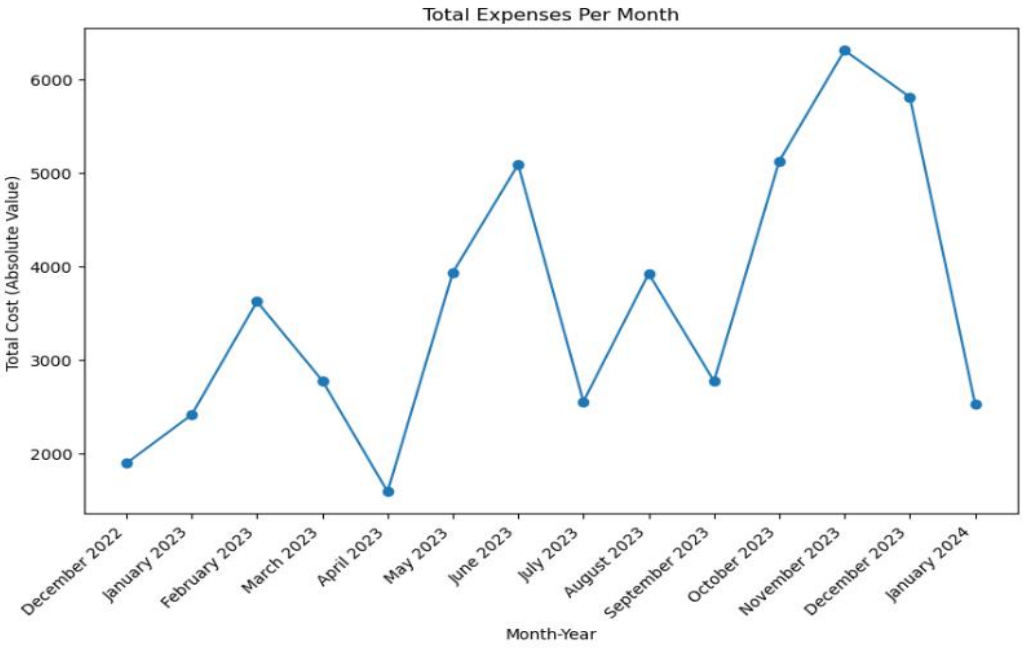
ii. Monthly Costs of Top 10 Transactions: Monthly costs of the top 10 most frequent transactions were listed to examine how expenses were distributed over the months of Fall 2023-2024.

iii. Machine Learning Prediction for Top Transactions: Another machine learning model was trained to predict the top 5 transactions of Fall 2023-2024, enabling a comparison between predicted and actual top transactions.

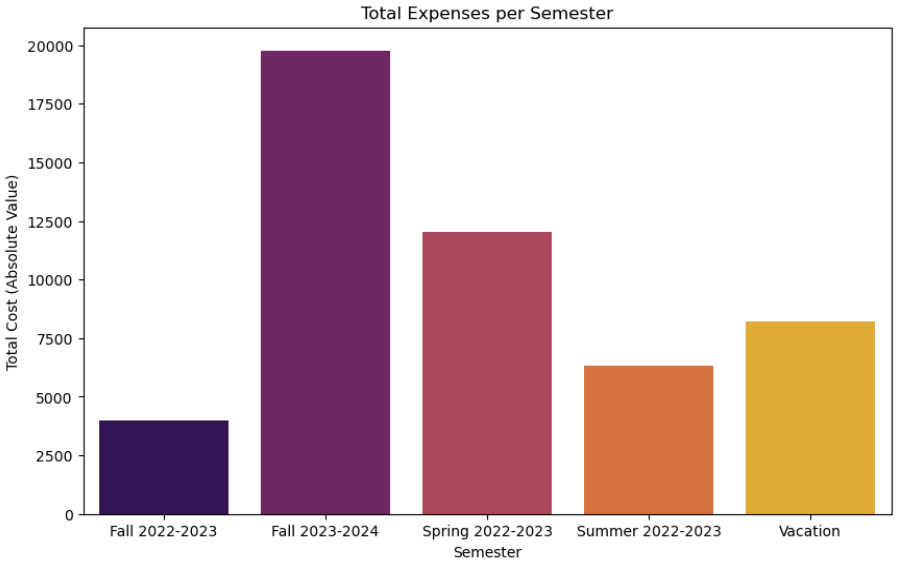
This multi-faceted approach not only provides a comprehensive understanding of spending patterns during semesters and vacations but also incorporates predictive elements for a forward-looking perspective.

D. Data Analysis and Interpretation

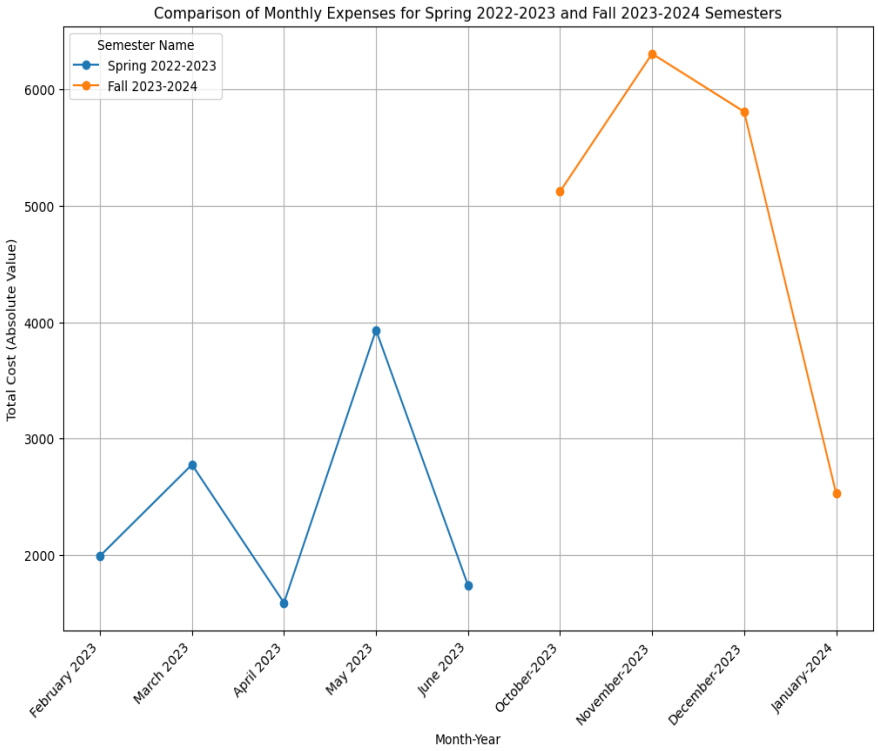
a. Costs in Time Fragments



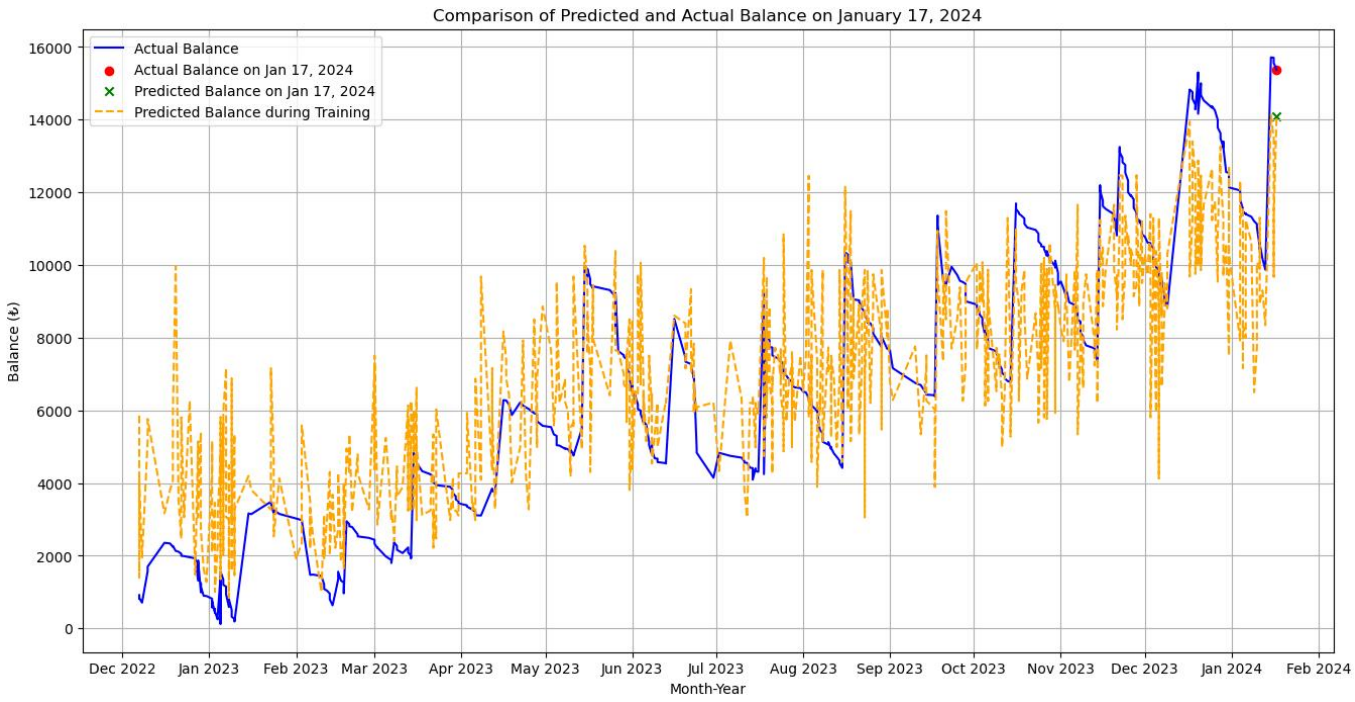
November 2023 boasts the global maximum value, surpassing 6000, closely followed by December 2023, both corresponding to Fall 2023-2024. October 2023 (Fall 2023-2024) closely rivals June 2023 (Spring 2022-2023). Despite outliers in December 2022, April 2023, and January 2024, the majority of higher values align with semester periods rather than vacations.



Categorizing transactions into respective time periods reveals the "Total Expenses per Semester" graph, showcasing the overall cost for each duration. Notably, Fall 2023-2024, conducted entirely face-to-face, stands out as the highest performer, surpassing even other semesters. While Spring 2022-2023, with an online format until finals, follows in the ranking, the 8-week duration of Summer 2022-2023 surprisingly registers a total cost near the Vacation period. Fall 2022-2023 appears as an outlier in this graph, given that the dataset doesn't cover the entire semester.



The graph illustrates a month-wise comparison of expenses between online and face-to-face semesters. The exception in May 2023, marked by a peak, is attributed to three travels, including two domestic and one international, occurring during the ongoing online semester. Consequently, expenses for that month significantly surpass others in the same semester. The graph distinctly showcases a notable increase in total costs during face-to-face semesters compared to those held online. In Spring 2022-2023, fewer classes were enrolled, resulting in a reduced number of finals attended. Consequently, June 2023 exhibits lower expenses compared to some counterpart months within the same semester.



Actual Balance on January 17, 2024: 15377.27 Predicted Balance on January 17, 2024: 14078.89

For this graph above, a machine learning model is trained using the fluctuations in balance values until the commencement of the Fall 2023-2024 semester, starting on October 2, 2023. The model is then employed to predict the bank account balance on the last day of the dataset, January 17, 2024. The predicted and actual balances are relatively close, indicating that the model provides accurate predictions. The graph illustrates a sharper decrease in balance during semester periods, aligning with the model's closer predictions to reality in these periods.

b. Most Frequent Transactions in Fall 2023-2024

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Top 5 Most Frequent Transactions in Fall 2023-2024 Semester:
Transaction: 046 STARBUCKS İST SABANC , Frequency: 33
Transaction: 064 EKMOT GIDA ANONIM SI , Frequency: 30
Transaction: 205 SELF GIDA SANAYI VE  , Frequency: 15
Transaction: 032 YUKSELEN YILDIZ TURI , Frequency: 13
Transaction: 046 PAYTR. /MARTI        , Frequency: 12
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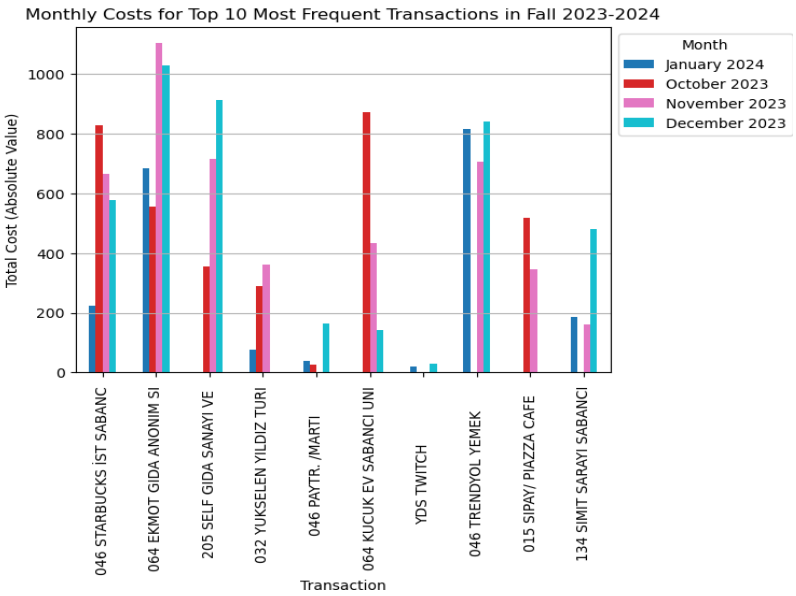
Figure 3 – Top 5 Most Frequent Transactions Made in Fall 2023-2024 Semester

In Figure 3, the frequencies of distinct transactions in Fall 2023-2024 are counted, and the top 5 most frequent transactions are ranked and listed accordingly. Among the top 5, the first four transactions are related to food shopping, while the fifth one pertains to transportation.



Utilizing the rationale from Figure 3, the graph on the left showcases the top 10 most frequent transactions. With the exception of Twitch and Martı transactions, eight of the most frequent transactions are associated with food companies, exhibiting an increase in November and December 2023, coinciding with the midterms of Fall 2023-2024. During November 2023, as midterms commenced, Ekmot Gıda experienced a significant surge in its cost, while Starbucks, which held one of the highest values in the previous month, saw a noticeable decrease. Similarly, in line with Starbucks, the entertainment-related transaction Twitch recorded no occurrences during this period. The heightened academic intensity of the semester not only led to increased expenses but also resulted in a shift in the frequency of distinctive transactions.

	Actual Transactions	Predicted Transactions
0	046 STARBUCKS İST SABANC	032 YUKSELEN YILDIZ TURI
1	064 EKMOT GIDA ANONIM SI	046 STARBUCKS İST SABANC
2	205 SELF GIDA SANAYI VE	064 EKMOT GIDA ANONIM SI
3	032 YUKSELEN YILDIZ TURI	067 KOPUKLU KAHVE
4	046 PAYTR. /MARTI	YDS TWITCH

Figure 4- Top 5 Most Frequent Transactions of Fall 2023-2024: Actual Transaction vs. Predicted Transactions

In Figure 4, the top 5 most frequent transactions of Fall 2023-2024 are predicted using another machine learning model. The model was trained with data from the dataset generated before October 2, 2024, the beginning date of Fall 2023-2024 semester. Despite a discrepancy in their order, the model successfully predicted 3 out of 5 transactions accurately. According to the model, Köpüklü and Twitch were potential top 4 and 5 transactions, as opposed to Martı and Yükselen Yıldız transactions. Surprisingly, Self Gıda was not included in its predictions. Noteworthy is the fact that, despite the distinction in types such as transportation (Martı) and entertainment (Twitch), both actual and predicted transactions consist of 4 food-related transactions. This similarity suggests that as the semester progresses and academic demands intensify, secondary expenses like entertainment gradually yield to primary expenditures such as food and transportation. Such interpretations imply that

distractions may give way to a focus on essential expenses as the semester advances and academic intensity increases.

E. Conclusion

The comprehensive analysis of bank transactions from December 2022 to January 17, 2024, provides valuable insights into spending patterns during academic semesters and vacation periods. The project initially hypothesized that expenditures would demonstrate a more pronounced increase during academic semesters held face-to-face compared to vacation periods.

The data collection and processing, as detailed in section C, involved careful steps to ensure compliance with privacy regulations and meticulous organization of the dataset. The subsequent analyses in section D explored various facets, including monthly expense fluctuations, semester-wise categorization, and predictions using machine learning models. The examination of the most frequent transactions in Fall 2023-2024 offered a focused perspective on transactional trends during a specific academic term.

The results, as illustrated in the visualizations and findings, consistently point towards a notable increase in expenses during academic semesters, especially face-to-face semesters. The "Total Expenses per Semester" graph reveals that Fall 2023-2024, conducted entirely face-to-face, stands out as the highest performer among the semesters. The comparison between online and face-to-face semesters reinforces the trend, showcasing a significant increase in total costs during face-to-face semesters.

Analyzing the most frequent transactions in Fall 2023-2024 further supports the hypothesis. The top transactions during this semester predominantly involve food-related expenses, suggesting a shift in spending patterns during periods of heightened academic intensity. Additionally, machine learning models predicting future balances align with this trend, demonstrating sharper decreases during semester periods.

In conclusion, the findings consistently indicate that expenditures indeed exhibit a more significant upswing during academic semesters, particularly those held face-to-face, supporting the hypothesis established at the outset of the project. The nuanced analyses provide a detailed understanding of how financial behaviors evolve during distinct temporal contexts, contributing valuable insights into spending dynamics.