iscte

**INSTITUTO
UNIVERSITÁRIO
DE LISBOA**

Comparing Financial Performance of Online-Only and Brick-and-Click Retailers Under Covid-19 Pandemic Using Ratio Analysis

Weixiang Lin

Master in Accounting & Management Control

Supervisor:
Prof. Helena Oliveira Isidro
Professor Catedrático
ISCTE Business School

September, 2025

Department of Accounting

Comparing Financial Performance of Online-Only and Brick-and-Click Retailers under Covid-19 pandemic using ratio analysis

Weixiang Lin

Master in Accounting & Management Control

Supervisor:
Prof. Helena Oliveira Isidro
Professor Catedrático
ISCTE Business School

September, 2025

Acknowledgement

I would like to express my sincere gratitude to my supervisor, Professor Helena Isidro, for her invaluable guidance, constructive feedback, and continuous encouragement throughout the course of my research and the preparation of this thesis.

I am also grateful to my family for their unwavering support and understanding, which have been essential to the completion of this work. My special thanks go to my girlfriend, Mengyang for her constant encouragement and companionship during this academic journey.

Resumo

A pandemia da COVID-19 acelerou mudanças estruturais no setor do retalho, levantando questões sobre o desempenho financeiro comparativo dos retalhistas exclusivamente online e dos retalhistas brick-and-click. Este estudo investiga essas diferenças nos Estados Unidos durante o período de 2019 a 2023.

Foram utilizados dados em painel de dezasseis empresas cotadas obtidos na LSEG, e seis rácios financeiros: Return on Assets, Return on Equity, Net Profit Margin, Current Ratio, Quick Ratio e Cash Ratio. Estes rácios foram calculados e analisados através de estatísticas descritivas e testes estatísticos, incluindo testes t e ANOVA.

Os resultados mostram que os retalhistas brick-and-click alcançaram, de forma geral, uma rentabilidade mais forte e estável. O Return on Assets foi significativamente superior neste grupo, as diferenças no Return on Equity não foram estatisticamente significativas devido à elevada variação entre as empresas online, e as diferenças no Net Profit Margin foram modestas. Em contraste, os três indicadores de liquidez favoreceram os retalhistas exclusivamente online, que mantiveram rácios current, quick e cash significativamente mais elevados, refletindo maior solvência de curto prazo e flexibilidade financeira.

Estas conclusões evidenciam um compromisso estrutural: os retalhistas brick-and-click beneficiam de canais de receita diversificados e de estabilidade operacional, enquanto os retalhistas exclusivamente online dependem de reservas de liquidez para assegurar resiliência, mas enfrentam dificuldades em convertê-las em rentabilidade sustentável. O estudo contribui para a literatura sobre a transformação do retalho ao clarificar como os modelos de negócio moldam a resiliência financeira perante choques sistémicos. Fornece também implicações de gestão para o equilíbrio entre rentabilidade e liquidez. As limitações incluem o foco em empresas dos EUA e em duas dimensões de desempenho, sugerindo que pesquisas futuras devem alargar a comparação entre países e incorporar indicadores financeiros e não financeiros adicionais.

Abstract

The COVID-19 pandemic accelerated structural changes in the retail industry, raising questions about the comparative financial performance of online-only and brick-and-click retailers. This study investigates these differences in the United States during the period 2019 to 2023.

Panel data from sixteen publicly listed firms were obtained from LSEG, and six financial ratios: Return on Assets, Return on Equity, Net Profit Margin, Current Ratio, Quick Ratio, and Cash Ratio, they were calculated and analyzed through descriptive statistics and statistical tests, including t-tests and ANOVA.

The results show that brick-and-click retailers achieved stronger and more stable profitability overall. Return on Assets was significantly higher for this group, Return on Equity differences were not statistically significant due to extreme variation among online firms, and Net Profit Margin differences were modest. In contrast, all three liquidity indicators favored online-only retailers, which maintained significantly higher current, quick, and cash ratios, reflecting stronger short-term solvency and financial flexibility.

These findings highlight a structural trade-off: brick-and-click firms benefit from diversified revenue channels and operational stability, while online-only firms rely on liquidity buffers to ensure resilience but struggle to translate them into sustainable profitability. The study contributes to the literature on retail transformation by clarifying how business models shape financial resilience under systemic shocks. It also provides managerial implications for balancing profitability and liquidity. Limitations include the focus on U.S. firms and two performance dimensions, suggesting that future research should extend to cross-country comparisons and incorporate broader financial and non-financial measures.

Index

Table of Figures

x

List of Tables

Chapter 1

1.1 Introduction

Over the past decade, the global retail sector has undergone a profound transformation driven by the exponential growth of e-commerce. Advances in internet technologies have enabled online retailers to offer consumers unprecedented convenience, competitive pricing, and a vast selection of products. As a result, global e-commerce sales surged to an estimated USD 26.7 trillion in 2019, accounting for nearly 30% of global GDP (United Nation Trade and Development (UNTCAD), 2021). The United States has been at the forefront of this digital revolution, with firms such as Amazon and eBay rapidly gaining market dominance by leveraging cost-effective and highly efficient digital business models. These online-native companies have fundamentally altered the competitive dynamics for traditional retailers, forcing many to reconsider their strategic positioning and channel structures (Wang, 2023).

Meanwhile, traditional brick-and-mortar retailers incur substantial fixed costs tied to maintaining physical storefronts, such as rent, utilities, staffing, and inventory holding that do not fluctuate with consumer demand or seasonal variations. These ongoing overheads create structural inflexibility, compress profit margins, and hinder responsiveness during market downturns or shifts in consumer behavior. Evidence shows that traditional retail firms exhibit significantly less flexibility in adjusting operating costs, particularly labor and goods-related costs, when activity declines, highlighting the persistent burden of fixed cost commitments in physical retail operations (Argilés-Bosch et al., 2022)

Faced with intensifying competition and changing consumer preferences, many traditional retailers have embraced a brick-and-click (omnichannel) model that integrates physical and digital sales channels. This hybrid approach aims to leverage the benefits of both formats, delivering a seamless shopping experience, like allowing customers to research products online and then purchase in-store or vice versa. However, successfully managing an omnichannel operation presents considerable challenges. It requires investment in new technologies, integration of logistics systems, and alignment of organizational processes. For many legacy retailers with complex, store-centric infrastructure, these tasks are difficult (Cuellar-Fernández et al., 2021).

However, the COVID-19 pandemic introduced unprecedented disruptions across the global retail landscape. While pure online retailers benefited from their digital agility and minimal reliance on physical storefronts, brick-and-click retailers encountered severe operational challenges due to their dependence on in-person infrastructure. As lockdowns, social distancing mandates, and safety restrictions led to extended store closures, many hybrid retailers faced disruptions in foot traffic, inventory management, and logistics coordination. At the macroeconomic level, the pandemic precipitated what has been characterized as one of the most severe economic shocks since 2008, triggering deep recessions in multiple countries and significantly contracting consumption across retail sectors (Goolsbee & Syverson, 2020), (Che et al., 2023).

According to UNCTAD's annual report, the global share of e-commerce in total retail sales increased from 16% in 2019 to 19% in 2020, highlighting a sharp consumer shift toward online shopping (UNCTAD, 2021). Past study's evidence further indicates that the pandemic caused a permanent upward shift in the long-term trajectory of online retail growth in most nations studied, effectively accelerating a structural transition in the retail sector (Afonso et al., 2024).

1.2 Problem Statement

Despite the significant transformation brought about by e-commerce and multi-channel retailing, there is still considerable debate surrounding the financial performance differences between online retailers and brick-and-click retailers. Particularly in terms of profitability and liquidity, these two models have exhibited significant differences across the pre-pandemic, pandemic, and post-pandemic periods. As previous studies examined that "The online distribution channel swipes away some traditional sales, but it also activates consumers who find the online channel more appealing, so there is a considerable positive effect on total sales."(Duch-Brown et al., 2017) But it remains unclear whether the presence of physical stores truly provides brick-and-click retailers with a financial advantage or adds an operational burden. These issues remain underexplored in empirical research. Furthermore, how these two models have managed to recover financially and adapt during and after the pandemic is a pressing question that has yet to be thoroughly investigated. This study aims to explore these questions by examining the financial ratios of online only and brick-and-click retailers to assess the impact of physical stores on their financial performance.

2

1.3 Research Objectives

The objective of this research is to provide a ratio-based financial analysis of online-only retailers and brick-and-click retailers operating in the United States, focusing on key profitability and liquidity indicators. Specifically, this study aims to explore and compare the financial performance of these two retail models with a focus on key indicators of profitability and liquidity. By examining a range of financial ratios, including return on assets, net profit margin, current ratio, quick ratio, cash ratio, and this research seeks to identify structural differences in performance outcomes attributable to the presence or absence of physical retail infrastructure.

Furthermore, this research intends to evaluate the adaptability and resilience of both retail models under varying market conditions across three critical timeframes: the pre-pandemic period, the COVID-19 crisis period, and the post-pandemic recovery phase. Through this multi-period comparison, the study seeks to generate insights into the relative sustainability and strategic flexibility of each retail format.

1.4 Research Questions

To achieve the research objective of evaluating and comparing the financial performance of online-only and brick-and-click retailers in the United States, this study proposes a set of focused research questions. These questions are designed to reflect the key dimensions of analysis, including profitability, liquidity, and the adaptability of retail models under different market conditions. Each question corresponds to a specific aspect of the objective and helps operationalize the study's approach through the use of ratio analysis.

1. How does the presence of physical stores influence the profitability of brick-and-click retailers, and how does their profitability compare to that of online-only retailers?

2. How does the liquidity of brick-and-click retailers compare to that of online-only retailers, and how does the presence of physical stores affect their liquidity ratios?

3. Impact of COVID-19 and Adaptability: How did the COVID-19 pandemic affect the financial performance of brick-and-click retailers compared to online-only retailers, and how did their adaptability to the pandemic environment impact their overall resilience and financial recovery?

1.5 Declaration of Using of AI tools

In the preparation of this thesis, AI-assisted tools (specifically ChatGPT by OpenAI) were used in a limited way to support language polishing, formatting consistency, and technical assistance in R programming. In addition, after reviewing draft sections of the thesis, the tool suggested a very small number of references for potential inclusion or replacement. These references were only incorporated after independent verification and critical assessment.

All research design, data collection, statistical analysis, interpretations, and conclusions were conducted independently, and full responsibility for the content of this thesis is assumed.

Chapter 2

2.1 Literature Review

To better understand the comparative performance of online-only and brick-and-click retailers, this literature review has examined the evolution of retail formats, the rise of e-commerce, and the shifting dynamics brought by digital transformation. Much of the academic discourse focuses on how technological advancements and changing consumer behavior have reshaped the structure and competitiveness of the retail sector. While numerous studies explore the operational benefits of digital channels (Jiao & Hu, 2022); (Chava et al., 2024); (Brynjolfsson & Smith, 2000), there remains an ongoing debate regarding the long-term financial sustainability of different retail models. A particular emphasis has been placed on how retailers adapted to the COVID-19 crisis, which exposed deep structural vulnerabilities in traditional formats and accelerated digital integration across the industry. This chapter lays the groundwork for evaluating how the presence of physical stores impacts profitability, liquidity, and strategic flexibility in an increasingly digital retail environment.

2.2 Evolution of Retail Industry

The retail industry has undergone a profound transformation over the past three decades, primarily driven by the expansion of digital technologies and evolving consumer expectations. The widespread diffusion of internet access in the late 1990s and early 2000s enabled retailers to establish online channels that operated independently from physical storefronts. This shift marked the beginning of a new era in retailing, where consumer interactions, transactions, and supply chain operations became increasingly digitized. Digitalization has not only altered how and where retailing occurs but also challenged conventional definitions of products, services, and customer value creation (Hagberg et al., 2016). The retail process moved beyond the fixed location of the store and began to encompass anytime-anywhere commerce.

Alongside the growth of online retail, a more complex transformation unfolded in the form of multi-channel and later omnichannel retailing. Retailers began integrating physical and digital platforms to deliver seamless consumer experiences across multiple touchpoints. Omnichannel

retailing is a strategic model in which all customer-facing channels are coordinated and leveraged to enhance consumer satisfaction and behavioral outcomes (Verhoef et al., 2015).

This development represented a shift from simple channel proliferation to strategic alignment, where mobile applications, social media, websites, and in-store environments were interlinked to reinforce brand identity and streamline fulfillment. For many established retailers, this transition was both a challenge and an opportunity, requiring significant investment in information systems, supply chain redesign, and organizational restructuring. As noted in recent research, the shift to omnichannel retailing demands substantial reconfiguration of operational processes, IT infrastructure, and internal coordination to ensure consistency across channels (Jocevski, 2020).

As e-commerce platforms such as Amazon and eBay gained prominence, the competitive pressure on traditional brick-and-mortar firms intensified. The cost advantages of online-only models, particularly their ability to avoid fixed costs related to physical locations, allowed them to scale rapidly and capture market share (Rigby, 2011). In response, many incumbent firms adopted hybrid or brick-and-click models, aiming to combine the reach of online channels with the immediacy and tactile benefits of in-store shopping. This convergence of retail formats has reshaped the competitive landscape, blurring the boundaries between what constitutes a "store" and a "platform."

2.3 Emergence of E-Commerce

The emergence of e-commerce can be defined as the buying and selling of goods and services via electronic platforms, primarily the internet. Initiated in the mid-1990s with pioneers such as Amazon and eBay, e-commerce transformed retail by offering consumers convenience, access to broader assortments, and dynamic pricing options (Brynjolfsson & Smith, 2000). The term "frictionless commerce" created by early scholars encapsulates how online marketplaces reduced transaction barriers and streamlined shopping behavior. Prices in internet retail channels have been found to be 9 to 16 percent lower than in conventional retail outlets, reflecting cost efficiencies made possible by digital technologies.

The rise of e-commerce has fundamentally changed consumer shopping behavior. One notable trend is showrooming, where consumers examine products in physical stores before purchasing them online. Despite price-matching strategies, showrooming has widened and contributed to

declines in store traffic and sales. Webrooming, which involves researching products online before purchasing them in stores, reflects an increasing preference for price transparency, convenience, and comprehensive product information (Jiao & Hu, 2022). Consumer expectations for easy comparison and access across channels have shifted decision-making habits toward digital-first engagement.

These evolving behaviors have increasingly undermined traditional retail models. Evidence from NBER indicates that the rapid expansion of e-commerce fulfillment centers is associated with a significant reduction in local retail employment and store openings, demonstrating that enhanced online infrastructure erodes the structural viability of brick-and-mortar retailers (Chava et al., 2024). This finding underscores the systemic disadvantage traditional stores face as consumer preference shifts toward digital channels.

2.4 Traditional Brick-and-Mortar Model

The traditional brick and mortar retail model refers to businesses that operate primarily through physical stores, where consumers interact with products and sales personnel in person. These retailers rely heavily on their geographic location, store atmosphere, and face-to-face service to attract and retain customers. Unlike online or hybrid models, traditional retailers often require substantial fixed investments in real estate, staffing, and inventory, which makes rapid strategic adaptation more difficult. The rigid cost structure of brick-and-mortar operations coupled with limited technological flexibility has further weakened their position. According to a past study, many traditional retailers were unable to respond effectively to the challenges posed by the COVID-19 pandemic, with a significant number experiencing bankruptcy due to the absence of integrated omnichannel strategies (Fang, 2024).

Traditional brick-and-mortar retailers face physical shelf constraints that narrow assortments and raise local inventory-carrying burdens (Verhoef et al., 2015), and they also display less pricing flexibility and systematically higher posted prices than online sellers (Brynjolfsson & Smith, 2000).

2.5 Online Model

The online-only retail model refers to firms that conduct all commercial transactions exclusively through digital platforms, without maintaining any form of physical retail presence. These firms depend entirely on a robust digital infrastructure, including e-commerce websites, mobile applications, online payment systems, and cloud-based logistics management to facilitate operations. By eliminating the costs associated with physical stores, such as rent, utilities, and in-store staffing, this model enhances overall cost efficiency. Furthermore, the online-only format supports high scalability and operational streamlining, enabling retailers to expand their market presence rapidly and flexibly. These structural advantages frequently translate into superior profit margins and broader consumer reach when compared to traditional or brick-and-click retail formats (Zhang et al., 2010).

While the online-only retail model offers substantial advantages in scalability and cost efficiency, its success also depends on the retailer's ability to navigate several operational complexities. For example, challenges such as the lack of sensory experience or the intricacies of last-mile logistics have prompted online retailers to innovate rapidly, through virtual try-on technologies, generous return policies, and strategic partnerships with logistics providers (Argilés-Bosch et al., 2022). Far from being limitations, these factors have catalyzed advancements in customer experience and supply chain agility. As the past study emphasizes, the online retail environment continues to evolve through adaptive strategies that strengthen consumer trust and engagement. Therefore, rather than undermining the model, these evolving challenges have become key drivers of innovation and differentiation in the digital marketplace.

2.6 Brick-and-Click Model

The brick-and-click retail model, also known as the hybrid or omni-channel model, integrates physical stores with digital platforms to offer consumers a seamless and flexible shopping experience. Unlike purely online or offline formats, this model leverages the strengths of both channels: the convenience and reach of e-commerce, and the immediacy, tactile experience, and personal service of in-store shopping (Verhoef et al., 2015). Recent studies suggest that brick-and-click retailers often outperform single-channel competitors in customer satisfaction and brand loyalty due to their ability to offer cross-channel fulfillment options, such as click-and-collect, in-store returns, and online inventory visibility (Juaneda-Ayensa et al., 2016).

Despite its versatility and consumer appeal, the brick-and-click model is not without limitations. Because it integrates both physical and digital infrastructures, it often inherits the complexities and cost burdens of both formats. Firms must juggle dual-channel inventories, coordinate online and offline logistics, and keep pricing and brand messaging aligned across channels. These demands raise operational complexity and cost (Gallino & Moreno, 2014).

2.7 Growing e-commerce and Covid-19

In recent years, the global retail industry has undergone significant transformation, primarily driven by the rapid growth of e-commerce. With the proliferation of internet technologies, online retail has offered consumers unprecedented convenience and a wide range of product choices. (Duch-Brown et al., 2017) The United States, as a leader in the global retail market, has witnessed the rapid expansion of this trend. (Negricea et, 2007) Online retailers, such as Amazon, have risen swiftly by leveraging low-cost, high-efficiency business models, fundamentally altering the landscape for traditional retailers.

At the same time, traditional brick-and-mortar retailers face increasing pressure and are forced to adapt their business models to accommodate the growing demand for online shopping. To remain competitive, many traditional retailers have adopted the brick-and-click model, which integrates both online and offline channels in an effort to capitalize on the advantages of both physical stores and e-commerce. (Cuellar-Fernández et al., 2021)

However, the outbreak of the COVID-19 pandemic brought unprecedented disruptions to the global retail landscape. Government-imposed lockdowns, mobility restrictions, and heightened health concerns fundamentally altered consumer behavior and retail operations (Pantano et al., 2020). The COVID-19 pandemic triggered a severe and synchronized global economic contraction, marking the most significant downturn since the Great Depression. In 2020, global GDP declined by 3.4%, with advanced economies experiencing sharp recessions due to mobility restrictions, business closures, and widespread supply chain disruptions (Gopinath, 2020). Unemployment rates rose rapidly, consumer confidence collapsed, and financial markets experienced acute volatility. These dynamics prompted extraordinary fiscal and monetary interventions across major economies. Industries that depend heavily on physical presence, such as retail, hospitality, and transportation, were particularly vulnerable. Many small and medium-sized enterprises faced prolonged revenue

declines, cash flow instability, and widespread closures. These shocks not only reduced short-term economic output but also intensified pre-existing structural weaknesses in labor markets and global production systems (Fernandes, 2020).

While online-only retailers benefited from their inherently digital infrastructure and operational flexibility, allowing them to rapidly scale and meet rising e-commerce demand, brick-and-click retailers faced more complex challenges. Despite having some digital capabilities, their dependence on physical storefronts for customer interaction, fulfillment, and revenue generation exposed them to substantial operational vulnerabilities. These firms encountered store closures, inventory backlogs, staffing disruptions, and increased costs associated with safety compliance and logistics reconfiguration. As a result, their performance during the pandemic varied significantly depending on the extent of their digital integration and logistical adaptability (Nakano, 2022).

2.8 Retailer Adaptability and Strategic Resilience under COVID-19

The COVID-19 crisis served as a large-scale stress test for retail business models, indicating the extent to which firms could withstand sudden operational and financial shocks. Retailers that demonstrated greater adaptability during the pandemic typically exhibited stronger digital integration, agile supply chains, and diversified revenue channels. For instance, the ability to reallocate inventory swiftly across channels, adopt curbside pickup, and provide real-time customer service became critical factors in retaining sales and brand loyalty (Delasay et al., 2022).

Digitally mature retailers were also better positioned to respond to demand fluctuations and lockdown-driven channel shifts, as they could leverage e-commerce infrastructure, data analytics, and omnichannel customer engagement tools.

Financial resilience was equally important. Many firms with low liquidity reserves or high leverage ratios were unable to absorb prolonged revenue losses, leading to an uptick in bankruptcies and store closures, particularly among traditional and mid-sized chains. Retailers that maintained flexible cost structures and strong cash flow prior to the pandemic showed greater survivability and faster recovery potential (Donthu & Gustafsson, 2020). Strategic responses such as renegotiating leases, implementing workforce redeployment, and accelerating digital investment became widespread among firms aiming to mitigate long-term disruptions.

These adaptive capabilities varied across retail formats. Online-only retailers, with inherently leaner operations, experienced fewer disruptions. Brick-and-click retailers had mixed results, depending on the sophistication of their omnichannel infrastructure. In contrast, traditional brick-and-mortar retailers, lacking digital readiness, suffered the most from forced closures and demand erosion. The pandemic thus highlighted adaptability not merely as a competitive advantage but as a determinant of survival in the face of systemic shocks.

Chapter 3

3.1 Methodology

This study adopts a quantitative empirical design, using key financial ratios to compare the performance of online-only and brick-and-click retailers in the United States. We focus on profitability (return on assets, return on equity, net profit margin) and liquidity (current ratio, Quick/Acid-Test Ratio, cash ratio). These ratio-based indicators are standard, objective measures in mainstream empirical research on firm performance and financial distress (Giordani et al., 2014). By focusing on quantifiable indicators, this approach ensures that the evaluation of retail performance is grounded in observable financial outcomes rather than subjective interpretation. This methodological orientation is particularly appropriate for the research context, as it facilitates the identification of statistically significant trends and patterns across distinct retail formats over a multiyear period.

Data will be collected from the London Stock Exchange Group (LSEG, formerly Refinitiv), which provides comprehensive financial information for publicly listed companies. The sample will consist of at least five online-only retailers and five brick-and-click retailers that have maintained continuous operations in the United States from 2019 to 2023. This sampling strategy ensures that all firms included in the study have faced comparable macroeconomic conditions, including the COVID-19 pandemic and the post-pandemic recovery period, thereby enhancing the internal validity of the analysis. Companies with incomplete or inconsistent financial disclosures during this time frame will be excluded to maintain the reliability of the results.

Key financial ratios will be calculated using R and Microsoft Excel. These include profitability ratios such as Return on Assets, Return on Equity, and Net Profit Margin, as well as liquidity ratios such as Current Ratio, Quick Ratio, and Cash Ratio. These metrics are widely used in empirical analysis of firm performance and financial distress, with profitability, leverage, and liquidity ratios serving as core predictors (Giordani et al., 2014). For each firm, annual averages of these ratios will be computed, and year-over-year growth rates will be analyzed to assess both absolute performance and trajectory. To determine whether the financial differences between the two retail models are statistically significant, independent samples t-tests will be conducted.

This quantitative approach not only enables a structured comparison of financial resilience between the two retail types, but also contributes to theory-building by offering empirical insights into how physical store presence affects profitability and liquidity under dynamic market conditions.

3.2 Research Design

This study employs a comparative quantitative research design to evaluate the financial performance of online-only and brick-and-click retailers in the United States. The central aim is to examine how the presence or absence of physical stores influences firm profitability and liquidity across pre-, during-, and post-COVID-19 periods. A deductive, hypothesis-testing strategy is used, relying on objective, ratio-based measures commonly applied in empirical research on firm performance and financial distress (Giordani et al., 2014)

The unit of analysis is the firm-year observation, with each observation corresponding to a single firm's financial performance in a given year from 2019 to 2023. This time frame captures pre-pandemic baseline operations, crisis-level disruptions during 2020–2021, and recovery trajectories in the post-pandemic period. The use of a five-year panel allows for robust intra- and inter-group comparisons over time and enhances the temporal validity of the study.

A minimum of five publicly listed firms will be selected for each retail category to ensure sufficient representation of the two business models. All selected companies must have operated continuously during the study period and must have consistently published complete financial data across the five years. The selection criteria are designed to control for data availability and financial reporting consistency, thereby increasing the internal validity and comparability of the dataset.

In this study, retailer type serves as the primary categorical dimension of analysis, distinguishing firms as either "online-only" or "brick-and-click" according to the presence of physical stores. The analysis focuses on a set of financial performance indicators, including profitability (ROA, ROE, and Net Profit Margin) and liquidity (Current Ratio, Quick Ratio, and Cash Ratio). These indicators are widely used in empirical research as standard measures of firm performance and short-term solvency, including in bankruptcy-risk prediction based on financial ratios (Giordani et al., 2014).

To analyze the data, descriptive statistics will be used to summarize average performance across both groups. Inferential statistics, specifically independent samples t-tests, will be employed to determine whether statistically significant differences exist between the financial indicators of the two retail models. These statistical procedures will be conducted using R Studio and Microsoft Excel to ensure both computational accuracy and replicability.

By focusing on observable and measurable financial outcomes, this research design facilitates a rigorous examination of the structural and strategic implications of retail format on firm performance. It also provides an empirical basis for evaluating the resilience of different models under external shocks such as the COVID-19 pandemic.

3.3 Variables

To conduct a structured financial comparison between online-only and brick-and-click retailers, this study selects a set of widely recognized financial ratios that capture two core dimensions of firm performance: profitability and liquidity. These ratios are selected based on their relevance to operational efficiency, financial stability, and investor evaluation.

3.3.1 Return on Assets (ROA)

$$ROA = \frac{Net\ Income}{Total\ Assets}$$

Return on Assets measures a company's ability to convert its total assets into net income. It captures operational efficiency by showing how effectively the firm is utilizing its asset base to generate profits. ROA is widely used in financial performance assessments because it provides a standardized metric to compare companies of different sizes or across industries. In the context of retail, where asset bases can differ significantly depending on whether the firm operates physical stores or is entirely digital, ROA offers critical insight into how productively firms deploy their capital investments. A higher ROA suggests superior internal resource management, while a lower ROA may indicate either inefficiency or underutilization of assets. When analyzing online-only versus brick-and-click retailers, this metric helps evaluate which model yields greater output per unit of asset investment.

3.3.2 Return on Equity (ROE)

$$ROE = \frac{Net\ Income}{Shareholders'Equity}$$

Return on Equity reflects the amount of net income returned as a percentage of shareholders' equity. It is one of the most important indicators for investors, as it directly measures how effectively a company uses its capital to generate profits. ROE also reflects strategic financial choices, such as leverage and dividend policy. In comparative studies, firms with higher ROE are typically seen as better at creating shareholder value. For this research, comparing ROE across online-only and brick-and-click models can indicate differences in capital structure and profitability management. A consistently higher ROE in one model may signal its superior long-term financial attractiveness and capacity to reward equity holders.

3.3.3 Net Profit Margin (NPM)

$$Net\ Profit\ Margin = \frac{Net\ Income}{Revenue}$$

The net profit margin represents the percentage of revenue that remains after deducting all expenses, taxes, and costs. It is an essential measure of bottom-line profitability and is often used to evaluate how efficiently a company converts sales into actual profit. In the retail context, this ratio is particularly valuable because it captures the cumulative effect of cost control, pricing strategies, and operational overhead. For example, online retailers typically operate with leaner structures and may therefore enjoy higher margins, whereas brick-and-click retailers may face higher fixed costs and staffing expenses. Analyzing the net profit margin offers nuanced insight into which retail model is more capable of sustaining profitability under varying economic conditions.

3.3.4 Current Ratio

$$Current\ Ratio = \frac{Current\ Assets}{Current\ Liabilities}$$

The current ratio evaluates a firm's ability to meet its short-term liabilities using its short-term assets. It is widely regarded as a general indicator of liquidity and operational stability. For retailers,

maintaining adequate current assets is crucial to fund seasonal inventories, fulfill supplier obligations, and cover operating expenses. A healthy current ratio indicates that the firm has sufficient working capital to handle financial obligations without resorting to external financing. Conversely, an abnormally high ratio may also suggest inefficient capital allocation. In this research, comparing current ratios between online and hybrid retail models can help identify which business structure demonstrates stronger liquidity management in the post-pandemic period.

3.3.5 Quick Ratio (Acid-Test Ratio)

$$Quick\ Ratio = \frac{Current\ Assets - Inventory}{Current\ Liabilities}$$

The quick ratio provides a more stringent test of liquidity by removing inventory from current assets, focusing instead on more immediately realizable resources such as cash and receivables. This is particularly relevant in sectors where inventory may be illiquid or subject to obsolescence. In retail, brick-and-click firms generally carry larger inventories due to their physical store operations, making this ratio an effective differentiator. A higher quick ratio indicates a firm's preparedness to meet short-term liabilities without relying on the sale of inventory, which may be critical during demand shocks or supply chain disruptions. This measure is useful in understanding which retail models are structurally more resilient in liquidity-constrained scenarios.

3.3.6 Cash Ratio

$$Cash\ Ratio = \frac{Cash\ and\ Cash\ Equivalents}{Current\ Liabilities}$$

The cash ratio is the most conservative liquidity metric, assessing whether a firm can pay off its current liabilities using only cash or cash equivalents. While firms rarely maintain a cash ratio above 1, this metric becomes especially relevant in times of financial distress, crisis response, or when access to short-term financing is limited. For example, during the COVID-19 pandemic, companies with stronger cash buffers were better positioned to survive demand shocks and logistical disruptions. This ratio helps identify which retailers operate with financial prudence and are better equipped to weather operational volatility. In comparative analysis, cash ratio serves as

a benchmark for evaluating immediate solvency without reliance on receivables or inventory liquidation.

3.4 Data Collection

This study draws upon a structured panel dataset comprising financial information from sixteen publicly listed U.S. retailers over the five-year period from 2019 to 2023. The sample includes eight online-only retailers and eight brick-and-click retailers, carefully selected to ensure sectoral relevance, data availability, and operational continuity throughout the study period. Selection criteria prioritized firms with consistent annual financial disclosures, active trading status, and well-established market presence in either the digital-only or hybrid retail domain.

The raw financial data were extracted from LSEG, a reputable financial database widely used in academic research for its comprehensive and verified reporting. Key financial line items were retrieved, including but not limited to net revenue, net income, total assets, current assets, total liabilities and shareholders' equity. The data were compiled in native currency units (USD) and organized by year and firm for consistency across cases. In total, the dataset reflects 40 firm-year observations per retail category, forming a robust empirical base for ratio-based financial analysis.

Data was manually cleaned and standardized in Microsoft Excel to remove discrepancies and ensure consistency in variable labeling across firms. Data preparation involved two main steps: cleaning and standardization. Cleaning referred to the exclusion of observations with extreme outliers that could distort ratio values, as well as the removal of firms that ceased operations during the study period to ensure sample continuity. Standardization consisted of harmonizing the reporting units so that all financial line items were expressed consistently in thousands of U.S. dollars. These steps were taken to enhance the comparability of firms and the reliability of the computed ratios. Where necessary, missing or non-reportable values were interpolated using adjacent period data, provided such estimates met the criteria for analytical reliability. Ratio metrics including Return on Assets (ROA), Return on Equity (ROE), Net Profit Margin, Current Ratio, Acid Test Ratio, and Cash Ratio were computed using uniform formulas. This ensured comparability across firms and time periods and allowed for precise statistical testing of performance differences.

The initial preparation was conducted in Excel because its tabular interface facilitates quick manual inspection, removal of extreme values, and adjustment of reporting units. After this preliminary step, the dataset was imported into R Studio for ratio computation, statistical testing, and visualization. While Excel could in principle perform similar functions, R provides superior reproducibility, statistical rigor, and flexibility in producing professional outputs, which makes it more suitable as the primary analytical environment.

3.5 Data Analysis

To rigorously evaluate the financial performance of online-only and brick-and-click retailers, this study employs a structured ratio analysis framework covering the period from 2019 to 2023. All financial ratios will be calculated using the R programming language, which enables reproducible workflows, efficient data processing, and robust statistical analysis suited for longitudinal financial datasets. The objective of this analysis is to uncover temporal patterns and intergroup differences in core dimensions of financial performance, particularly profitability and liquidity.

The analytical procedure begins by computing six key financial ratios： Return on Assets (ROA), Return on Equity (ROE), Net Profit Margin, Current Ratio, Acid Test Ratio, and Cash Ratio. For each firm in each year. These indicators are selected based on their widespread acceptance in financial performance assessment and their capacity to reflect operational efficiency, shareholder returns, and short-term solvency. After calculating the individual firm-level ratios, annual averages for each retail category will be computed, enabling a comparison between the two groups across time.

To evaluate changes in performance across the study period, the compound annual growth rate (CAGR) will be calculated for each ratio. This metric summarizes the multi-year trajectory of each financial indicator and controls for short-term fluctuations, providing a stable measure of trend progression. These analyses aim to identify whether either retail format has exhibited consistent financial improvement or decline during the selected timeframe.

Subsequently, a comparative ratio analysis will be conducted to explore the structural performance differences between the two retail categories. This analysis offers insight into how format-specific characteristics, such as asset structure or channel integration, may relate to measurable differences in financial outcomes.

Table 1 Summary of Profitability and Liquidity Ratios for Brick-and-Click Firms for 2019-2023

	Mean	Median	St Dev	Min	Max
Profitability					
ROA	7.63%	7.76%	6.55%	-23.4%	18.9%
ROE	29.9%	24%	84%	-175%	404%
Net Profit Margin	3.37%	2.85%	4.99%	-22.9%	12.4%
Liquidity					
Current Ratio	108%	102%	27.9%	73.5%	188%
Acid Test Ratio	39.6%	35.9%	20.3%	10%	104%
Cash Ratio	27%	21.2%	21.6%	2.8%	97.4%

The descriptive statistics indicate that brick-and-click retailers achieved stable profitability across the observation period. The ROA was 0.076 with a median of 0.078 and a relatively small standard deviation of 0.066, suggesting that most firms in this group consistently generated positive returns on their asset base. The range from –0.234 to 0.189 reflects that while some firms experienced temporary losses, the overall distribution was concentrated around positive values. ROE showed a higher mean of 0.299 and a median of 0.240, but with considerably greater variability (SD = 0.840) and an extended range from –1.75 to 4.04. This indicates substantial heterogeneity in shareholder returns, likely influenced by differences in capital structures, with some firms achieving very high equity returns while others recorded negative values. Net profit margin was modest, with a mean of 0.034, a median of 0.029, and a low standard deviation of 0.050, underscoring that most brick-and-click firms clustered around low but positive profit margins. Together, these figures suggest that profitability in this group is generally stable, although equity returns are more volatile and sensitive to firm-specific conditions.

Liquidity indicators point to a strategy of maintaining lean but consistent solvency positions. The current ratio averaged 1.08 with a median of 1.02 and limited dispersion (SD = 0.279), suggesting that brick-and-click retailers operate with a relatively balanced coverage of current liabilities. Both the quick ratio (mean = 0.396, median = 0.359, SD = 0.203) and the cash ratio (mean = 0.270, median = 0.212, SD = 0.216) were lower, but with narrow standard deviations, indicating that most firms followed similar liquidity practices. The limited ranges observed across

all three measures point to homogeneity in liquidity management, with firms generally avoiding large excess reserves while still maintaining sufficient buffers to meet short-term obligations. Overall, the liquidity profile of brick-and-click retailers reflects a consistent approach centered on operational efficiency and predictable cash flows rather than reliance on substantial cash holdings.

Table 2 Summary of Profitability and Liquidity Ratios for Online Only Firms for 2019-2023

	Mean	Median	St Dev	Min	Max
Profitability					
ROA	-2.23%	-0.59%	17%	-48.4%	34.2%
ROE	123%	15%	737%	-501%	4620%
Net Profit Margin	3.03%	-0.55%	9.68%	-26.9%	21%
Liquidity					
Current Ratio	222%	173%	152%	57.2%	679%
Acid Test Ratio	183%	140%	136%	28.3%	564%
Cash Ratio	145%	89.3%	133%	13.7%	540%

The descriptive statistics indicate that online-only retailers exhibited weaker and more volatile profitability compared to brick-and-click firms. The average ROA was slightly negative at –0.022, with a median close to zero (–0.006) and a relatively large standard deviation of 0.170. This distribution, ranging from –0.484 to 0.342, indicates that many online firms struggled to generate consistent returns on their assets, with losses being relatively common. ROE displayed an extremely high mean of 1.23, but the standard deviation was very large (7.37), and the values ranged from –5.01 to 46.2. This suggests that the average was heavily influenced by extreme cases, likely associated with negative or very small equity bases that inflated the ratio, thereby limiting its reliability as a profitability measure. Net profit margin averaged close to zero at 0.003, with a median of –0.005 and a standard deviation of 0.097. The range from –0.269 to 0.210 indicates substantial dispersion, with some firms achieving positive margins while others reported sizeable losses. Overall, these patterns point to greater heterogeneity and instability in profitability among online-only retailers, reflecting diverse operational performances and financial structures.

In contrast to their profitability, online-only retailers maintained substantially stronger liquidity positions. The current ratio averaged 2.22 (median = 1.73) with considerable variation (SD = 1.52,

range 0.57–6.79), indicating that while many firms held significant current asset buffers, others operated closer to minimum thresholds. The quick ratio showed a mean of 1.83 (median = 1.40, SD = 1.36), and the cash ratio averaged 1.45 (median = 0.893, SD = 1.33), both with wide ranges extending up to values above 5. These high averages and large dispersions suggest that a substantial share of online firms maintained very strong liquid reserves relative to short-term obligations, though practices varied widely across the group. Collectively, the liquidity measures highlight that online-only retailers tended to prioritize financial flexibility and solvency cushions, even though this strategy produced notable heterogeneity in outcomes.

Statistical comparisons across the two retail models indicate clear but uneven patterns. For profitability, ROA was significantly higher among brick-and-click firms (t-test $p < 0.01$; ANOVA $p < 0.01$), underscoring their ability to generate more stable asset returns. In contrast, neither ROE nor NPM differences reached significance ($p > 0.05$). The lack of statistical separation in ROE reflects the extreme dispersion of values in the online group, driven by negative or very small equity bases that inflated the mean, while the marginal differences in NPM suggest only slight advantages for brick-and-click retailers in operating margins. Liquidity tests, however, produced consistent and highly significant results. The current, quick, and cash ratios were all markedly higher for online-only retailers (all t-tests and ANOVA $p < 0.001$), with wide dispersions but a clear group-level distinction.

3.6 Statistical Comparison and Hypothesis Testing

In order to statistically assess whether the observed differences between online-only and brick-and-click retailers are significant, formal hypothesis testing will be employed. Independent samples t-tests will be conducted for each financial ratio to examine differences in mean values between the two retail models. This technique is appropriate for comparing means from two independent groups and provides a systematic approach to inferential analysis.

For each ratio, the following hypotheses will be tested:

Null hypothesis: There is no significant difference in the average value of the financial ratio between online-only retailers and brick-and-click retailers.

Alternative hypothesis: There is a significant difference in the average value of the financial ratio between the two retail categories.

22

These tests will be performed using R statistical packages, and a significance level of 0.05 will be adopted. Ratios yielding p-values below this threshold will be interpreted as demonstrating statistically significant differences in financial performance across the two groups.

This inferential step strengthens the analytical framework by confirming whether observed variations are likely attributable to structural distinctions in business models rather than random variation. The integration of descriptive and inferential methods ensures both clarity of insight and methodological rigor.

Chapter 4

Note

The sample comprises 16 publicly listed U.S. retailers, eight brick-and-click and eight online-only. Annual data cover the period 2019–2023, yielding a balanced panel of 80 firm-year observations in total, with 40 observations per group (8 firms × 5 years).

4.1 Profitability

4.1.1 ROA

Table 3 Comparing the ROA of Brick and Click model and Online Only model: the Mean and Standard Deviation for 2019-2023, 40 observations per group

ROA	Mean	Standard Deviation
Brick and click	7.63%	6.55%
Online only	-2.23%	16.97%

The empirical analysis focuses on comparing the return on assets (ROA) between brick-and-click retailers and online-only retailers over the period 2019–2023. Descriptive statistics indicate a clear divergence in both profitability levels and stability between the two business models. Brick-and-click retailers achieved an overall mean ROA of 7.63% (SD = 6.55%), consistently maintaining positive profitability throughout the observed period. In contrast, online retailers reported a negative overall mean ROA of –2.23% (SD = 16.97%), suggesting that while a few firms achieved substantial profitability, the majority performed poorly, resulting in both a lower average and substantially greater variability. Year-by-year comparisons further reinforce this pattern: brick-and-click firms exhibited relatively stable ROA performance (ranging from 3.97% to 11.0%) with moderate volatility, whereas online firms fluctuated widely, including periods of positive profitability (2020–2021) , as well as notable declines into negative territory (2019, 2022, and 2023).

Table 4 Average ROA and Standard Deviation by Year for Brick-and-Click and Online-Only Retailers for 2019-2023, 40 observations per group

Type	Year	Average ROA	ROA Std
Brick and click	2019	6.67%	2.94%
	2020	3.97%	11.32%
	2021	11.03%	5.51%
	2022	8.26%	3.63%
	2023	8.23%	5.28%
Online only	2019	-7.49%	20.44%
	2020	4.57%	8.33%
	2021	7.43%	13.47%
	2022	-9.91%	16.39%
	2023	-5.76%	19.86%

Figure 1 Distribution of ROA by Retailer Type for 2019-2023; (Red: Brick-and-Click, Blue: Online-Only)
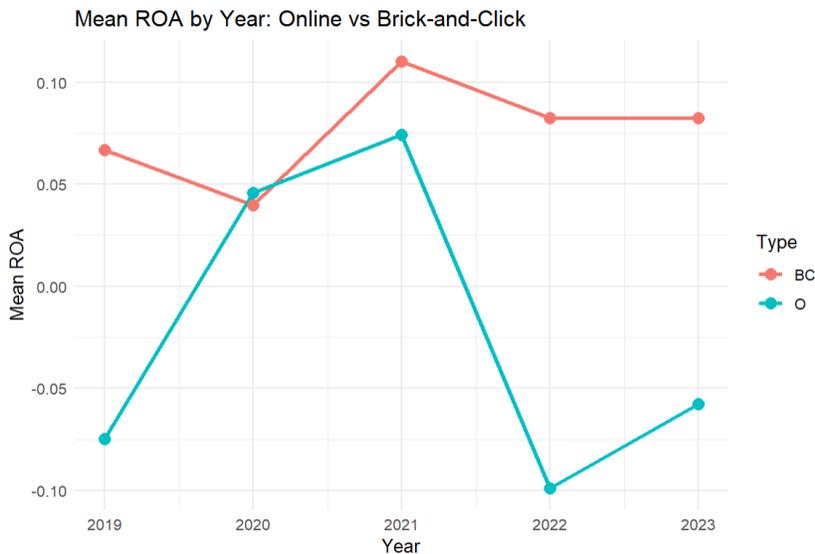
In 2019, prior to the pandemic, brick-and-click retailers already showed positive and stable profitability (mean ROA = 6.67%), while online retailers recorded negative ROA on average (–7.49%) with substantial variability. This establishes a baseline difference in performance between the two models before the external shock.

In 2020, during the initial outbreak of COVID-19, brick-and-click retailers experienced a decline in ROA (3.97%) and increased volatility, reflecting the disruptive impact of lockdowns on

physical operations. In contrast, online retailers temporarily benefited, shifting to a positive mean ROA (4.57%) as e-commerce demand surged.

By 2021, as the sector adapted to the pandemic, brick-and-click retailers not only recovered but reached their highest ROA (11.03%), demonstrating resilience and successful adjustment to the new environment. Online retailers also maintained positive profitability (7.43%), though with higher volatility, indicating widening disparities between leading and weaker players.

In the post-pandemic years (2022–2023), brick-and-click retailers stabilized their profitability around 8.2%, whereas online retailers reverted to negative ROA (–9.91% in 2022 and –5.76% in 2023) with high volatility. This suggests that the temporary advantage of online retailers during the pandemic was not sustained, while the brick-and-click model proved more robust in the longer term.

Figure 2 Average ROA Distribution by Type for 2019-2023 (Red: Brick and click; Blue: Online only)
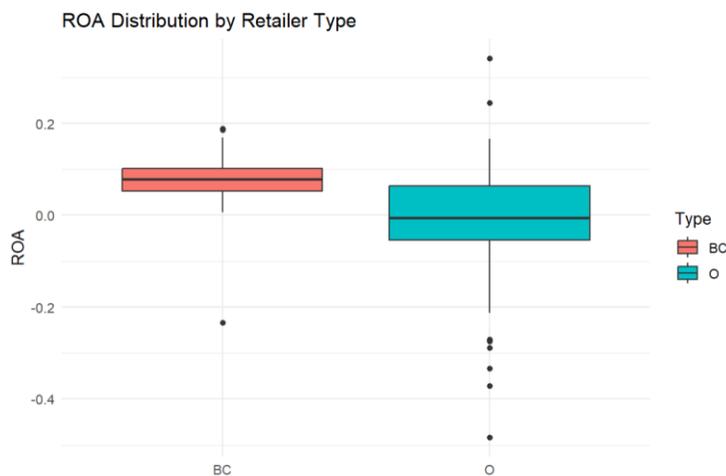
Table 5 t-Test Results for Differences in ROA Between Brick-and-Click and Online-Only Retailers for 2019-2023, 40 observations per group, Reject the H0

	t-value	Degrees of freedom	p-value	95% Confidence interval for mean diff.
ROA	3.4305	50.3505	0.0012 < 0.01	[0.0409, 0.1564]

To formally test the significance of these observed differences, a Welch two-sample t-test was conducted. The results confirmed that the difference in mean ROA between the two groups is statistically significant (t = 3.4305, Degrees of freedom = 50.3505, p = 0.0012). The 95%

confidence interval for the mean difference (0.0409 to 0.1564) does not include zero, providing strong evidence that brick-and-click retailers significantly outperform online retailers in terms of ROA.

Table 6 ROA: ANOVA Results Examining the Effects of Retailer Type on ROA for 2019-2023, 40 observations per group, Reject the H0

Variable	Degrees of freedom	Sum Square	Mean Square	F value	Pr (>F)
Type	1	0.1947	0.1947	11.6221	0.00104 < 0.01 **
Year	1	0.0005	0.0005	0.0314	0.8599
Residuals	77	1.2898	0.0168		

To account for possible temporal effects, a two-way analysis of variance (ANOVA) was performed with ROA as the response variable, while retailer type and year were treated as factors. The results indicated a significant main effect of retailer type ($F(1,77) = 11.62$, $p = 0.001$), indicating that the profitability gap between business models is systematic rather than incidental. By contrast, the effect of year was not statistically significant ($F(1,77) = 0.03$, $p = 0.86$), suggesting that variations in ROA cannot be primarily attributed to temporal changes across the study period. Taken together, these findings provide robust statistical support for the conclusion that business model differences, rather than yearly fluctuations, are the dominant factor influencing profitability performance in the retail sector during the period under study.

The results show that brick-and-click retailers consistently achieved higher and more stable ROA compared to online retailers. This suggests that the hybrid model provides a profitability advantage, as firms can rely on both physical and online channels to diversify revenue and mitigate risks. In contrast, online retailers displayed lower average profitability and greater volatility, reflecting the uneven performance within the sector, where a few dominant players benefited from e-commerce growth but many smaller firms struggled with competition and rising costs. These findings highlight the role of business model design in shaping financial outcomes, with brick-and-click firms appearing more resilient during the observed period.

4.1.2 ROE

Table 7 Comparing the ROE of Brick and Click model and Online Only model: the Mean and Standard Deviation for 2019-2023, 40 observations per group

ROE	Mean	Standard Deviation
Brick and click	29.86%	84.00%
Online only	122.50%	736.71%

The analysis of return on equity (ROE) provides a different picture from that observed with ROA. Descriptive statistics indicate that brick-and-click retailers maintained an overall mean ROE of 0.30 (SD = 0.84), while online-only retailers reported a higher average of 1.23 (SD = 7.37). At first glance, this suggests that online retailers may have achieved higher equity returns; however, the very large variance within the online group indicates that this outcome is far from consistent.

Table 8 Average ROE and Standard Deviation by Year for Brick-and-Click and Online-Only Retailers for 2019-2023, 40 observations per group

Type	Year	Average ROE	ROE Std
Brick and click	2019	46.11%	69.55%
	2020	49.91%	157.86%
	2021	16.86%	80.99%
	2022	20.79%	28.83%
	2023	15.61%	29.75%
Online only	2019	1.69%	76.62%
	2020	582.33%	1630.70%
	2021	-46.30%	187.13%
	2022	63.66%	107.51%
	2023	11.14%	80.14%

Figure 3 Distribution of ROE by Retailer Type for 2019-2023; (Red: Brick-and-Click, Blue: Online-Only)
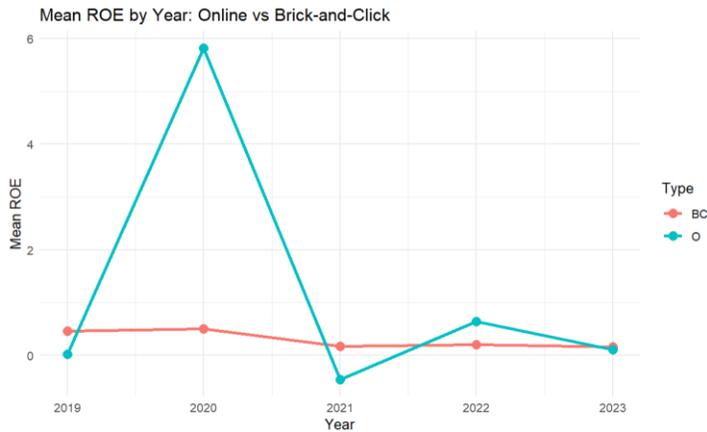
Year-by-year results reinforce this interpretation: brick-and-click retailers displayed relatively stable and positive ROE values across the entire sample period (ranging between 0.16 and 0.50), whereas online retailers exhibited extreme fluctuations, from near-zero levels in 2019, to a sharp spike in 2020 (mean = 5.82, SD = 16.3), to negative values in 2021, followed by partial recovery in 2022 and near-zero results in 2023.

Table 9 t-Test Results for Differences in ROE Between Brick-and-Click and Online-Only Retailers for 2019-2023, 40 observations per group, Fail to Reject the H0

	t-value	Degrees of freedom	p-value	95% Confidence interval for mean diff.
ROE	-0.7902	40.0140	0.4340	[-3.2959, 1.4430]

Statistical tests confirm that these apparent differences are not significant. A Welch two-sample t-test found no evidence of a systematic gap between the two groups (t = –0.79, Degrees of freedom = 40.01, p = 0.434), with the 95% confidence interval (–3.30 to 1.44) crossing zero.

Table 10 ANOVA Results Examining the Effects of Retailer Type on ROE for 2019-2023, 40 observations per group, Fail to Reject the H0

Variable	Degrees of freedom	Sum Square	Mean Square	F value	Pr (>F)
Type	1	17.1700	17.1700	0.6205	0.4333
Year	1	13.9200	13.9200	0.5031	0.4803
Residuals	77	2130.2900	27.6700		

Similarly, a two-way ANOVA indicated no significant effect of retailer type ($F_{(1,77)} = 0.62$, $p = 0.433$) and no significant effect of year ($F_{(1,77)} = 0.50$, $p = 0.480$). These results indicate that ROE differences between brick-and-click and online retailers cannot be considered statistically meaningful, and that temporal variation over the study period does not explain the volatility observed in the data.

Table 11 Selected Cases of High Liabilities and Negative Equity Among Online-Only Retailers for 2019-2023, 40 observations per group

Company	Year	Assets	Liabilities	Equity
Wayfair	2019	2,953,048	3,897,256	-944,208
Wayfair	2020	4,569,929	5,761,826	-1,191,897
Wayfair	2021	4,570,000	6,189,000	-1,619,000
Wayfair	2022	3,580,000	6,130,000	-2,550,000
Wayfair	2023	3,474,000	6,181,000	-2,707,000
Chewy	2019	932,321	1,336,295	-944,208
Chewy	2020	1,740,910	1,742,914	-1,191,897
Chewy	2021	2,086,281	2,071,545	-1,619,000
Chewy	2022	2,515,076	2,301,119	-2,550,000
Chewy	2023	3,186,851	2,676,607	-2,707,000
ETSY INC	2019	1,528,095	1,121,461	406,634
ETSY INC	2020	2,404,374	1,661,950	742,424
ETSY INC	2021	3,735,946	3,107,327	628,619
ETSY INC	2022	2,513,455	3,060,729	-547,274
ETSY INC	2023	2,547,624	3,091,339	-543,715

The extreme variation in the online group's ROE can be explained by structural factors in firm balance sheets, particularly the prevalence of negative equity values among several companies. Since ROE is calculated as net income divided by shareholders' equity, firms with equity close to or below zero generate disproportionately large positive or negative ROE values even when net income is modest. This mechanical effect inflates both the mean and variance of the ratio, reducing

its reliability as an indicator of profitability. By contrast, brick-and-click retailers, which tend to be larger and more established firms with more stable capital structures, rarely face negative equity, resulting in far more consistent ROE outcomes.

The results indicate that, unlike ROA, ROE does not indicate a statistically significant difference between brick-and-click and online retailers. Although the mean ROE of online firms appears higher, this outcome is largely driven by extreme values rather than systematic performance advantages. The volatility of online retailers' ROE reflects the prevalence of negative equity in several firms, a condition arising when liabilities exceed assets or when accumulated losses erode shareholders' capital. In such cases, the denominator of the ROE ratio becomes very small or negative, producing mechanically inflated positive or negative values that distort group averages. By contrast, brick-and-click retailers, with more stable balance sheets, reported consistently positive but moderate ROE, resulting in lower variance. Overall, these findings suggest that ROE may be a less reliable measure for comparing profitability across business models in this context, especially when firms with fragile capital structures are included in the sample.

4.1.3 Net Profit Margin

Table 12 Comparing the Net Profit Margin of Brick and Click model and Online Only model: the Mean and Standard Deviation for 2019-2023, 40 observations per group

Net Profit Margin	Mean	Standard Deviation
Brick and click	3.37%	4.99%
Online only	0.30%	9.68%

Brick-and-click retailers reported a higher average net profit margin (NPM) of 0.034 (SD = 0.050) compared with 0.003 (SD = 0.097) for online firms. This indicates that brick-and-click retailers achieved slightly stronger and more stable profitability, whereas online firms exhibited greater variability, suggesting higher sensitivity to shifts in costs and revenues.

Table 13 Average Net Profit Margin and Standard Deviation by Year for Brick-and-Click and Online-Only Retailers for 2019-2023, 40 observations per group

Type	Year	Average Net Profit Margin	Net Profit Margin Std
Brick and click	2019	3.05%	1.35%

	2020	0.54%	9.62%
	2021	5.52%	3.71%
	2022	3.91%	2.46%
	2023	3.82%	3.06%
Online only	2019	0.11%	8.79%
	2020	4.13%	7.68%
	2021	5.11%	9.20%
	2022	-6.71%	10.57%
	2023	-1.13%	9.33%

Figure 4 Distribution of Net Profit Margin by Retailer Type for 2019-2023; (Red: Brick-and-Click, Blue: Online-Only)
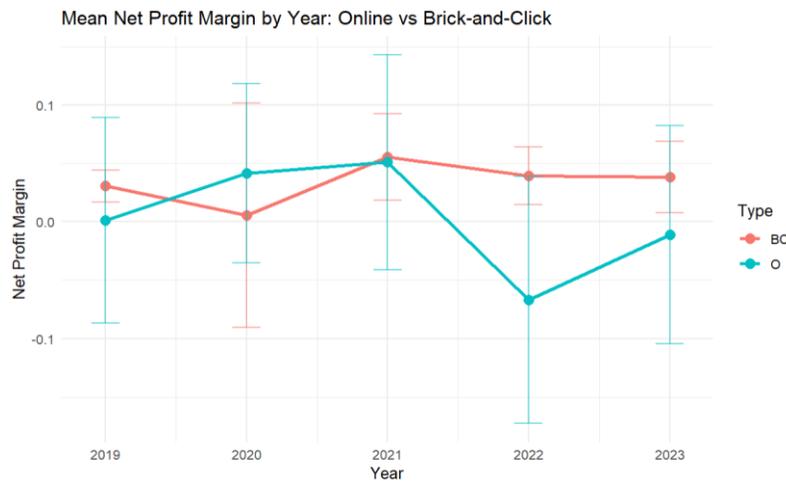
Year-by-year results provide further insight into these patterns. Brick-and-click retailers consistently maintained positive margins, ranging from 0.005 in 2020 (the lowest point during the pandemic) to 0.055 in 2021, before stabilizing around 0.038 in the post-pandemic years. By contrast, online retailers experienced more pronounced fluctuations: while margins were positive in 2020 and 2021 (0.041 and 0.051, respectively), averages turned negative in 2022 (–0.067) and 2023 (–0.011), reflecting weaker profitability and reduced resilience once the immediate pandemic-driven demand surge subsided.

Table 14 t-Test Results for Differences in Net Profit Margin Between Brick-and-Click and Online-Only Retailers for 2019-2023, 40 observations per group, Fail to Reject the H0

	t-value	Degrees of freedom	p-value	95% Confidence interval for mean diff.
Net Profit Margin	1.7812	58.3654	0.0801	[-0.0038, 0.0651]

Table 15 ANOVA Results Examining the Effects of Retailer Type on Net Profit Margin for 2019-2023, 40 observations per group, Fail to Reject the H0

Variable	Degrees of freedom	Sum Square	Mean Square	F value	Pr (>F)
Type	1	0.0188	0.0188	3.1512	0.0798
Year	1	0.0028	0.0028	0.4752	0.4927
Residuals	77	0.4594	0.0060		

From a statistical perspective, the evidence is weaker than in the case of ROA but stronger than in ROE. A Welch two-sample t-test showed that brick-and-click firms achieved higher NPM on average, although the difference was only marginally significant (t = 1.78, Degrees of freedom = 58.37, p = 0.080, 95% CI = –0.0038 to 0.0651). Consistent with this, the ANOVA detected a marginal effect of retailer type (F(1,77) = 3.15, p = 0.080), whereas no significant year effect was observed (F(1,77) = 0.48, p = 0.493). Thus, while business model type appears to play some role, the instability of online retailers' margins across years explains much of the observed variation.

4.1.4 Profitability

ROA exhibited the clearest distinction: brick-and-click retailers maintained positive and relatively stable returns, while online retailers, on average, reported negative and highly volatile values, with statistical tests confirming a significant difference between the groups. By contrast, ROE produced no significant difference despite online firms displaying a higher mean. This result is largely explained by extreme variation in the online group, driven by negative equity in several firms, which mechanically inflated the ratio and undermined its reliability as a comparative measure. Net profit margin presented an intermediate case: brick-and-click firms sustained modest but

consistently positive margins, while online retailers showed short-lived improvements during the pandemic years, followed by negative averages in 2022 and 2023. Statistical evidence suggested only marginal significance in favor of brick-and-click firms. Taken together, these indicators suggest that brick-and-click retailers demonstrated stronger and more stable profitability overall, while online firms were characterized by greater heterogeneity and financial fragility.

4.2 Liquidity

4.2.1 Current Ratio

Table 16 Comparing the Current Ratio of Brick and Click model and Online Only model: the Mean and Standard Deviation for 2019-2023, 40 observations per group

Current ratio	Mean	Standard Deviation
Brick and click	108.07%	27.94%
Online only	222.32%	152.21%

Figure 5 Distribution of Current Ratio by Retailer Type for 2019-2023; (Red: Brick-and-Click, Blue: Online-Only)
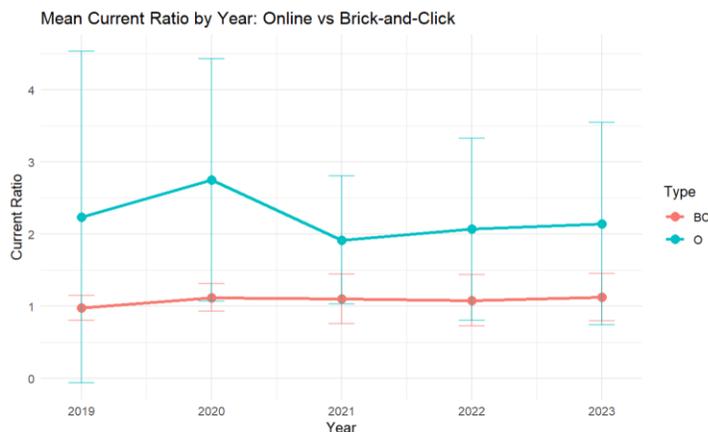
Descriptive statistics for the current ratio indicate clear differences between the two business models. Brick-and-click firms maintained stable levels around 1.08 (SD = 0.28), close to the conventional benchmark of 1.0 to 1.2 that is generally associated with balanced short-term solvency. Online retailers, in comparison, exhibited higher average values (mean = 2.22, SD = 1.52) alongside greater variability, suggesting more diverse liquidity practices within the group. Year-by-year trends reinforce this observation: brick-and-click firms consistently recorded ratios near

unity across 2019–2023, whereas online firms fluctuated between 1.9 and 2.7, with standard deviations above 1.0 in most years, pointing to heterogeneity in cash and liability management strategies.

Table 17 Average Current Ratio and Standard Deviation by Year for Brick-and-Click and Online-Only Retailers for 2019-2023, 40 observations per group

Type	Year	Average Current Ratio	Current Ratio Std
Brick and click	2019	97.71%	17.13%
	2020	112.02%	19.30%
	2021	110.07%	34.43%
	2022	108.19%	35.47%
	2023	112.35%	32.76%
Online only	2019	223.55%	230.04%
	2020	275.03%	168.09%
	2021	191.68%	88.49%
	2022	206.82%	125.93%
	2023	214.51%	140.06%

Looking more closely at key points in time, brick-and-click firms remained stable around unity throughout, whereas online firms entered 2019 already elevated at 2.24, surged to a peak of 2.75 in 2020 during the pandemic, it's likely reflecting precautionary liquidity accumulation amid e-commerce growth, then it declined to 1.92 in 2021 before stabilizing at around 2.0 to 2.15 in 2022 to 2023.

Table 18 t-Test Results for Differences in Current Ratio Between Brick-and-Click and Online-Only Retailers for 2019-2023, 40 observations per group, Reject the H0

	t-value	Degrees of freedom	p-value	95% Confidence interval for mean diff.
Current Ratio	-4.6694	41.6250	0.00003141 < 0.001	[-1.6364, -0.6486]

The Welch two-sample t-test shows that online retailers have significantly higher current ratios than brick-and-click retailers. The mean ratio for online firms was 2.22 (SD = 1.52) compared with

1.08 (SD = 0.28) for brick-and-click firms. The difference is statistically significant (t = –4.67, Degrees of freedom = 41.63, p < 0.001), with a 95% confidence interval of –1.64 to –0.65. This confirms that the liquidity position of online firms is structurally higher, though accompanied by substantially greater variance.

Table 19 ANOVA Results Examining the Effects of Retailer Type on Current Ratio for 2019-2023, 40 observations per group, Reject the H0

Variable	Degrees of freedom	Sum Square	Mean Square	F value	Pr (>F)
Type	1	26.1065	26.1065	21.5577	0.0000139 < 0.001 ***
Year	1	0.1482	0.1482	0.1223	0.7275
Residuals	77	93.2476	1.2110		

The two-way ANOVA results further support these findings, indicating a highly significant main effect of retailer type on the current ratio (F(1,77) = 21.56, p < 0.001). In contrast, the year effect was not significant (F(1,77) = 0.12, p = 0.727), indicating that the observed differences are consistent across the period 2019–2023 and are primarily attributable to business model rather than temporal variation.

These findings indicate that online retailers, on average, hold substantially more current assets relative to short-term liabilities than brick-and-click firms. Higher current ratios are generally associated with stronger short-term solvency and greater resilience, enabling firms to absorb shocks and respond more flexibly to fluctuations in demand. The considerable variance within the online group reflects the diversity of strategic approaches, with some firms opting to maintain very high liquidity buffers as a safeguard in a dynamic market environment, while others operate closer to conventional benchmarks. Brick-and-click firms, by comparison, exhibit more stable and moderate current ratios, reflecting predictable operating cycles and a consistent approach to working capital. Taken together, these results highlight two distinct liquidity strategies: online retailers prioritize adaptability and financial flexibility through larger buffers, while brick-and-click firms emphasize stability through leaner and more uniform liquidity positions.

4.2.2 Acid Test Ratio (Quick Ratio)

Table 20 Comparing the Acid Test Ratio of Brick and Click model and Online Only model: the Mean and Standard Deviation for 2019-2023, 40 observations per group

Acid Test Ratio	Mean	Standard Deviation
Brick and click	39.60%	20.28%
Online only	182.89%	136.03%

Brick-and-click retailers maintained consistently low but stable quick ratios over the period 2019–2023, with an overall mean of 0.40 (SD = 0.20). These levels, just above the minimum solvency threshold, suggest that such firms rely on steady cash inflows and the turnover of receivables to meet short-term obligations. The relatively low variance indicates a broadly uniform approach to liquidity, consistent with established operating cycles and predictable revenue streams.

Online retailers, in contrast, recorded substantially higher average quick ratios of 1.83 (SD = 1.36). Such elevated levels indicate that, as a group, online firms maintain stronger liquidity buffers relative to current liabilities, enhancing their immediate solvency and providing flexibility in adapting to rapidly changing market conditions. This may reflect structural features of the business model, such as faster cash conversion cycles and lower reliance on physical inventory, as well as a strategic preference to hold liquid reserves to support growth and mitigate uncertainty. The higher variance across firms underscores the diversity of strategies within the sector, ranging from those operating near conventional benchmarks to others choosing to preserve significant liquidity cushions as a proactive safeguard.

Table 21 Average Acid Test Ratio and Standard Deviation by Year for Brick-and-Click and Online-Only Retailers for 2019-2023, 40 observations per group

Type	Year	Average Acid Test Ratio	Acid Test Ratio Std
Brick and click	2019	27.68%	14.51%
	2020	51.58%	14.12%
	2021	43.88%	26.87%
	2022	35.99%	20.86%
	2023	38.85%	19.03%
Online only	2019	187.11%	211.34%
	2020	223.36%	147.84%

	2021	153.19%	83.80%
	2022	168.91%	107.11%
	2023	181.86%	122.31%

Figure 6 Distribution of Acid Test Ratio by Retailer Type for 2019-2023; (Red: Brick-and-Click, Blue: Online-Only)

Mean Quick Ratio (Acid Test) by Year: Online vs Brick-and-Click
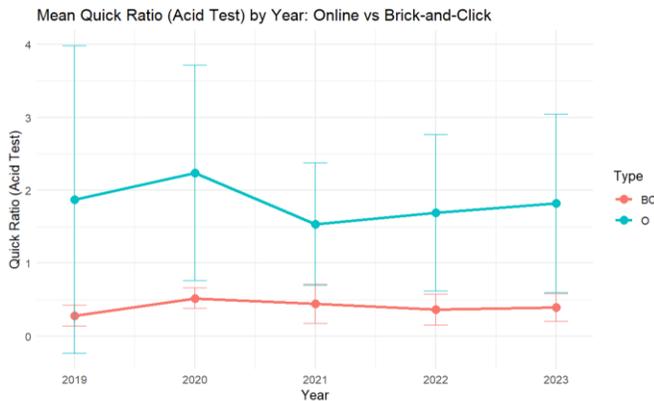
At the start of the period in 2019, brick-and-click retailers recorded quick ratios close to 0.4, reflecting a lean but adequate level of liquid assets to cover short-term liabilities. Online retailers, by contrast, already maintained a higher average of around 1.8, indicating a preference for stronger liquidity cushions even under normal operating conditions. In 2020, during the COVID-19 pandemic, the gap widened further: while brick-and-click firms remained steady at just above 0.4, online firms' quick ratios rose sharply to above 2.3. This adjustment suggests that brick-and-click retailers relied primarily on established cash flows to navigate the disruption, whereas online retailers strategically increased liquid reserves to safeguard against uncertainty while accommodating surging e-commerce demand. By 2021, online firms' ratios moderated to around 1.6, approaching pre-pandemic levels, while brick-and-click firms continued to operate in the narrow range of 0.37–0.41. In the post-pandemic years 2022 and 2023, both models stabilized, with brick-and-click retailers maintaining lean liquidity levels near 0.4 and online firms sustaining higher averages of 1.7–1.8, underscoring a consistent structural distinction: one emphasizing efficiency through steady operating cycles, and the other prioritizing flexibility through larger and more adaptive liquidity buffers.

Table 22 t-Test Results for Differences in Acid Test Ratio Between Brick-and-Click and Online-Only Retailers for 2019-2023, 40 observations per group, Reject the H0

	t-value	Degrees of freedom	p-value	95% Confidence interval for mean diff.
Acid Test Ratio	-6.5891	40.7332	0.0000000648 < 0.001	[-1.8722, -0.9936]

Statistical tests confirm that these differences are systematic. The Welch two-sample t-test showed that online retailers' quick ratios were significantly higher than those of brick-and-click firms (t = –6.59, Degrees of freedom = 40.73, p < 0.001, 95% CI = –1.87 to –0.99). This result demonstrates that the observed gap is not due to random variation but reflects a consistent structural feature of the two business models. In particular, the findings indicate that online retailers generally hold larger buffers of highly liquid assets relative to short-term liabilities, which enhances their immediate solvency and provides greater flexibility to respond to fluctuations in demand or external shocks. Brick-and-click firms, by contrast, consistently report lower ratios, reflecting a strategy that relies on predictable operating cash flows and established turnover cycles, with less emphasis on maintaining substantial liquid reserves.

Table 23 ANOVA Results Examining the Effects of Retailer Type on Acid Test Ratio for 2019-2023, 40 observations per group, Reject the H0

Variable	Degrees of freedom	Sum Square	Mean Square	F value	Pr (>F)
Type	1	41.0643	41.0643	42.9384	0.00000000577 < 0.001 ***
Year	1	0.1354	0.1354	0.1416	0.7078
Residuals	77	73.6392	0.9564		

A two-way ANOVA likewise identified a strong main effect of retailer type ($F(1,77) = 42.9384$, $p < 0.001$), while the effect of year was not significant ($F(1,77) = 0.1354$, $p = 0.708$). These findings suggest that the difference between the two groups reflects a structural characteristic of their business models rather than temporary year-to-year fluctuations. Brick-and-click firms tend to maintain relatively modest and stable liquidity positions aligned with predictable operating cycles, whereas online retailers generally hold higher and more varied liquid asset buffers, which strengthen short-term solvency and provide greater adaptability in dynamic market environments.

The analysis of the quick ratio illustrates distinct liquidity management strategies across the two retail models. Online retailers consistently reported higher average quick ratios than brick-and-click firms, indicating stronger short-term solvency and greater capacity to adapt to fluctuations in demand. This outcome is closely related to structural features of the online business model, such as faster cash conversion cycles, lower reliance on physical inventory, and a strategic preference for maintaining larger liquidity buffers to safeguard against volatility. Brick-and-click firms, in contrast, operated with lower but steady quick ratios close to the minimum solvency threshold, reflecting reliance on predictable operating cash flows and established turnover cycles to meet short-term obligations. Taking together, these findings suggest that the divergence in quick ratios is structural rather than temporal, with online retailers prioritizing flexibility through higher liquidity cushions, while brick-and-click firms emphasize stability through consistent but leaner liquidity positions.

4.2.3 Cash Ratio

Table 24 Comparing the Cash Ratio of Brick and Click model and Online Only model: the Mean and Standard Deviation for 2019-2023, 40 observations per group

Cash Ratio	Mean	Standard Deviation
Brick and click	26.96%	21.59%
Online only	144.52%	132.77%

The descriptive statistics show clear differences in cash ratios between the two business models. Brick-and-click retailers reported a relatively low average of 0.27 (SD = 0.22), reflecting limited reliance on cash holdings and a greater dependence on receivables and inventory turnover to cover short-term liabilities. Online retailers, in contrast, recorded a substantially higher mean of 1.45 (SD = 1.33). This level indicates stronger immediate solvency and greater financial flexibility, as larger cash reserves enhance their ability to withstand uncertainty and respond quickly to market opportunities. The higher variance within the online group reflects diversity in financial practices: while some firms operate closer to benchmark levels, others deliberately maintain more extensive cash buffers as a proactive liquidity strategy.

Table 25 Average Cash Ratio and Standard Deviation by Year for Brick-and-Click and Online-Only Retailers for 2019-2023, 40 observations per group

Type	Year	Average Cash Ratio	Cash Ratio Std
Brick and click	2019	15.81%	13.64%
	2020	37.66%	19.10%
	2021	31.91%	29.18%
	2022	23.39%	22.13%
	2023	26.04%	19.68%
Online only	2019	151.37%	209.78%
	2020	181.66%	143.63%
	2021	120.88%	81.08%
	2022	129.00%	107.47%
	2023	139.68%	113.49%

Figure 7 Distribution of Cash Ratio by Retailer Type for 2019-2023; (Red: Brick-and-Click, Blue: Online-Only)
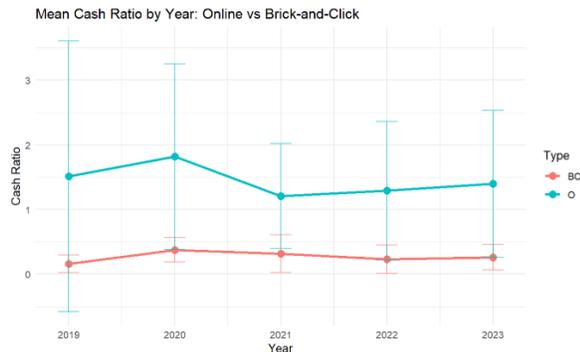
Analysis of annual trends further illustrates how liquidity patterns evolved during the study period and in response to the COVID-19 pandemic. In 2019, brick-and-click firms maintained relatively low cash ratios near 0.16, while online retailers already held much higher levels at 1.51, reflecting an inclination to preserve larger liquidity cushions from the outset. In 2020, both groups increased their cash holdings: brick-and-click firms rose to 0.38, whereas online retailers peaked at 1.82. This adjustment suggests a precautionary response to pandemic-related uncertainty, with brick-and-click firms modestly strengthening their buffers and online firms reinforcing their capacity to absorb shocks and accommodate surging e-commerce demand. In the subsequent years, cash ratios declined from their 2020 highs but stabilized above pre-pandemic levels, with brick-and-click firms averaging 0.23–0.26 and online firms 1.2–1.4 by 2022–2023. These trajectories

indicate that the temporary surge in 2020 was crisis-driven, yet the structural difference between the two business models, one emphasizing lean liquidity, the other prioritizing flexibility through larger reserves remained evident.

Table 26 t-Test Results for Differences in Cash Ratio Between Brick-and-Click and Online-Only Retailers for 2019-2023, 40 observations per group, Reject the H0

	t-value	Degrees of freedom	p-value	95% Confidence interval for mean diff.
Cash Ratio	-5.5273	41.0604	0.00000202 < 0.001	[-1.6051, -0.7461]

Table 27 ANOVA Results Examining the Effects of Retailer Type on Cash Ratio for 2019-2023, 40 observations per group, Reject the H0

Variable	Degrees of freedom	Sum Square	Mean Square	F value	Pr (>F)
Type	1	27.6398	27.6398	30.2430	0.000000478 < 0.001 ***
Year	1	0.1951	0.1951	0.2135	0.6453
Residuals	77	70.3720	0.9139		

Statistical tests confirm that these differences are significant and systematic. The Welch two-sample t-test demonstrated that online retailers' cash ratios were significantly higher than those of brick-and-click firms (t = –5.53, Degrees of freedom = 41.06, p < 0.001, 95% CI = –1.61 to –0.75). Similarly, the two-way ANOVA reported a strong main effect of retailer type (F(1,77) = 30.24, p < 0.001), while the effect of year was not significant (F(1,77) = 0.21, p = 0.645). These findings suggest that the divergence in cash ratios is structural rather than temporal, with online retailers generally maintaining larger liquidity reserves that strengthen short-term solvency and enhance flexibility in dynamic markets, whereas brick-and-click firms consistently operate with leaner but steady cash levels aligned with predictable operating cycles.

The results for the cash ratio point to structural differences in liquidity management between the two models. Online retailers consistently maintained higher ratios, often exceeding unity, which indicates that many firms in this group prioritize stronger short-term solvency and greater flexibility in adapting to market fluctuations by holding larger cash reserves. Brick-and-click retailers, in contrast, reported much lower but stable ratios around 0.27, reflecting a leaner approach

that relies on predictable revenue streams, receivables, and inventory turnover rather than on large cash holdings. Overall, the divergence suggests distinct but deliberate liquidity strategies: online firms emphasize resilience and adaptability through higher cash buffers, while brick-and-click firms focus on stability through more streamlined cash management.

4.2.4 Liquidity

Patterns in the liquidity ratios highlight distinct approaches to short-term financial management across the two retail models. Online retailers generally reported higher values in the current ratio (mean = 2.22, SD = 1.52), the quick ratio (mean = 1.83, SD = 1.36), and the cash ratio (mean = 1.45, SD = 1.33). These elevated levels indicate stronger short-term solvency and a strategic emphasis on flexibility, which may be linked to lighter inventory structures, faster cash conversion cycles, and a preference for maintaining larger liquid buffers to support adaptability in dynamic market conditions. The greater variance within the online group suggests heterogeneity in financial practices, with some firms choosing to preserve substantial reserves while others align more closely with conventional benchmarks.

Brick-and-click retailers, by contrast, consistently operated with lower but steadier levels: the current ratio averaged 1.08 (SD = 0.28), the quick ratio 0.40 (SD = 0.20), and the cash ratio 0.27 (SD = 0.22). These values point to a strategy that relies on predictable cash flows, receivables, and established supplier networks to manage short-term obligations. Although such positions reflect leaner liquidity margins, their stability over time suggests a deliberate reliance on operational predictability rather than on large cash cushions.

Statistical tests confirm that these differences are systematic. Welch two-sample t-tests showed that online retailers' current, quick, and cash ratios were all significantly higher than those of brick-and-click firms (all $p < 0.001$). Two-way ANOVAs likewise identified strong main effects of retailer type (Current: $F(1,77) = 21.56$, $p < 0.001$; Quick: $F(1,77) = 42.94$, $p < 0.001$; Cash: $F(1,77) = 30.24$, $p < 0.001$), while year effects were not significant. Taken together, the evidence indicates that online firms prioritize resilience and adaptability through higher liquidity holdings, while brick-and-click firms emphasize stability through consistent operating cycles. These contrasting patterns appear to be structural characteristics of the respective business models rather than temporary year-to-year fluctuations.

4.3 Impact of The Pandemic and Adaptability and Recovery

4.3.1 Pre-pandemic (2019).

Table 28 Pre-Pandemic (2019) Financial Ratio Comparison: Brick-and-Click vs. Online-Only Retailers, 40 observations per group

Ratios 2019	Brick and Click Mean	Online Only Mean	Brick and Click Standard Deviation	Online Only Standard Deviation
ROA	6.67%	-7.49%	2.94%	20.44%
ROE	46.11%	1.69%	69.55%	76.62%
Net Profit Margin	3.05%	0.11%	1.35%	8.79%
Current Ratio	97.71%	223.55%	17.13%	230.04%
Quick Ratio	27.68%	187.11%	14.51%	211.34%
Cash Ration	15.81%	151.37%	13.64%	209.78%

Before the pandemic, brick-and-click retailers exhibited stable and balanced financial profiles. Their profitability indicators were consistently positive, and their liquidity ratios clustered at modest levels, indicating reliance on predictable revenue cycles and efficient working-capital turnover rather than large liquid reserves. Online-only retailers, by contrast, entered the period with weak profitability but substantially stronger liquidity positions, accompanied by much larger variance across firms. This pattern suggests that brick-and-click firms were positioned for operational continuity, while online retailers had already adopted a more cautious and flexibility-oriented stance, maintaining liquidity buffers that could absorb shocks or finance rapid adjustments.

4.3.2 During the pandemic (2020–2021).

Table 29 During Pandemic (2020-2021) Financial Ratio Comparison: Brick-and-Click vs. Online-Only Retailers, 40 observations per group

Ratios 2020	Brick and Click Mean	Online Only Mean	Brick and Click Standard Deviation	Online Only Standard Deviation

	Brick and Click Mean	Online Only Mean	Brick and Click Standard Deviation	Online Only Standard Deviation
ROA	3.97%	4.57%	11.32%	8.33%
ROE	49.91%	582.33%	157.86%	1629.70%
Net Profit Margin	0.54%	4.13%	9.62%	7.68%
Current Ratio	112.02%	275.03%	19.30%	168.09%
Quick Ratio	51.58%	223.36%	14.12%	147.84%
Cash Ration	37.66%	181.66%	19.10%	143.63%
Ratios 2021	**Brick and Click Mean**	**Online Only Mean**	**Brick and Click Standard Deviation**	**Online Only Standard Deviation**
ROA	11.03%	7.43%	5.51%	13.47%
ROE	16.86%	-46.30%	80.99%	187.13%
Net Profit Margin	5.52%	5.11%	3.71%	9.20%
Current Ratio	110.07%	191.68%	34.43%	88.49%
Quick Ratio	43.88%	153.19%	26.87%	83.80%
Cash Ration	31.91%	120.88%	29.18%	81.08%

The pandemic shock exposed these structural differences and prompted divergent adaptive responses. Brick-and-click firms experienced a temporary dip in profitability in 2020 but recovered quickly by 2021, while only modestly increasing their liquidity. This trajectory reflects a controlled adaptation strategy: they buffered short-term solvency just enough to stabilize operations and restore earnings as market conditions improved. Online-only firms, in contrast, pursued a much more aggressive approach. They sharply increased their liquidity while profitability became volatile, suggesting a deliberate shift to protect solvency and maintain operational flexibility, even at the cost of short-term earnings stability. Brick-and-click firms thus demonstrated profitability-based resilience, whereas online firms relied on liquidity-driven resilience to withstand disruption.

4.3.3 Post-pandemic (2022–2023).

Table 30 Post-Pandemic (2022-2023) Financial Ratio Comparison: Brick-and-Click vs. Online-Only Retailers, 40 observations per group

Ratios 2022	Brick and Click Mean	Online Only Mean	Brick and Click Standard Deviation	Online Only Standard Deviation

ROA	8.26%	-9.91%	3.63%	16.39%
ROE	20.79%	63.66%	28.83%	107.51%
Net Profit Margin	3.91%	-6.71%	2.46%	10.57%
Current Ratio	108.19%	206.82%	35.47%	125.93%
Quick Ratio	35.99%	168.91%	20.86%	107.11%
Cash Ration	23.39%	129.00%	22.13%	107.47%
Ratios 2023	Brick and Click Mean	Online Only Mean	Brick and Click Standard Deviation	Online Only Standard Deviation
ROA	8.23%	-5.76%	5.28%	19.86%
ROE	15.61%	11.14%	29.75%	80.14%
Net Profit Margin	3.82%	-1.13%	3.06%	9.33%
Current Ratio	112.35%	214.51%	32.76%	140.06%
Quick Ratio	38.85%	181.86%	19.03%	122.31%
Cash Ration	26.04%	139.68%	19.68%	113.49%

As market conditions stabilized, the two models followed different recovery paths. Brick-and-click firms returned to a profile resembling their pre-pandemic norms, sustaining positive and stable profitability while reducing liquidity back to lean levels. Online-only firms maintained elevated liquidity, but their profitability weakened again, with many firms struggling to sustain positive returns despite ample liquid reserves. This suggests that the liquidity-focused strategy that had protected them during the crisis was less effective in supporting long-term recovery. Brick-and-click firms regained performance by restoring their pre-crisis operating model, while online-only firms emerged from the crisis with stronger solvency but without a parallel recovery in earnings, reflecting fundamentally different adaptive trajectories.

4.4 Summary

Overall, the analysis indicates systematic differences in financial performance between online-only and brick-and-click retailers. In terms of profitability, brick-and-click firms generally reported more stable returns, as reflected in higher and less volatile ROA and NPM values, whereas online retailers showed greater variability in ROE due in part to negative equity among some firms. In

contrast, liquidity indicators consistently favored online retailers, with higher averages across the current, quick, and cash ratios, demonstrating stronger short-term solvency and greater financial flexibility. Both groups increased liquidity during 2020 in response to the COVID-19 pandemic, but their structural differences persisted in subsequent years.

The hypothesis tests provide evidence regarding the statistical significance of differences between online-only and brick-and-click retailers across the selected financial ratios. For profitability indicators, the null hypothesis of equal means was rejected only in the case of ROA, where brick-and-click firms consistently achieved higher and more stable returns (t-test $p < 0.01$; ANOVA $p < 0.01$). By contrast, ROE and NPM differences were not statistically significant ($p > 0.05$), indicating that despite descriptive differences in averages, the observed gaps may be attributed to sample variation rather than systematic divergence.

Liquidity indicators, however, yielded consistently significant results. The null hypothesis was rejected for the current ratio, quick ratio, and cash ratio (all t-test and ANOVA $p < 0.001$), confirming that online retailers systematically maintain stronger short-term solvency than brick-and-click firms. These findings suggest that while profitability advantages are more closely associated with brick-and-click models, liquidity strength is a defining characteristic of online retailers.

These findings confirm that profitability and liquidity strategies diverge systematically across the two business models: brick-and-click firms emphasize stability and predictability through lean but steady working capital management, while online retailers prioritize adaptability and resilience through higher liquidity holdings. The results therefore contribute new empirical evidence on how physical store presence shapes financial outcomes, and how both models adjusted to pandemic-related challenges, offering insights relevant for managers seeking to balance efficiency with resilience in a rapidly changing retail environment.

Chapter 5

5.1 Conclusion

This study examined the financial performance of online-only and brick-and-click retailers in the U.S. market during 2019–2023, focusing on profitability and liquidity as core dimensions of financial health. By situating the analysis within the unique context of the COVID-19 pandemic, it addressed an important gap in the literature concerning how retail formats differ in their financial strategies and resilience under crisis conditions.

The empirical evidence indicates enduring divergences in performance. Brick-and-click retailers displayed stronger and more stable profitability, with higher and less volatile ROA and NPM values, reflecting reliance on established operating cycles and predictable revenue streams. Net profit margin differences were less pronounced but nonetheless indicated greater stability among brick-and-click firms. Online-only retailers, by contrast, exhibited greater variability in profitability, and although their mean ROE appeared higher, this was largely driven by extreme values associated with negative equity, limiting its reliability as an indicator of superior performance.

Liquidity comparisons, however, consistently favored online retailers. They maintained higher average values across the current, quick, and cash ratios, which strengthened short-term solvency and provided greater flexibility in adapting to volatile market conditions. Importantly, these higher liquidity holdings should not be interpreted solely as inefficiency but as a deliberate strategic choice to enhance resilience and preserve adaptability. Both groups temporarily increased liquidity in 2020 as a precautionary response to the pandemic, but their underlying financial orientations persisted thereafter, underscoring that these contrasts are structural rather than temporal.

This study contributes to the literature by providing a ratio-based comparison of profitability and liquidity for U.S. online-only and brick-and-click retailers from 2019 to 2023, documenting patterns in financial outcomes and firms' adaptation during the pandemic period. From a managerial perspective, the findings suggest that brick-and-click firms may strengthen long-term resilience by maintaining flexible liquidity policies and aligning working-capital buffers with demand volatility, while online-only retailers could improve sustainability by stabilizing profitability through cost discipline, pricing governance, and more consistent margin management.

For both groups, sustained competitiveness will depend on balancing efficiency with adaptability in an increasingly dynamic retail environment.

Limitations must be acknowledged. The analysis was confined to U.S. firms, constraining generalizability to other markets. The observation period captures only the pandemic and its immediate aftermath, leaving long-term trajectories uncertain. Moreover, the scope was restricted to profitability and liquidity indicators; future studies could expand by incorporating growth, leverage, or market valuation measures and by extending the comparison to international contexts.

References

Afonso, A. P., Carneiro, J., & Azevedo, A. I. (2024). The impact of covid-19 on e-commerce: A systematic review of the literature on the purchasing behavior of online retail consumers. *Journal of Marketing Research and Case Studies*, 1–9. https://doi.org/10.5171/2024.403212

Argilés-Bosch, J. M., Garcia-Blandón, J., & Ravenda, D. (2022). Cost behavior in e-commerce firms. *Electronic Commerce Research*, *23*(4), 2101–2134. https://doi.org/10.1007/s10660-021-09528-2

Brynjolfsson, E., & Smith, M. D. (2000). Frictionless Commerce? A comparison of internet and conventional retailers. *Management Science*, *46*(4), 563–585. https://doi.org/10.1287/mnsc.46.4.563.12061

Chava, S., Oettl, A., Singh, M., & Zeng, L. (2024). Creative destruction? impact of e-commerce on the retail sector. Management Science, 70(4), 2168–2187. https://doi.org/10.1287/mnsc.2023.4795

Che, J., Lee, J. S., & Kim, S. (2023). How has covid-19 impacted the economic resilience of retail clusters?: Examining the difference between neighborhood-level and district-level retail clusters. *Cities*, *140*, 104457. https://doi.org/10.1016/j.cities.2023.104457

Cuellar-Fernández, B., Fuertes-Callén, Y., & Serrano-Cinca, C. (2021). Survival of e-commerce entrepreneurs: The importance of brick-and-click and internationalization strategies. *Electronic Commerce Research and Applications*, *46*, 101035. https://doi.org/10.1016/j.elerap.2021.101035

Delasay, M., Jain, A., & Kumar, S. (2022). Impacts of the Covid-19 pandemic on Grocery Retail Operations: An analytical model. Production and Operations Management, 31(5), 2237–2255. https://doi.org/10.1111/poms.13717

Donthu, N., & Gustafsson, A. (2020). Effects of COVID-19 on business and research. *Journal of Business Research*, *117*, 284–289. https://doi.org/10.1016/j.jbusres.2020.06.008

Duch-Brown, N., Grzybowski, L., Romahn, A., & Verboven, F. (2017). The impact of online sales on consumers and firms. evidence from Consumer Electronics. International Journal of Industrial Organization, 52, 30–62. https://doi.org/10.1016/j.ijindorg.2017.01.009

Evans, J. R., & Mathur, A. (2013). Retailing and the period leading up to the great recession: A model and a 25-year financial ratio analysis of US retailing. *The International Review of Retail, Distribution and Consumer Research*, *24*(1), 30–58. https://doi.org/10.1080/09593969.2013.801360

Fang, L. (2024). The resilience of retail stores amid covid-19. *Journal of Planning Education and Research*. https://doi.org/10.1177/0739456x241293710

Fernandes, N. (2020). Economic effects of coronavirus outbreak (covid-19) on the World Economy. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3557504

Giordani, P., Jacobson, T., Schedvin, E. von, & Villani, M. (2014). Taking the twists into account: Predicting firm bankruptcy risk with splines of financial ratios. *Journal of Financial and Quantitative Analysis*, *49*(4), 1071–1099. https://doi.org/10.1017/s0022109014000623

Goolsbee, A., & Syverson, C. (2020). *Fear, Lockdown, and Diversion: Comparing Drivers of Pandemic Economic Decline 2020*. https://doi.org/10.3386/w27432

Hagberg, J., Sundstrom, M., & Egels-Zandén, N. (2016). The digitalization of retailing: An exploratory framework. *International Journal of Retail; Distribution Management*, *44*(7), 694–712. https://doi.org/10.1108/ijrdm-09-2015-0140

Jiao, C., & Hu, B. (2022). Showrooming, webrooming, and operational strategies for competitiveness. *Production and Operations Management*, *31*(8), 3217–3232. https://doi.org/10.1111/poms.13747

Jocevski, M. (2020). Blurring the lines between physical and digital spaces: Business Model Innovation in retailing. *California Management Review*, *63*(1), 99–117. https://doi.org/10.1177/0008125620953639

Jones, M. J., & Xiao, J. Z. (2004). Financial reporting on the internet by 2010: A consensus view. *Accounting Forum*, *28*(3), 237–263. https://doi.org/10.1016/j.accfor.2004.07.002

Nakano, S. (2022). Factors influencing consumers' online grocery shopping under the new normal. Studies in Computational Intelligence, 59–75. https://doi.org/10.1007/978-3-031-19604-1_5

Negricea, Costel & Preda, Oana. (2007). The retail market around the world. Romanian Economic Business Review. 2. 13-24.

Pantano, E., Pizzi, G., Scarpi, D., & Dennis, C. (2020). Competing during a pandemic? retailers' ups and downs during the covid-19 Outbreak. *Journal of Business Research*, *116*, 209–213. https://doi.org/10.1016/j.jbusres.2020.05.036

Rigby, D. (2011). *The Future of Shopping. Harvard business review*, 4–14.

UNCTAD. (2021, May 3). *Global e-commerce jumps to $26.7 trillion, COVID-19 boosts online sales*. UN Trade and Development (UNCTAD). https://unctad.org/news/global-e-commerce-jumps-267-trillion-covid-19-boosts-online-sales

United Nations Conference on Trade and Development. (2021). UNCTAD annual report 2021: Highlights. https://unctad.org/system/files/official-document/dom2022-flyer_en.pDegrees of freedom

Verhoef, P. C., Kannan, P. K., & Inman, J. J. (2015). From multi-channel retailing to Omni-channel retailing. *Journal of Retailing*, *91*(2), 174–181. https://doi.org/10.1016/j.jretai.2015.02.005

Wang, T. (2023). Research on the impact of e-commerce on offline retail industry. *Frontiers in Business, Economics and Management*, *10*(1), 169–173. https://doi.org/10.54097/fbem.v10i1.10237

Appendix

Annex A All ratios List from 2019 to 2023

Company	Type	Year	ROA	ROE	Net Profit Margin	Current Ratio	Acid test Ratio	Cash Ratio
Warlmart	BC	2019	6.29%	19.93%	2.84%	79.45%	22.33%	19.15%
Warlmart	BC	2020	5.35%	16.69%	2.42%	97.22%	48.70%	16.89%
Warlmart	BC	2021	5.58%	16.42%	2.39%	92.78%	28.11%	9.35%
Warlmart	BC	2022	4.80%	15.23%	1.91%	82.06%	20.69%	10.68%
Warlmart	BC	2023	6.15%	18.50%	2.39%	83.19%	23.79%	12.17%
Target	BC	2019	7.67%	19.93%	2.84%	79.45%	22.33%	12.17%
Target	BC	2020	8.52%	30.25%	4.67%	103.14%	50.20%	42.29%
Target	BC	2021	12.91%	54.15%	6.55%	99.20%	35.27%	27.18%
Target	BC	2022	5.21%	24.75%	2.55%	91.52%	22.29%	11.43%
Target	BC	2023	7.48%	30.81%	3.85%	90.64%	29.07%	19.71%
Best Buy	BC	2019	9.89%	44.29%	3.53%	109.89%	45.69%	30.68%
Best Buy	BC	2020	9.43%	39.20%	3.80%	119.19%	65.85%	53.46%
Best Buy	BC	2021	14.02%	81.26%	4.74%	98.74%	42.85%	30.03%
Best Buy	BC	2022	8.98%	50.77%	3.06%	98.03%	40.78%	25.09%
Best Buy	BC	2023	8.29%	40.65%	2.86%	99.85%	37.16%	22.67%
Lowe's	BC	2019	10.87%	216.43%	5.92%	100.90%	14.09%	5.77%
Lowe's	BC	2020	12.53%	404.38%	6.49%	119.20%	32.74%	27.74%
Lowe's	BC	2021	18.91%	-174.61%	8.74%	101.99%	12.48%	7.14%
Lowe's	BC	2022	14.76%	-45.01%	6.61%	109.90%	14.91%	8.88%
Lowe's	BC	2023	18.55%	-51.20%	8.92%	122.50%	13.98%	7.89%
Costco	BC	2019	7.86%	23.20%	2.32%	101.07%	52.03%	40.64%
Costco	BC	2020	7.26%	21.89%	2.40%	113.19%	63.91%	53.55%
Costco	BC	2021	8.51%	28.51%	2.56%	100.22%	51.93%	41.35%
Costco	BC	2022	9.17%	28.31%	2.57%	102.18%	46.22%	34.53%
Costco	BC	2023	9.18%	25.11%	2.60%	106.84%	57.26%	45.36%
Macy's	BC	2019	2.66%	8.84%	2.23%	118.43%	28.21%	11.91%
Macy's	BC	2020	-23.43%	-162.51%	-22.93%	115.44%	44.99%	31.34%
Macy's	BC	2021	8.13%	39.49%	5.65%	124.78%	43.85%	31.61%
Macy's	BC	2022	6.98%	28.83%	4.65%	120.41%	32.63%	17.73%
Macy's	BC	2023	0.65%	2.54%	0.44%	137.45%	39.01%	23.34%
Dick's Sporting Goods	BC	2019	4.50%	17.18%	3.40%	116.06%	10.00%	3.34%
Dick's Sporting Goods	BC	2020	6.89%	22.66%	5.53%	147.43%	70.82%	65.02%
Dick's Sporting Goods	BC	2021	16.87%	72.32%	12.36%	188.25%	103.55%	97.44%

Dick's Sporting Goods	BC	2022	11.65%	41.32%	8.43%	187.90%	80.72%	72.85%
Dick's Sporting Goods	BC	2023	11.28%	39.98%	8.06%	177.67%	74.16%	65.44%
Kroger	BC	2019	3.62%	19.07%	1.34%	76.46%	26.72%	2.80%
Kroger	BC	2020	5.25%	26.69%	1.93%	81.37%	35.40%	10.98%
Kroger	BC	2021	3.34%	17.34%	1.19%	74.58%	33.03%	11.16%
Kroger	BC	2022	4.48%	22.15%	1.50%	73.50%	29.64%	5.89%
Kroger	BC	2023	4.25%	18.48%	1.43%	80.63%	36.39%	11.73%
Amazon	O	2019	5.14%	18.67%	4.13%	109.70%	86.36%	62.97%
Amazon	O	2020	6.64%	22.84%	5.53%	105.02%	86.20%	66.96%
Amazon	O	2021	7.93%	24.13%	7.10%	113.58%	90.63%	67.68%
Amazon	O	2022	-0.60%	-1.86%	-0.53%	94.46%	72.32%	45.29%
Amazon	O	2023	5.91%	15.07%	5.29%	104.51%	84.30%	52.92%
Wayfair	O	2019	-33.42%	104.52%	-10.81%	85.46%	81.63%	61.25%
Wayfair	O	2020	4.05%	-15.52%	1.31%	140.65%	138.24%	119.65%
Wayfair	O	2021	-2.87%	8.09%	-0.96%	135.86%	132.75%	108.21%
Wayfair	O	2022	-37.18%	52.20%	-10.89%	93.29%	88.95%	61.68%
Wayfair	O	2023	-21.24%	27.26%	-6.15%	84.97%	81.54%	62.07%
Chewy	O	2019	-27.07%	62.47%	-5.21%	57.23%	28.35%	19.27%
Chewy	O	2020	-5.31%	4615.07%	-1.29%	88.84%	51.67%	40.80%
Chewy	O	2021	-3.54%	-500.93%	-0.83%	80.46%	46.39%	36.66%
Chewy	O	2022	1.96%	23.01%	0.49%	85.93%	47.75%	38.28%
Chewy	O	2023	1.24%	7.76%	0.36%	99.69%	65.62%	53.72%
Freshpet	O	2019	-0.59%	-1.05%	-0.56%	129.39%	99.51%	22.56%
Freshpet	O	2020	-0.73%	-0.81%	-1.00%	329.39%	271.66%	203.03%
Freshpet	O	2021	-3.79%	-4.13%	-6.98%	255.02%	194.67%	123.48%
Freshpet	O	2022	-5.29%	-5.77%	-9.99%	292.33%	227.28%	148.12%
Freshpet	O	2023	-2.30%	-3.53%	-4.38%	478.94%	408.06%	332.73%
Etsy	O	2019	6.00%	22.55%	11.20%	488.54%	488.54%	433.49%
Etsy	O	2020	14.69%	47.57%	20.47%	416.74%	416.74%	367.13%
Etsy	O	2021	13.07%	77.69%	20.97%	217.92%	217.92%	159.95%
Etsy	O	2022	-27.48%	126.21%	-26.92%	239.61%	239.61%	185.47%
Etsy	O	2023	12.19%	-57.13%	11.30%	220.95%	220.95%	161.86%
Carvana	O	2019	-5.57%	-116.87%	-2.91%	157.18%	69.00%	13.70%
Carvana	O	2020	-5.64%	-44.15%	-3.06%	411.69%	189.86%	70.45%
Carvana	O	2021	-1.92%	-44.12%	-1.05%	169.27%	60.31%	22.01%
Carvana	O	2022	-18.25%	306.37%	-11.67%	177.24%	104.86%	24.23%
Carvana	O	2023	6.36%	185.19%	4.18%	216.21%	141.34%	38.67%
Beyond	O	2019	-28.88%	-104.83%	-8.27%	82.11%	79.41%	57.97%
Beyond	O	2020	6.20%	13.78%	2.02%	177.89%	175.99%	159.03%
Beyond	O	2021	34.25%	47.20%	12.75%	202.62%	200.73%	184.83%
Beyond	O	2022	-4.41%	-5.72%	-1.91%	216.86%	213.44%	194.34%

Beyond	O	2023	-48.43%	-85.72%	-19.72%	150.64%	145.03%	130.27%
Petmed	O	2019	24.44%	28.02%	13.32%	678.79%	564.06%	539.72%
Petmed	O	2020	16.64%	19.88%	9.10%	530.00%	456.53%	426.25%
Petmed	O	2021	16.32%	21.66%	9.90%	358.71%	282.11%	264.20%
Petmed	O	2022	11.97%	14.84%	7.72%	454.85%	357.08%	334.61%
Petmed	O	2023	0.14%	0.19%	0.09%	360.17%	308.05%	285.19%

Annex B Original Data of Online Only Model from 2019 to 2023

Unit k	AMAZON.COM INC							
	NET SALES OR REVENUES	NET INCOME - BASIC	CURRENT LIABILITIES-TOTAL	TOTAL LIABILITIES	TOTAL SHAREHOLDERS EQUITY	TOTAL ASSETS	CURRENT ASSETS	CASH & EQUIVALENTS
Code	@AMZN(WC01001)~U$	@AMZN(WC01706)~U$	@AMZN(WC03101)~U$	@AMZN(WC03351)~U$	@AMZN(WC03995)~U$	AMZN(WC02999)	@AMZN(WC02201)~	@AMZN(WC02001)~U$
2019	280,522,000.00	11,588,000.00	87,812,000.00	163,188,000.00	62,060,000.00	225,248,000.00	96,334,000.00	55,297,000.00
2020	386,064,000.00	21,331,000.00	126,385,000.00	227,791,000.00	93,404,000.00	321,195,000.00	132,733,000.00	84,629,000.00
2021	469,822,000.00	33,364,000.00	142,266,000.00	282,304,000.00	138,245,000.00	420,549,000.00	161,580,000.00	96,291,000.00
2022	513,983,000.00	-2,722,000.00	155,393,000.00	309,119,000.00	146,043,000.00	455,162,000.00	146,791,000.00	70,384,000.00
2023	574,785,000.00	30,425,000.00	164,917,000.00	312,782,000.00	201,875,000.00	514,657,000.00	172,351,000.00	87,277,000.00
	WAYFAIR INC							
	NET SALES OR REVENUES	NET INCOME - BASIC	CURRENT LIABILITIES-TOTAL	TOTAL LIABILITIES	TOTAL SHAREHOLDERS EQUITY	TOTAL ASSETS	CURRENT ASSETS	CASH & EQUIVALENTS
	U:W(WC01001)~U$	U:W(WC01706)~U$	U:W(WC03101)~U$	U:W(WC03351)~U$	U:W(WC03995)~U$	U:W(WC02999)	U:W(WC02201)~	U:W(WC02001)~U$
2019	9,127,057.00	-986,877.00	1,611,519.00	3,897,256.00	944,208.00 -	2,953,048.00	1,377,138.00	987,005.00
2020	14,145,156.00	184,996.00	2,165,594.00	5,761,826.00	1,191,897.00 -	4,569,929.00	3,045,802.00	2,591,138.00
2021	13,708,000.00	-131,000.00	2,217,000.00	6,189,000.00	1,619,000.00 -	4,570,000.00	3,012,000.00	2,399,000.00
2022	12,218,000.00	-1,331,000.00	2,072,000.00	6,130,000.00	2,550,000.00 -	3,580,000.00	1,933,000.00	1,278,000.00
2023	12,003,000.00	-738,000.00	2,183,000.00	6,181,000.00	2,707,000.00 -	3,474,000.00	1,855,000.00	1,355,000.00
	CHEWY							
	NET SALES OR REVENUES	NET INCOME - BASIC	CURRENT LIABILITIES-TOTAL	TOTAL LIABILITIES	TOTAL SHAREHOLDERS EQUITY	TOTAL ASSETS	CURRENT ASSETS	CASH & EQUIVALENTS
	U:CHWY(WC01001)~U$	U:CHWY(WC01706)~U$	U:CHWY(WC03101)~U$	U:CHWY(WC03351)~U$	U:CHWY(WC03995)~U$	U:CHWY(WC02999)	U:CHWY(WC02201)~	U:CHWY(WC02001)~U$
2019	4,846,743.00	-252,370.00	1,100,538.00	1,336,295.00	403,974.00 -	932,321.00	629,789.00	212,088.00
2020	7,146,264.00	-92,486.00	1,380,862.00	1,742,914.00	2,004.00 -	1,740,910.00	1,226,778.00	563,345.00
2021	8,890,773.00	-73,817.00	1,644,879.00	2,071,545.00	14,736.00	2,086,281.00	1,323,532.00	603,079.00
2022	10,098,939.00	49,232.00	1,769,349.00	2,301,119.00	213,957.00	2,515,076.00	1,520,321.00	677,385.00
2023	11,147,720.00	39,580.00	2,110,877.00	2,676,607.00	510,244.00	3,186,851.00	2,104,348.00	1,134,017.00
	FRESHPET INC							
	NET SALES OR REVENUES	NET INCOME - BASIC	CURRENT LIABILITIES-TOTAL	TOTAL LIABILITIES	TOTAL SHAREHOLDERS EQUITY	TOTAL ASSETS	CURRENT ASSETS	CASH & EQUIVALENTS
	@FRPT(WC01001)~U$	@FRPT(WC01706)~U$	@FRPT(WC03101)~U$	@FRPT(WC03351)~U$	@FRPT(WC03995)~U$	FRPT(WC02999)	@FRPT(WC02201)~	@FRPT(WC02001)~U$
2019	245,862.00	-1,383.00	41,986.00	104,861.00	131,265.00	236,126.00	54,324.00	9,472.00
2020	318,790.00	-3,188.00	33,121.00	40,219.00	394,169.00	434,388.00	109,096.00	67,247.00
2021	425,489.00	-29,699.00	58,946.00	64,656.00	719,754.00	784,410.00	150,325.00	72,788.00
2022	595,344.00	-59,494.00	89,614.00	93,814.00	1,031,569.00	1,125,383.00	261,965.00	132,735.00
2023	766,895.00	-33,614.00	89,222.00	510,967.00	953,454.00	1,464,421.00	427,319.00	296,871.00
	ETSY INC							

	NET SALES OR REVENUES	NET INCOME - BASIC	CURRENT LIABILITIES-TOTAL	TOTAL LIABILITIES	TOTAL SHAREHOLDERS EQUITY	TOTAL ASSETS	CURRENT ASSETS	CASH & EQUIVALENTS
	@ETSY(WC01001)~U$	@ETSY(WC01706)~U$	@ETSY(WC03101)~U$	@ETSY(WC03351)~U$	@ETSY(WC03995)~U$	ETSY(WC02999)	@ETSY(WC02201)~	@ETSY(WC02001)~U$
2019	818,379.00	91,697.00	188,528.00	1,121,461.00	406,634.00	1,528,095.00	921,038.00	817,252.00
2020	1,725,625.00	353,169.00	454,664.00	1,661,950.00	742,424.00	2,404,374.00	1,894,781.00	1,669,218.00
2021	2,329,114.00	488,352.00	615,588.00	3,107,327.00	628,619.00	3,735,946.00	1,341,501.00	984,612.00
2022	2,566,111.00	-690,700.00	631,755.00	3,060,729.00	547,274.00	2,513,455.00	1,513,743.00	1,171,691.00
2023	2,748,377.00	310,638.00	710,781.00	3,091,339.00	543,715.00	2,547,624.00	1,570,446.00	1,150,441.00

	NET SALES OR REVENUES	NET INCOME - BASIC	CURRENT LIABILITIES-TOTAL	TOTAL LIABILITIES	TOTAL SHAREHOLDERS EQUITY	TOTAL ASSETS	CURRENT ASSETS	CASH & EQUIVALENTS
	U:CVNA(WC01001)~U$	U:CVNA(WC01706)~U$	U:CVNA(WC03101)~U$	U:CVNA(WC03351)~U$	U:CVNA(WC03995)~U$	U:CVNA(WC02999)	U:CVNA(WC02201)~	U:CVNA(WC02001)~U$
2019	3,939,896.00	-114,659.00	864,870.00	1,865,809.00	98,112.00	2,057,748.00	1,359,422.00	118,459.00
2020	5,586,565.00	-171,140.00	467,137.00	2,233,028.00	387,600.00	3,034,531.00	1,923,147.00	329,111.00
2021	12,814,000.00	-135,000.00	2,890,000.00	6,490,000.00	306,000.00	7,015,000.00	4,892,000.00	636,000.00
2022	13,604,000.00	-1,587,000.00	2,592,000.00	9,751,000.00	518,000.00	8,698,000.00	4,594,000.00	628,000.00
2023	10,771,000.00	450,000.00	1,536,000.00	7,455,000.00	243,000.00	7,071,000.00	3,321,000.00	594,000.00

	NET SALES OR REVENUES	NET INCOME - BASIC	CURRENT LIABILITIES-TOTAL	TOTAL LIABILITIES	TOTAL SHAREHOLDERS EQUITY	TOTAL ASSETS	CURRENT ASSETS	CASH & EQUIVALENTS
	BS:OVER(WC01001)~U$	BS:OVER(WC01706)~U$	BS:OVER(WC03101)~U$	BS:OVER(WC03351)~U$	BS:OVER(WC03995)~U$	BS:OVER(WC02999)	BS:OVER(WC02201)~	BS:OVER(WC02001)~U$
2019	1,459,418.00	-120,645.00	215,999.00	239,872.00	115,084.00	417,727.00	177,363.00	125,206.00
2020	2,549,783.00	51,507.00	327,581.00	393,888.00	373,692.00	830,214.00	582,740.00	520,943.00
2021	2,756,446.00	351,364.00	272,333.00	281,545.00	744,386.00	1,025,931.00	551,790.00	503,366.00
2022	1,929,334.00	-36,933.00	191,142.00	191,281.00	645,826.00	837,107.00	414,509.00	371,457.00
2023	1,561,122.00	-307,842.00	232,395.00	276,534.00	359,132.00	635,666.00	350,073.00	302,749.00

	NET SALES OR REVENUES	NET INCOME - BASIC	CURRENT LIABILITIES-TOTAL	TOTAL LIABILITIES	TOTAL SHAREHOLDERS EQUITY	TOTAL ASSETS	CURRENT ASSETS	CASH & EQUIVALENTS
	@SFIX(WC01001)~U$	@SFIX(WC01706)~U$	@SFIX(WC03101)~U$	@SFIX(WC03351)~U$	@SFIX(WC03995)~U$	SFIX(WC02999)	@SFIX(WC02201)~	@SFIX(WC02001)~U$
2019	1,577,558.00	36,863.00	182,631.00	197,891.00	396,000.00	593,891.00	482,404.00	314,208.00
2020	1,711,733.00	-70,187.00	212,155.00	368,059.00	401,037.00	769,096.00	466,310.00	286,492.00
2021	2,101,258.00	-22,447.00	228,313.00	358,300.00	460,849.00	819,149.00	521,804.00	231,331.00
2022	2,072,812.00	-207,121.00	295,570.00	441,884.00	322,651.00	764,535.00	477,252.00	212,984.00
2023	NA	NA	NA	367,168.00	NA	NA	425,461.00	NA

	NET SALES OR REVENUES	NET INCOME - BASIC	CURRENT LIABILITIES-TOTAL	TOTAL LIABILITIES	TOTAL SHAREHOLDERS EQUITY	TOTAL ASSETS	CURRENT ASSETS	CASH & EQUIVALENTS
	@PETS(WC01001)~U$	@PETS(WC01706)~U$	@PETS(WC03101)~U$	@PETS(WC03351)~U$	@PETS(WC03995)~U$	PETS(WC02999)	@PETS(WC02201)~	@PETS(WC02001)~U$
2019	283,419.00	37,740.00	18,626.00	19,747.00	134,680.00	154,427.00	126,431.00	100,529.00
2020	284,125.00	25,851.00	24,343.00	25,313.00	130,010.00	155,323.00	129,018.00	103,762.00
2021	309,215.00	30,603.00	44,935.00	46,216.00	141,281.00	187,497.00	161,187.00	118,718.00
2022	273,417.00	21,100.00	33,197.00	34,133.00	142,186.00	176,319.00	150,995.00	111,080.00
2023	256,858.00	233.00	36,497.00	39,694.00	123,795.00	163,489.00	131,451.00	104,086.00

Annex C Original Data of Brick and Click Model from 2019 to 2023

Unit: K	Walmart Inc							
#NAME?	NET SALES OR REVENUES	NET INCOME - BASIC	CURRENT LIABILITIES-TOTAL	TOTAL LIABILITIES	TOTAL SHAREHOLDERS EQUITY	TOTAL ASSETS	CURRENT ASSETS	CASH & EQUIVALENTS
Code	U:WMT(WC01001)	U:WMT(WC01706)	U:WMT(WC03101)	U:WMT(WC03351)	U:WMT(WC03995)	U:WMT(WC02999)	U:WMT(WC02201)	U:WMT(WC02001)
2019	523,964,000.00	14,881,000.00	77,790,000.00	154,943,000.00	74,669,000.00	236,495,000.00	61,806,000.00	9,465,000.00
2020	559,151,000.00	13,510,000.00	92,645,000.00	164,965,000.00	80,925,000.00	252,496,000.00	90,067,000.00	17,741,000.00
2021	572,754,000.00	13,673,000.00	87,379,000.00	152,969,000.00	83,253,000.00	244,860,000.00	81,070,000.00	14,760,000.00
2022	611,289,000.00	11,680,000.00	92,198,000.00	159,206,000.00	76,693,000.00	243,197,000.00	75,655,000.00	8,625,000.00
2023	648,125,000.00	15,511,000.00	92,415,000.00	161,828,000.00	83,861,000.00	252,399,000.00	76,877,000.00	9,867,000.00
	TARGET CORP							
	NET SALES OR REVENUES	NET INCOME - BASIC	CURRENT LIABILITIES-TOTAL	TOTAL DEBT	TOTAL SHAREHOLDERS EQUITY	TOTAL ASSETS	CURRENT ASSETS	CASH & EQUIVALENTS
	U:TGT(WC01001)	U:TGT(WC01706)	U:TGT(WC03101)	U:TGT(WC03255)	U:TGT(WC03995)	U:TGT(WC02999)	U:TGT(WC02201)	U:TGT(WC02001)
2019	78,112,000.00	3,281,000.00	14,487,000.00	11,499,000.00	11,833,000.00	42,779,000.00	12,902,000.00	2,600,000.00
2020	93,561,000.00	4,368,000.00	20,125,000.00	12,680,000.00	14,440,000.00	51,248,000.00	20,756,000.00	8,511,000.00
2021	106,005,000.00	6,946,000.00	21,747,000.00	13,720,000.00	12,827,000.00	53,811,000.00	21,573,000.00	5,911,000.00
2022	109,120,000.00	2,780,000.00	19,500,000.00	16,139,000.00	11,232,000.00	53,335,000.00	17,846,000.00	2,229,000.00
2023	107,412,000.00	4,138,000.00	19,304,000.00	16,038,000.00	13,432,000.00	55,356,000.00	17,498,000.00	3,805,000.00
	BEST BUY CO INC							
	NET SALES OR REVENUES	NET INCOME - BASIC	CURRENT LIABILITIES-TOTAL	TOTAL DEBT	TOTAL SHAREHOLDERS EQUITY	TOTAL ASSETS	CURRENT ASSETS	CASH & EQUIVALENTS
	U:BBY(WC01001)	U:BBY(WC01706)	U:BBY(WC03101)	U:BBY(WC03255)	U:BBY(WC03995)	U:BBY(WC02999)	U:BBY(WC02201)	U:BBY(WC02001)
2019	43,638,000.00	1,541,000.00	8,060,000.00	1,931,000.00	3,479,000.00	15,582,000.00	8,857,000.00	2,473,000.00
2020	47,262,000.00	1,798,000.00	10,521,000.00	2,070,000.00	4,587,000.00	19,067,000.00	12,540,000.00	5,625,000.00
2021	51,761,000.00	2,454,000.00	10,674,000.00	1,877,000.00	3,020,000.00	17,504,000.00	10,539,000.00	3,205,000.00
2022	46,298,000.00	1,419,000.00	8,979,000.00	1,814,000.00	2,795,000.00	15,799,000.00	8,802,000.00	2,253,000.00
2023	43,452,000.00	1,241,000.00	7,909,000.00	1,165,000.00	3,053,000.00	14,967,000.00	7,897,000.00	1,793,000.00
	HOME DEPOT, INC							
	NET SALES OR REVENUES	NET INCOME - BASIC	CURRENT LIABILITIES-TOTAL	TOTAL DEBT	TOTAL SHAREHOLDERS EQUITY	TOTAL ASSETS	CURRENT ASSETS	CASH & EQUIVALENTS
	U:HD(WC01001)	U:HD(WC01706)	U:HD(WC03101)	U:HD(WC03255)	U:HD(WC03995)	U:HD(WC02999)	U:HD(WC02201)	U:HD(WC02001)
2019	110,225,000.00	11,242,000.00	18,375,000.00	31,483,000.00	-3,116,000.00	51,236,000.00	19,810,000.00	2,133,000.00
2020	132,110,000.00	12,866,000.00	23,166,000.00	37,238,000.00	3,299,000.00	70,581,000.00	28,477,000.00	7,895,000.00
2021	151,157,000.00	16,433,000.00	28,693,000.00	40,086,000.00	-1,696,000.00	71,876,000.00	29,055,000.00	2,343,000.00
2022	157,403,000.00	17,105,000.00	23,110,000.00	43,193,000.00	1,562,000.00	76,445,000.00	32,471,000.00	2,757,000.00
2023	152,669,000.00	15,143,000.00	22,015,000.00	44,111,000.00	1,044,000.00	76,530,000.00	29,775,000.00	3,760,000.00
	LOWE'S COMPANI							
	NET SALES OR REVENUES	NET INCOME - BASIC	CURRENT LIABILITIES-TOTAL	TOTAL DEBT	TOTAL SHAREHOLDERS EQUITY	TOTAL ASSETS	CURRENT ASSETS	CASH & EQUIVALENTS
	U:LOW(WC01001)	U:LOW(WC01706)	U:LOW(WC03101)	U:LOW(WC03255)	U:LOW(WC03995)	U:LOW(WC02999)	U:LOW(WC02201)	U:LOW(WC02001)
2019	72,148,000.00	4,268,000.00	15,182,000.00	19,306,000.00	1,972,000.00	39,255,000.00	15,318,000.00	876,000.00
2020	89,597,000.00	5,811,000.00	18,730,000.00	21,780,000.00	1,437,000.00	46,395,000.00	22,326,000.00	5,196,000.00
2021	96,250,000.00	8,409,000.00	19,668,000.00	24,727,000.00	-4,816,000.00	44,476,000.00	20,060,000.00	1,404,000.00
2022	97,059,000.00	6,416,000.00	19,511,000.00	33,960,000.00	-14,254,000.00	43,458,000.00	21,442,000.00	1,732,000.00
2023	86,377,000.00	7,706,000.00	15,568,000.00	35,921,000.00	-15,050,000.00	41,547,000.00	19,071,000.00	1,228,000.00

	COSTCO WHOLESALE							
	NET SALES OR REVENUES	NET INCOME - BASIC	CURRENT LIABILITIES-TOTAL	TOTAL DEBT	TOTAL SHAREHOLDERS EQUITY	TOTAL ASSETS	CURRENT ASSETS	CASH & EQUIVALENTS
	@COST(WC01001)	@COST(WC01706)	@COST(WC03101)	@COST(WC03255)	@COST(WC03995)	@COST(WC02999)	COST(WC02201)	@COST(WC02001)
2019	152,703,000.00	3,536,000.00	23,237,000.00	7,244,000.00	15,243,000.00	45,002,000.00	23,485,000.00	9,444,000.00
2020	166,761,000.00	4,002,000.00	24,844,000.00	8,297,000.00	18,284,000.00	55,150,000.00	28,120,000.00	13,305,000.00
2021	195,929,000.00	5,007,000.00	29,441,000.00	8,584,000.00	17,564,000.00	58,824,000.00	29,505,000.00	12,175,000.00
2022	226,954,000.00	5,844,000.00	31,998,000.00	8,273,000.00	20,642,000.00	63,721,000.00	32,696,000.00	11,049,000.00
2023	242,290,000.00	6,292,000.00	33,583,000.00	7,890,000.00	25,058,000.00	68,503,000.00	35,879,000.00	15,234,000.00
	MACY'S INC							
	NET SALES OR REVENUES	NET INCOME - BASIC	CURRENT LIABILITIES-TOTAL	TOTAL DEBT	TOTAL SHAREHOLDERS EQUITY	TOTAL ASSETS	CURRENT ASSETS	CASH & EQUIVALENTS
	U:M(WC01001)	U:M(WC01706)	U:M(WC03101)	U:M(WC03255)	U:M(WC03995)	U:M(WC02999)	U:M(WC02201)	U:M(WC02001)
2019	25,331,000.00	564,000.00	5,750,000.00	4,183,000.00	6,377,000.00	21,172,000.00	6,810,000.00	685,000.00
2020	18,097,000.00	-4,149,000.00	5,357,000.00	4,880,000.00	2,553,000.00	17,706,000.00	6,184,000.00	1,679,000.00
2021	25,292,000.00	1,430,000.00	5,416,000.00	3,314,000.00	3,621,000.00	17,590,000.00	6,758,000.00	1,712,000.00
2022	25,305,000.00	1,177,000.00	4,861,000.00	3,013,000.00	4,082,000.00	16,866,000.00	5,853,000.00	862,000.00
2023	23,866,000.00	105,000.00	4,430,000.00	3,012,000.00	4,137,000.00	16,246,000.00	6,089,000.00	1,034,000.00
	DICK'S SPORTING GOOD							
	NET SALES OR REVENUES	NET INCOME - BASIC	CURRENT LIABILITIES-TOTAL	TOTAL DEBT	TOTAL SHAREHOLDERS EQUITY	TOTAL ASSETS	CURRENT ASSETS	CASH & EQUIVALENTS
	U:DKS(WC01001)	U:DKS(WC01706)	U:DKS(WC03101)	U:DKS(WC03255)	U:DKS(WC03995)	U:DKS(WC02999)	U:DKS(WC02201)	U:DKS(WC02001)
2019	8,750,743.00	297,462.00	2,076,474.00	227,852.00	1,731,598.00	6,614,148.00	2,410,016.00	69,334.00
2020	9,584,019.00	530,251.00	2,550,198.00	421,093.00	2,339,534.00	7,701,384.00	3,759,650.00	1,658,067.00
2021	12,293,368.00	1,519,871.00	2,712,680.00	1,930,730.00	2,101,586.00	9,006,652.00	5,106,656.00	2,643,205.00
2022	12,368,198.00	1,043,138.00	2,641,446.00	1,540,607.00	2,524,623.00	8,951,007.00	4,963,186.00	1,924,386.00
2023	12,984,399.00	1,046,519.00	2,752,394.00	1,483,260.00	2,617,281.00	9,273,906.00	4,890,049.00	1,801,220.00
	GAP INC							
	NET SALES OR REVENUES	NET INCOME - BASIC	CURRENT LIABILITIES-TOTAL	TOTAL DEBT	TOTAL SHAREHOLDERS EQUITY	TOTAL ASSETS	CURRENT ASSETS	CASH & EQUIVALENTS
	U:GAP(WC01001)	U:GAP(WC01706)	U:GAP(WC03101)	U:GAP(WC03255)	U:GAP(WC03995)	U:GAP(WC02999)	U:GAP(WC02201)	U:GAP(WC02001)
2019	16,383,000.00	381,000.00	3,209,000.00	1,249,000.00	3,316,000.00	13,679,000.00	4,516,000.00	1,664,000.00
2020	13,800,000.00	-787,000.00	3,884,000.00	2,216,000.00	2,614,000.00	13,769,000.00	6,008,000.00	2,407,000.00
2021	16,670,000.00	238,000.00	4,077,000.00	1,484,000.00	2,722,000.00	12,761,000.00	5,165,000.00	893,000.00
2022	15,616,000.00	-202,000.00	3,256,000.00	1,836,000.00	2,233,000.00	11,386,000.00	4,617,000.00	1,226,000.00
2023	14,889,000.00	502,000.00	3,096,000.00	1,488,000.00	2,595,000.00	11,044,000.00	4,395,000.00	1,880,000.00