International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2019): 7.583

Study of Dynamic Pricing Model for Two - Sided Marketplace

Pushkar Mehendale[1], Pranitha Buddiga[2]

[1]San Francisco, CA, USA
Email: *pushkar.mehendale[at]yahoo.com*

[2]Boston, MA, USA
Email: *pranitha. bsk3[at]gmail.com*

Abstract: ***Dynamic pricing has revolutionized the way prices are set in online marketplaces, providing sellers with the ability to adapt to changing demand and market conditions. This paper delves into the theoretical underpinnings and practical applications of dynamic pricing models in two - sided marketplaces. It explores various dynamic pricing strategies, including those based on demand forecasting, competition tracking, and machine learning. The paper analyses the impact of these strategies on market efficiency, considering factors such as consumer surplus, producer surplus, and overall market welfare. Furthermore, it examines the role of machine learning in optimizing pricing decisions, discussing how algorithms can leverage data to predict demand, identify optimal prices, and automate pricing adjustments. By synthesizing past research and utilizing data - driven approaches, this paper provides valuable insights into the mechanisms that drive dynamic pricing and the benefits it offers in competitive online environments.***

Keywords: Dynamic Pricing, Two - Sided Marketplace, Revenue Management, E - commerce, Sports Ticketing, Machine Learning, Market Efficiency

1. Introduction

Dynamic pricing, a strategy where prices are adjusted in real - time based on market demand and other factors, has become a prevalent strategy in various industries, including airlines, hospitality, and sports. These industries have leveraged dynamic pricing to maximize revenue and manage perishable inventory, adjusting prices based on demand forecasts, competition, and external influences. However, its application in two - sided marketplaces, where there are distinct groups of users, such as buyers and sellers, remains a relatively new area of research [9]. This paper explores dynamic pricing models within this context, leveraging existing literature and recent advancements in machine learning to analyse and optimize pricing strategies.

1.1 Background

Two - sided marketplaces are platforms that connect two distinct user groups that provide each other with network benefits. Examples include e - commerce sites like Amazon, ride - sharing platforms like Uber, and accommodation platforms like Airbnb. These platforms face unique pricing challenges because they must balance the interests and behaviours of both sides of the market – sellers and buyers. Sellers aim to maximize their revenue while maintaining competitive prices, whereas buyers seek the best value for their money. This dual - sided dynamic introduces complexities that single - sided markets do not face, necessitating sophisticated pricing models that can adapt to the changing conditions on both sides. Dynamic pricing in two - sided marketplaces must account for factors such as user demand elasticity, competitive actions, and the interplay between supply and demand from both user groups. Traditional pricing models often fall short in addressing these intricacies, making room for advanced techniques that leverage machine learning and data analytics. Machine learning models, for instance, can analyse large volumes of transactional data to predict demand patterns, optimize pricing decisions in real - time, and dynamically adjust prices to balance market supply and demand effectively.

1.2 Research Objectives

The primary objectives of this research are to:

1) ***Examine the theoretical foundations of dynamic pricing models in two - sided marketplaces:*** This involves reviewing existing literature and identifying the core principles that underpin dynamic pricing strategies tailored to the dual - sided nature of these platforms.
2) ***Analyse the impact of dynamic pricing on market efficiency and revenue optimization:*** By evaluating how dynamic pricing influences market behaviour, this research aims to determine its effectiveness in enhancing both operational efficiency and financial performance.
3) ***Explore the application of machine learning techniques in enhancing dynamic pricing strategies:*** Machine learning offers promising tools for improving dynamic pricing by leveraging data - driven insights to make more accurate and timely pricing adjustments.
4) ***Provide practical insights and recommendations for implementing dynamic pricing in competitive online environments:*** This objective focuses on translating theoretical insights into actionable strategies that businesses can adopt to optimize their pricing models, improve market responsiveness, and achieve better alignment with market conditions.

By addressing these objectives, this paper seeks to contribute to the growing body of knowledge on dynamic pricing in two - sided marketplaces and offer practical guidance for businesses operating in these complex environments.

2. Literature Review

2.1 Dynamic Pricing in Sports and Hospitality

Dynamic pricing strategies, originating from the airline and hotel industries where they are known as revenue management or yield management, have garnered significant attention and adoption in various sectors, particularly sports and hospitality. For instance, entities like the San Francisco Giants have successfully implemented dynamic pricing for all tickets, resulting in a notable 7% increase in revenue. Similarly, the hospitality industry extensively employs dynamic pricing to adjust room rates based on forecasted demand and availability, as extensively documented in research [1]. The success of dynamic pricing in these industries is attributed to several key factors:

1) ***Forecasting Demand:*** Accurate demand forecasting enables businesses to anticipate future demand fluctuations, allowing for timely price adjustments to maximize revenue [6]. Sophisticated forecasting models leverage historical data, market trends, and external factors to predict demand patterns with precision.
2) ***Market Segmentation:*** Accurate demand forecasting enables businesses to anticipate future demand fluctuations, allowing for timely price adjustments to maximize revenue. Sophisticated forecasting models leverage historical data, market trends, and external factors to predict demand patterns with precision.
3) ***Inventory Management:*** Effective dynamic pricing aids in the management of perishable inventory, such as hotel rooms or airline seats, by optimizing their utilization and minimizing revenue loss due to unsold inventory. By adjusting prices dynamically based on demand and availability, businesses can optimize inventory utilization and maximize revenue generation.

2.2 Application in Online Marketplaces

Dynamic pricing in online marketplaces represents a complex and dynamic environment where prices are adjusted dynamically based on real - time market conditions, competitive dynamics, and consumer behaviour. Researchers have delved into stochastic dynamic pricing models in competitive markets, employing simulations to study the impact of different pricing strategies [6]. This research underscores the complexity and potential of dynamic pricing in online settings, where data availability and market transparency vary significantly. Noteworthy aspects include:

1) ***Real - Time Data:*** Dynamic pricing in online marketplaces relies on real - time data to inform pricing decisions, necessitating access to accurate and timely market information. Businesses leverage data analytics and machine learning algorithms to analyse market trends, competitor pricing strategies, and consumer behaviour in real - time.
2) ***Competitive Environment:*** The competitive landscape plays a crucial role in dynamic pricing strategies, with businesses adjusting prices in response to competitor actions and market dynamics. Pricing decisions must consider competitor pricing strategies, market positioning, and competitive dynamics to remain competitive and maximize profitability.
3) ***Customer Behaviour:*** Understanding consumer behaviour is paramount in dynamic pricing, as pricing decisions must align with customer preferences and purchasing patterns to maximize revenue and market share. Businesses utilize customer data and behavioural analytics to identify price - sensitive segments, predict purchasing behavior, and tailor pricing strategies to individual customer preferences.

2.3 Revenue Management Theory

Revenue management theory, as applied in sports and hospitality industries, encompasses a comprehensive framework for optimizing revenue generation through strategic pricing and inventory management practices. Rooted in understanding consumer demand, segmenting markets, and adjusting prices dynamically, revenue management principles outlined by Kimes serve as foundational pillars for effective revenue optimization strategies [1]. These principles, although initially developed in the context of traditional industries, are equally applicable and relevant in the dynamic landscape of online marketplaces, where product availability and consumer preferences can fluctuate rapidly.

1) ***Demand Segmentation:*** Demand segmentation involves dividing the market into distinct customer segments based on their preferences, purchasing behaviors, and willingness to pay. By identifying and targeting specific customer segments with tailored pricing strategies, businesses can maximize revenue potential. Effective demand segmentation allows for the customization of pricing strategies to align with the unique needs and preferences of different customer segments, optimizing revenue generation.
2) ***Price Elasticity:*** Price elasticity refers to the sensitivity of demand to changes in price. Understanding price elasticity enables businesses to gauge how changes in pricing will impact consumer demand and revenue. By analysing price elasticity across different market segments, businesses can determine optimal pricing levels that maximize revenue without significant reductions in demand. This nuanced understanding of price elasticity guides pricing decisions, ensuring that prices are set at levels that capture maximum value from customers.
3) ***Dynamic Adjustments:*** Dynamic adjustments involve the real - time modification of pricing strategies in response to changes in market conditions, consumer behavior, and competitive dynamics. Leveraging data analytics and machine learning algorithms, businesses can implement dynamic pricing strategies that adapt to fluctuations in demand, supply, and competitor pricing. By continuously monitoring market conditions and adjusting prices accordingly, businesses can optimize revenue generation and maintain competitiveness in dynamic online marketplaces.

2.3 Dynamic pricing models

a) ***Stochastic Models***

Stochastic models serve as fundamental tools in dynamic pricing, employing probabilistic methods to model uncertain market conditions and inform pricing decisions. These models encapsulate the inherent randomness and variability in market dynamics, allowing businesses to account for

uncertainties such as demand fluctuations and competitive dynamics. The paper "Dynamic Pricing Model with Multiple Products: Application to the Airline Industry" [3] proposes a stochastic dynamic pricing model utilizing phase type distributions and renewal processes to address pricing challenges in the airline industry. The model estimates transition probabilities using the inter - arrival time distribution of bookings and the probability that a booking turns into a ticket. Key features of stochastic models highlighted in the paper include:

1) ***Probabilistic Framework:*** The model operates within a probabilistic framework, using phase type distributions to represent the inter - arrival time between customers booking a ticket and the probability of a booking converting into a ticket. This probabilistic approach allows for the quantification of uncertainty and enables informed pricing decisions.
2) ***Dynamic Optimization:*** The stochastic model enables dynamic optimization of pricing strategies by continuously updating prices based on changing market conditions. By incorporating real - time data on booking patterns and demand dynamics, the model adapts pricing strategies to maximize revenue and utilization of available inventory.
3) ***Improved Revenue:*** Application of the stochastic dynamic pricing model to a case study in the airline industry resulted in a significant improvement in expected revenue, with an average increase of 31 percent. By accurately estimating transition probabilities and leveraging phase type distributions, the model enhances revenue generation while considering the perishable nature of airline inventory.

In summary, by incorporating stochastic modelling techniques, businesses can optimize pricing decisions and achieve better revenue outcomes in dynamic market environments. Stochastic models are mathematical frameworks used to describe systems that evolve over time with inherent randomness. In the context of dynamic pricing, these models help in understanding and optimizing pricing strategies under uncertain market conditions. Various stochastic models include:

1) ***Poisson Process:*** Used to model the number of events happening over a fixed interval of time or space.
2) ***Markov Chains:*** Used to model systems that transition from one state to another on a state space.
3) ***Renewal Processes:*** Generalize the Poisson process to allow for arbitrary inter - arrival times.
4) ***Queueing Models:*** Used to model the behaviour of queues or waiting lines.
5) ***Brownian Motion:*** Used to model continuous paths and financial markets.
6) ***Phase - Type Distributions:*** Used to model the time until absorption in a Markov process with one absorbing state, providing flexibility to fit various types of distribution shapes.

b) Machine Learning Approaches

Machine learning (ML) approaches have emerged as powerful tools for dynamic pricing in online marketplaces, leveraging advanced algorithms to analyze vast amounts of data and extract actionable insights. These approaches encompass a diverse array of algorithms, each offering unique capabilities for pricing optimization. Machine learning approaches encompass a wide range of algorithms, including regression models, decision trees, neural networks, and reinforcement learning [10]. Each algorithm exhibits specific strengths and weaknesses, making them suitable for different pricing scenarios and objectives.

Furthermore, the application of machine learning in dynamic pricing allows for adaptive and real - time adjustments to market conditions, consumer behavior, and competitive landscapes. By continuously learning from new data and feedback, ML algorithms can iteratively refine pricing strategies to maximize revenue, optimize inventory turnover, and enhance customer satisfaction. This agility in pricing decision - making provides a competitive advantage for businesses operating in fast - paced and dynamic market environments, driving efficiency and profitability in their asset management practices. In addition to enhancing pricing strategies, machine learning algorithms play a crucial role in mitigating risks associated with dynamic pricing. By analysing historical transaction data, market trends, and external factors such as economic indicators and competitor pricing, ML models can identify potential risks and uncertainties that may impact pricing decisions. This proactive risk management approach enables businesses to anticipate and respond to market fluctuations, supply chain disruptions, and demand volatility effectively. Moreover, ML algorithms can incorporate complex risk factors and dependencies into pricing models, enabling more accurate risk assessment and mitigation strategies. As a result, businesses can optimize their asset management practices while minimizing potential losses and maintaining resilience in dynamic market environments

Table 1: Comparison between stochastic models and machine learning approaches

	Stochastic Models	Machine Learning Approaches
Definition	Utilize probability theory to model uncertainty and variability.	Employ advanced algorithms to analyze data and extract patterns.
Flexibility	Limited flexibility in capturing complex market dynamics.	Flexible, adaptable, and capable of capturing complex patterns and nonlinear relationships in data.
Interpretability	Transparent and interpretable pricing algorithms.	May lack transparency and interpretability, especially in complex models.
Implementation	Relatively simple to implement and understand.	May require significant computational resources and expertise for implementation.
Performance	Stable performance under consistent market conditions.	Continuously learns and improves over time, but performance may vary depending on data quality and model complexity.
Adaptation	Less adept at adapting to rapidly changing market conditions.	Can adapt to changing market conditions in real - time.

Overfitting	Lower risk of overfitting to historical data.	Risk of overfitting to historical data, leading to suboptimal decisions.
Suitability for Complex Data	May struggle to capture nuances and subtleties in data.	Capable of capturing complex patterns and relationships in large volumes of data.

3. Case Studies

a) ***San Francisco Giants***

The implementation of dynamic pricing by the San Francisco Giants serves as a practical example of how dynamic pricing can increase revenue [2]. By adjusting ticket prices based on factors such as team performance and weather, the Giants were able to optimize their pricing strategy and achieve significant revenue gain.

1) ***Methodology:*** The Giants used a combination of historical sales data, real - time market conditions, and predictive analytics to set ticket prices. This approach allowed them to - *Maximize Revenue:* Increase ticket prices for high - demand games and reduce prices for low - demand games and *Enhance Fan Experience:* Ensure that tickets remained affordable for a broad range of fans by dynamically adjusting prices.
2) ***Results:*** The results of the Giants' dynamic pricing strategy included a 7% increase in ticket revenue during the first season of implementation and higher attendance rates for games that might otherwise have had unsold tickets [5], [8].

b) ***Dynamic Pricing in Airline Industry***

Let's consider a stochastic dynamic pricing model to maximize revenue over a finite horizon. Phase - Type distribution is used to model inter - arrival times of bookings. Renewal process is used to model the probability of booking turning into a ticket.

The dynamic pricing problem in the airline industry involves setting ticket prices to maximize revenue by considering uncertain customer demand and behaviour. First, we model the arrival of booking requests using a phase - type (PH) distribution, which captures the varying times between customer bookings. Each period's price decision affects future demand, so prices are adjusted dynamically. We begin by defining initial conditions, such as available seats and initial prices. Using the PH distribution, we estimate the expected number of bookings for each period. If the predicted demand exceeds available seats, we adjust the price to balance demand with capacity, leveraging price elasticity to understand how price changes affect demand. By iterating this process, we continuously update prices based on real - time data, optimizing revenue over the entire selling period. This approach ensures that prices reflect current market conditions and customer behavior, ultimately leading to higher overall revenue [3].

1) ***Initialization:*** Define initial conditions including seat availability, initial price, and parameters for the Phase - Type (PH) distribution.
2) ***Demand Estimation:*** Use the PH distribution to estimate the inter - arrival time of booking requests.

$$T \sim PH\ (\alpha, T)$$

Calculate buying probability,

$$P_{buy}\ (p)\ = 1/\ (1 + e^{-\beta\ (p\ -\ p0)}\ )$$

3) ***Revenue Calculation:*** Compute expected demand E [Dt] and Revenue Rt for the current period using the demand estimation and the current price.

$$E\ [D_t]\ =\ \lambda_t . P_{buy}\ (p_t)$$
$$R_t\ =\ p_t . E\ [D_t]$$

4) ***Price Adjustment:*** Adjust prices dynamically based on the estimated demand and capacity constraints, aiming to maximize total expected revenue.

$$max_{p1,p2,\ldots,pT}\ \Sigma^T{}_{t=1} pt . E\ [D_t]$$

5) ***Optimization:*** Use dynamic programming to solve the Bellman equation, updating the value function to reflect the maximum expected revenue over the selling period.

$$V_t\ (s)\ =\ max_{pt}\ \{pt . E\ [D_t]\ +\ E\ [V_{t+1}\ (s')\ ]\}$$

6) ***Iteration:*** Repeat the process for each time period, continuously updating prices based on real - time data and the evolving market conditions.

7) Capacity Constraint: Ensure the total number of booked seats does not exceed the plane's capacity.

$$\Sigma^T{}_{t=1}\ E\ [D_t]\ \leq\ Capacity$$

By following these steps and utilizing these formulas, the stochastic model allows for dynamic pricing that adapts to market fluctuations, maximizing revenue while managing demand and capacity effectively.

c) ***StubHub - A Two - Sided Ticket Marketplace***

StubHub, a prominent online platform in the secondary ticket market, exemplifies the application of dynamic pricing in a two - sided marketplace. It connects ticket sellers with potential buyers, facilitating transactions for various events like sports, concerts, and theatre performances [7]. StubHub's dynamic pricing model adjusts ticket prices in real - time based on supply and demand fluctuations, ensuring prices reflect the actual market value.

1) ***Methodology:*** StubHub employs sophisticated algorithms that analyse vast amounts of data to determine optimal ticket prices. These algorithms consider historical sales data, current market trends, seat location, time remaining until the event, and even external factors like weather forecasts and team performance. The platform's data - driven approach enables real - time price adjustments, enhancing market efficiency and maximizing revenue for sellers.

2) ***Results:*** Sellers can potentially earn substantial profits, especially for high - demand events. Dynamic pricing ensures that ticket prices align with their true market value, leading to a more efficient allocation of resources. This benefits both buyers and sellers by providing a fair and transparent marketplace.

However, challenges exist. Research reveals that seller on StubHub exhibit reference - dependent preferences and loss aversion [7]. They are influenced by reference points like the face value of the ticket and previous transaction prices, often

reluctant to sell below these values. This behavior can lead to price bunching and potentially hinder market efficiency.

Ticket prices in the secondary market can be highly volatile, fluctuating significantly due to changing demand and other factors [4]. This volatility can create uncertainty for both buyers and sellers.

3) ***Key Findings:*** Reference - dependent preferences and loss aversion lead to higher listing prices, especially closer to the event date. Iis estimated that listing prices on the last day before a game could be 19.3% lower if sellers did not exhibit these biases [7].

The presence of reference - dependent preferences also affects the probability of a ticket being sold. Without these biases, the probability of a typical listing being sold during the last two weeks before a game would increase from 43% to 48% [7].

Experienced sellers with numerous listings are less susceptible to the influence of face values, suggesting that market experience can mitigate the effects of reference - dependent preferences.

4) ***The Zone of Reasonableness:*** Researchers introduce the concept of a "zone of reasonableness" in dynamic ticket pricing, particularly in the context of Major League Baseball (MLB) [5]. This concept suggests that ticket prices in the primary market (sold directly by the team) are constrained by a lower limit - the price paid by season ticket holders and an upper limit - a price beyond which perceptions of unfairness arise.

In contrast, the secondary market, like StubHub, operates with a wider range of potential ticket prices. It is not bound by the same constraints as the primary market, leading to greater price dispersion. It is found that for a high - demand MLB game, the average secondary market price on StubHub was 32% higher than the primary market price [5].

4. Challenges and Opportunities

Dynamic pricing models in two - sided marketplaces present both significant challenges and opportunities. Understanding and addressing these factors is crucial for successfully implementing dynamic pricing strategies.

Data Availability and Quality

1) ***Data Sources:*** One of the primary challenges in implementing dynamic pricing models is the availability and reliability of data. Effective dynamic pricing relies on comprehensive and accurate datasets, including historical sales data, real - time market conditions, customer behavior patterns, and competitor pricing. These data sources can vary widely in quality and completeness, impacting the model's accuracy and effectiveness.

2) ***Data Management:*** Managing vast amounts of data is another significant challenge. Businesses need to develop robust data management systems that can handle large datasets, ensure data integrity, and facilitate real - time data processing. This includes implementing advanced data analytics tools and machine learning algorithms that can quickly analyse and interpret data to inform pricing decisions.

Consumer Protection

1) ***Fairness Perceptions:*** Dynamic pricing can lead to concerns about fairness among consumers. If customers perceive that prices are arbitrarily or unfairly adjusted, it can damage a company's reputation and customer trust. Ensuring transparency in how prices are determined and communicating the value proposition to customers is essential for maintaining positive customer relationships.

2) ***Communication Strategies:*** Effective communication strategies are vital to address consumer concerns about dynamic pricing. Businesses need to clearly explain the rationale behind price changes and how these adjustments benefit customers, such as through improved availability or enhanced service quality. Transparent communication can help mitigate negative perceptions and foster a more trusting relationship with consumers.

Technological Advancements

Technological advancements offer both opportunities and challenges for dynamic pricing models. Emerging technologies such as artificial intelligence (AI), machine learning (ML), and big data analytics are transforming how businesses approach dynamic pricing. These technologies enable more sophisticated and accurate pricing models that can adapt to market changes in real time.

However, integrating these advanced technologies requires significant investment in infrastructure and expertise. Businesses need to ensure they have the necessary technological capabilities and skilled personnel to leverage these tools effectively. Additionally, keeping up with rapid technological advancements and staying ahead of competitors can be a continuous challenge.

5. Conclusion

Dynamic pricing has revolutionized revenue maximization strategies in two - sided marketplaces. This innovative approach leverages real - time data and advanced analytics to optimize pricing and enhance market efficiency. However, data quality and consumer perception pose significant challenges to fully harness the potential of dynamic pricing. To address data quality issues, research should focus on developing effective methods for data cleansing, integration, and validation. Additionally, exploring alternative data sources, such as social media sentiment and customer feedback, can provide valuable insights for dynamic pricing. Addressing consumer concerns is equally important for the success of dynamic pricing. Research should investigate strategies to enhance price fairness and transparency. This can be achieved by providing clear explanations of how dynamic pricing works, offering price guarantees, and implementing loyalty programs. Emerging markets present a fertile ground for dynamic pricing applications. Future research should explore how dynamic pricing can be adapted to the unique challenges and opportunities of these markets, considering cultural differences, regulatory frameworks, and payment preferences.

Furthermore, dynamic pricing holds promise in new industries and use cases beyond traditional sectors. Research should identify and evaluate additional industries and applications where dynamic pricing can be effectively implemented. By addressing data quality challenges, consumer concerns, and exploring new markets and use cases, dynamic pricing can unleash its full potential as a powerful revenue optimization strategy.

References

[1] Kimes, Sheryl E.1989. "The Basics of Yield Management. " *Cornell Hotel and Restaurant Administration Quarterly* 30 (3): 14 - 19.
[2] Drayer, Joris, Stephen L. Shapiro, and Seoki Lee.2012. "Dynamic Ticket Pricing in Sport: An Agenda for Research and Practice. " *Sport Marketing Quarterly* 21 (3): 184 - 194.
[3] Otero - Leon, Daniel & Akhavan - Tabatabaei, Raha. (2015). “A stochastic dynamic pricing model for the multiclass problems in the airline industry”. *European Journal of Operational Research*.242.188 - 200.
[4] Chen, Boxiao & Chao, Xiuli. (2015). “Data - Driven Dynamic Pricing and Inventory Control with Censored Demand and Limited Price Changes”.
[5] Drea, John T., and Andrew Nahlik.2017. "Dynamic Pricing in Major League Baseball Tickets: Issues and Challenges. " *Atlantic Marketing Journal* 5 (3): 59 - 70.
[6] Schlosser, Rainer, and Martin Boissier.2018. "Dynamic Pricing under Competition on Online Marketplaces: A Data - Driven Approach. " In *Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining*, 2238–2246.
[7] Zhu, Jian - Da.2019. "Pricing Strategy under Reference - Dependent Preferences: Evidence from Sellers on StubHub. "
[8] Chen, Yiwei, Zheng Wen and Yao Xie.2019 “Dynamic Pricing in an Evolving and Unknown Marketplace. ” *Econometrics: Econometric & Statistical Methods - Special Topics eJournal*
[9] J. Lladós - Masllorens, A. Meseguer - Artola, and I. Rodríguez - Ardura, "Understanding Peer - to - Peer, Two - Sided Digital Marketplaces: Pricing Lessons from Airbnb in Barcelona, " Sustainability, vol.12, no.13, p.5229, 2020. [Online]. Available: https: //doi. org/10.3390/su12135229
[10] A. Kolbeinsson, N. Shukla, A. Gupta, L. Marla, and K. Yellepeddi, "Galactic Air Improves Airline Ancillary Revenues with Dynamic Personalized Pricing, " SSRN, Apr.29, 2021. [Online]. Available: https: //ssrn. com/abstract=3836941

ISSN: 2319-7064
SJIF (2019): 7.583

Volume 10 Issue 9, September 2021
www.ijsr.net