Price Competitiveness of Products on E-Commerce Websites – An Indian Perspective

By

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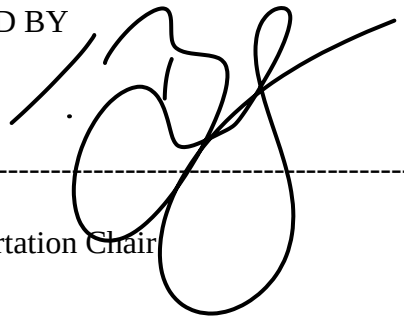
APPROVED BY



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DECLARATION

I hereby declare that the thesis entitled "Price Competitiveness of Products on E-Commerce Websites – An Indian Perspective" submitted to SSBM, Geneva for the award of degree of Global Doctor of Business Administration is my original research work. This thesis or any part thereof has not been submitted partially or fully for the fulfillment of any degree of discipline in any other University/Institution.

(PANKAJ KUMAR SINGH)

Dedication

I dedicate this work to my mom & dad (*Smt. Meera Singh and Shri Parmanand Singh*) and my Grandparents (My paternal grandfather *Late Shri Ramchandra Singh, my* maternal grandfather *Late Shri Chandraketu Singh,* my paternal grandmother *Late Smt. Pavitri Devi* and my maternal grandmother *Smt. Krishna Devi*) for all their sacrifice, their endless love, support and blessings.

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This thesis required blessings, support and help from a lot of people directly or indirectly. I would like to start first by thanking the open-source community for keeping the technology and data accessible. I am indebted to my guide Prof (*Dr.) Kunal Kishore* for his continued trust, support and guidance. My mother *Meera Singh* and my Father *Parmanand Singh* for their blessings and unconditional love, my siblings – *Priya, Dr. Divya, Vidya* for their undying love, the support of my brothers-in-laws *Dr. Manish and Priyevrat*, my niece *Pihu*, my nephew *Aayansh* and my son *Rishaank* who just arrived in time for making my world complete. My heart-felt thanks to the teaching and non-teaching staff of Upgrad and SSBM Geneva for making this journey pleasant and stress free.

I am indebted to my Idol *Lord Shree Ram*, for we all exist and flourish due to your grace.

ABSTRACT
PRICE COMPETITIVENESS OF PRODUCTS ON E-COMMERCE WEBSITES – AN INDIAN PERSPECTIVE

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2024

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Public accessibility to the internet has significantly changed the world. The worldwide web is now flooded with websites offering information, products and services. E-commerce has become the backbone of global transactions for goods and services initially in developed economies and rapidly growing in the developing economies as well. Initially led by Amazon and eBay, the internet is now a host of millions of e-commerce products and services related websites. India is no exception and as the fastest growing economy backed by a pool of young population, robust network of high-speed mobile and broadband communication, along with rapid urbanization shows immense scope for the growth and competitive environment for e-commerce. Pricing on e-commerce is highly competitive compared to its bricks and mortar peers and Indian market shows extremely cut-throat competition in the e-commerce segment. Studying the price differences among e-commerce sellers at a product level can provide a useful insight on the pricing strategy employed. We have tried to collect the data for different products sold across different e-commerce marketplaces within India to study the price variance and competitive pricing among these online sellers.
Keywords – e-commerce, internet, price variance, sellers, India, pricing strategies.

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CHAPTER I:
INTRODUCTION

The thesis begins with the chapter Introduction. This chapter explores the initial ideas of e-commerce, the journey of electronic commerce or e-commerce in USA, global status of e-commerce, e-commerce around the globe. We discuss the evolution of e-commerce in India. Further the chapter discusses the pricing strategy on e-commerce with special focus on Indian market. We discuss the origin of the problem that we want to investigate along with its purpose and significance. The chapter concludes by describing the structure of the thesis and laying the foundation for the study.

1.1 Introduction

Electronic commerce/e-business/e-commerce, in general terms, covers the transaction of goods and/or services over the wired channel viz. internet or electronic modes. Even though the term became more prominent to the public during the mid-1990s, it has been in practice for almost 50 years. With the computer hardware getting cheaper and powerful and the subsequent growth in the wireless telecommunication, internet has found its way into majority of the household of the world. With data getting cheaper globally and the advent of 5G/4G technology, the mobile internet has gained prominence and has contributed to online shopping or transactions.

1.1.1 Types of E-commerce

Like every commerce transaction, e-commerce also requires two parties, a seller and a buyer. To operate, sustain and generate revenue, every business needs to have a minimum of one business model (Abdollahi & Leimstoll, 2011). Every business model comprises actors and their defined roles. It is noteworthy that these business models are uniquely defined and crafted from company to company and industry to industry. One such classification relies on three different models (Abdollahi & Leimstoll, 2011) -

a. Brokerage business model – This model relies on one of the actors who can either offer services on a product but doesn't own the product or else can own the product and offer the services on the product but doesn't manufacture the product, hence

acting as a broker to the buyers. While the revenue is generated by the manufacturer, the broker receives a commission or a decided cut from the sale (Abdollahi & Leimstoll, 2011).

b. Advertising Business Model – In this category the e-commerce platform offers advertising services and products. The revenue is usually based on the commission from advertising. At times if the e-commerce platform is the owner of the product or services then the revenue becomes direct (Abdollahi & Leimstoll, 2011).
c. Infomediary Business Model – This model collects the information around the potential customers and shares it with the interested businesses (Abdollahi & Leimstoll, 2011).
d. Merchant Business Model – This can be understood as the current retail and wholesale dealership business model. The merchant is responsible for selling the product to the buyer (Abdollahi & Leimstoll, 2011).
e. Affiliate Business Model – In this model the company provides commission or incentives to the affiliates who can procure customers for them (Abdollahi & Leimstoll, 2011).
f. Manufacturer Business Model – This is a complete ownership model where the manufacturer directly engages with the buyer for selling the product or services (Abdollahi & Leimstoll, 2011).
g. Community Business Model – This model offers some of part of the services/immaterial which can solve a problem. Here the revenue is dependent on the type of product and services (Abdollahi & Leimstoll, 2011).
h. Subscription Business Model – This model is dependent on the time bound access to the product and services. The organization can also appoint resellers which can sell the services and products on their behalf. The revenue model in this case relies on the subscription fee applicable at a particular frequency. This model has a provision of renewal and unsubscribed (Abdollahi & Leimstoll, 2011).
i. Utility Business model – This model works on the principle of renting or leasing the services/immaterial. The revenue model relies on the usage fee from the customer.

In another attempt for Business model for e-commerce, one of the researchers describes a customized version for e-commerce (Mahadevan, 2000) –

a. Value stream – virtual communities, dynamic cost reduction, profitable exploitation of the market information, unique value propositions.
b. Revenue stream – increased margin, seller platform fees, advertising, dynamic pricing, freebies and discounts, exploitation of the market information
c. Logistic stream – optimized supply chain, curated information and meta-mediation (Mahadevan, 2000).

Between 2010 and 2020, the e-commerce business model became more prominent in classification. One of the recent works in India classifies the E-commerce business models into six distinct categories (Gojiya, 2023):

a. Business to Business (B2B) - This model is based on online transactions between two businesses/companies for e.g., wholesalers and retailers, bulk purchase of employee gifts by a company. It is considered as one of the most profitable models for e-commerce (Gojiya, 2023).
b. Business to Consumers (B2C) – This model is based on online transactions between a business and a consumer. This is the most prominent model in e-commerce space. It is a form of retailer-buyer relationship. The buyer in the case is generally the end user eliminating any mediators between the transaction. Initial businesses like Amazon and eBay prospered with this model and this model was a prominent digital disruptor during the dot com bubble (Gojiya, 2023).
c. Consumer to Consumer (C2C) – In this model consumers can directly conduct their transactions with consumers. The services and goods are sold via auctions and classifieds on the online platform (e.g., Craigslist, eBay etc.). In general, this type of model provides a higher margin due to absence of any direct or indirect mediators in between (Gojiya, 2023).
d. Business to Government (B2G) – E-commerce transaction where sellers sell goods directly to Government and Government owned bodies. This is via Request for information/proposals/quote mode which is standard operating procedure for the

government procurement process. This type of transaction process usually comes with a lot of regulations and compliance and is a time taking process (Gojiya, 2023).

e. Business to Business to Customers(B2B2C) – When a business offers goods or services to customer via another business, this falls under B2B2C transactions. This type of transaction has three actors (Gojiya, 2023).
f. Consumer to Business (C2B) – This type of model describes the transaction between a consumer and a business with roles reversed. Here, the consumer becomes the seller and Business becomes the buyer (Gojiya, 2023).

During the early internet era, the businesses facilitating the transactions via internet were known as brick and clicks in contrast to the physical transaction mode (brick and mortar). There were early hiccups during the dot com bubbles which led to the failure of many early ventures. Early comparative studies suggested multiple factors for the success and failure of e-commerce ventures. Some studies suggested that certain early e-commerce ventures failed due to lack of market knowledge, robust business ideas, long term planning, promotion and external relationships(Rasheed, 2009). In another study it was found that usability, customer friendliness, logistics, security, presentation, offers and promotions are the key differentiators between a successful and a failed e-business venture (Razi et al., 2004). This study compared the pure plays (new ventures) and brick & clicks model for small e-commerce businesses. As we look more towards the future, this would require a more customized e-commerce business model, especially towards the Web 3.0. Web 3.0 coupled with semantic web technologies provides enhanced user experience, hand-held device-based customization and responsiveness, location enablement, strong integration and personalized recommendation which requires newer or customized Business models (Almeida et al., 2014). In the internet era, most of the information is just a click away. Searching information over the internet has in layman term known as Googling, since google is one of the most widely and globally used search engines. It becomes crucial for businesses to be listed or found quickly in a search engine result page. The technique used by the websites to be found based on a sub-set of

keywords is Search engine optimization. In a study carried out on the e-commerce business models in German market, it was pointed out that certain e-businesses can run successfully independent of Search engine optimization (SEO). This is achieved using multiple customizations in the business models like – diversified customer footfall, unique and customer centric products, multichannel advertisements, customer trust, hassle-free and profitable registrations, community reference(Klatt, 2013).

1.1.2 History of E-commerce

First Generation E-commerce

The history of E-commerce traces back as early as the discovery of the internet. During the early 1960s the electronic data exchange (EDI) prompted the organizations involved in retail and transportation into creating paperless offices. Between 1970 to 1980's EDI was formalized and accepted as a data exchange standard and was adopted by the industries. This is what is considered as the first generation of e-commerce. The first generation of e-commerce relied on EDI for exchange of information, placing orders and transfer of funds via a computer (Sawanibi, 2001, cited in Tian & Stewart, 2006). The adoption of EDI was much slower due to the cost and technical complexities and only 1% of US and European companies were transacting online by late 1990s. The second generation of e-commerce was characterized by the transaction of goods and services via the internet. Between 1960 and 1970's ARPANET was still a research project and supported less than 100 nodes. The term *internet* was coined in 1982 when the ARPANET reached a host size of 213. During the 1983's, internet protocol (IP) became the only accepted mode for data transfer on the internet, this facilitated the transfer and exchange of information between two or more computers without any bias. What is now known as TCP/IP, came in existence during the late 1980s the National Science Foundation launched NSFNET to provide high speed connectivity between the major data centers (supercomputers centers) across the United States (Anthes, 1994, cited in

Tian & Stewart, 2006). The commercial use of the internet wasn't until the early 1990s, during the 1980s the internet was more primarily used by academics, engineers and scientists. This was because during that time using the internet was complex and required knowledge of computers and computer science (Eccleson, 1999, cited in Tian & Stewart, 2006). The breakthrough for e-commerce came with the democratization of the internet during 1991 when the NSFNET lifted the restrictions on the commercialization of the internet. Private players like IBM, MCI Communications Corp., Merit Network etc., started providing unrestricted internet services to the commercial users. This led to the rapid upgrade of the network infrastructure and services by investments towards network hardware. During this period, the Hypertext Markup Language (HTML) along with the specification of the uniform resource locator (URL) and World Wide Web paved way for the user-friendly nature of the internet. Between 1993 and 1994 Mosaic and Navigator browsers were released which helped with the much-needed usability feature of the internet. With all the developments in the network infrastructure, the golden era of e-commerce that we know today started from 1995 to 1999 (Tian & Stewart, 2006).

It is interesting to note that the first recognized e-commerce company founded in United States was CompuServe in the year 1969. It was also known as CompuServe Information Service or CIS/CSi. Initially it started as a time-sharing and remote access service to corporates. Later it expanded to online chatting, message forums, software libraries for personal computers, online gaming. It introduced the GIF format for storing and sharing pictures/images. In 1984, it launched a famous e-commerce service known as Electronic Mall, where the colored pictures of the product were displayed online. Despite being pioneered by three information services, it was sold multiple times. Initially to H&R Block in 1979, to AOL in 1997 and to Verizon in 2017. As we discuss the core breakthroughs, one of the core inventions that forms the heart of ecommerce, electronic shopping, was invented in 1979 by Michael Aldrich. One of the pioneers of ecommerce was the Boston computer exchange launched in 1982, which enabled a marketplace platform for selling used computers. The first web browser known as WorldWideWeb was released by Tim Berners-Lee in 1990. This allowed all users having access to

internet to browse e-commerce with significant ease. It may be surprising for many but Amazon.com was not the first online portal selling books online, this credit goes to Book Stacks Unlimited which initially launched as a bulletin board system (BBS). Parallelly, Mintel was launched in France between 1980- 1984. This was a pre-internet service which was one of the most successful online services prior to the WWW era and was a Videotex based service. Mintel enabled the users with online shopping, train reservations, stock-prices, mailbox and chatting. In 1994, the first commercially downloadable software online, Ipswitch IMail Server, was launched. This was an email server which ran on the Windows Operating system (Wikipedia contributors, 2023).

The Golden Era of E-commerce (1995-99)

It was not until 1995 when the term E-commerce was being used globally. This was marked with the advent of Amazon.com, the biggest e-market for books, being launched initially in United States. Amazon quickly became a multimillion-dollar business with 1.1 million searchable book titles in its database. eBay, the first auction site, came into existence just two months after the launch of Amazon. With a difference in the business model between the two, both the e-commerce ventures flourished and bloomed during this period. Dell started selling computers online in 1996 in the B2C initiative. The .com domain surpassed the other existing domains in 1997, thus marking the popularity and adoption of e-commerce by investors, businesses and customers alike. Between 1995 to 1999 the online presence and transaction increased several folds. In 1996 the online transactions accounted $707 million of revenue in United States which in 1997 crossed $2.6 billion and in 1998 it became $5.8 billion (Fellenstein & Wood as cited in Tian, 2008). Although Tian, 2008 has shared the insights until 2001, we have presented the total retail revenue growth and future projection in US in a table (Table 1) along with a trend chart (Graph 1) (Sabanoglu, 2023). By the end of year 2000, 60000 e-commerce companies were registered in United States (Dholakia *et al.*, 2002, cited in Tian, 2008). Again, we have added a table (Table 2) and a trend chart (Graph 2) to display the

subsequent growth of e-commerce retail revenue along with a projection till 2029 (Statista Research Department, 2024)

Table 1.1

US Total Retail sales forecast from 2020-26 (source – Statista Website)

Year	US Retail Sales (in $ trillion)
2017	5.04
2018	5.26
2019	5.4
2020	5.5
2021	6.57
2022	7.1
2023	7.18
2024	7.43
2025	7.66
2026	7.89

Figure 1.1

US Total Retail sales trends from 2020-26 (source – Statista Website)

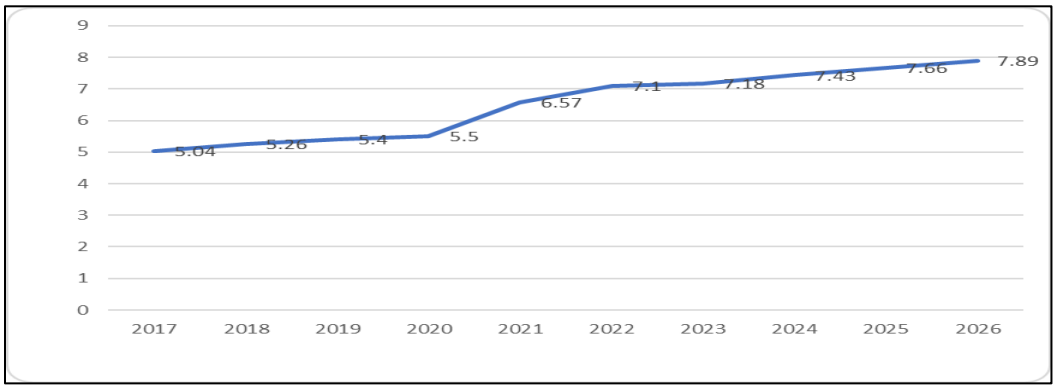


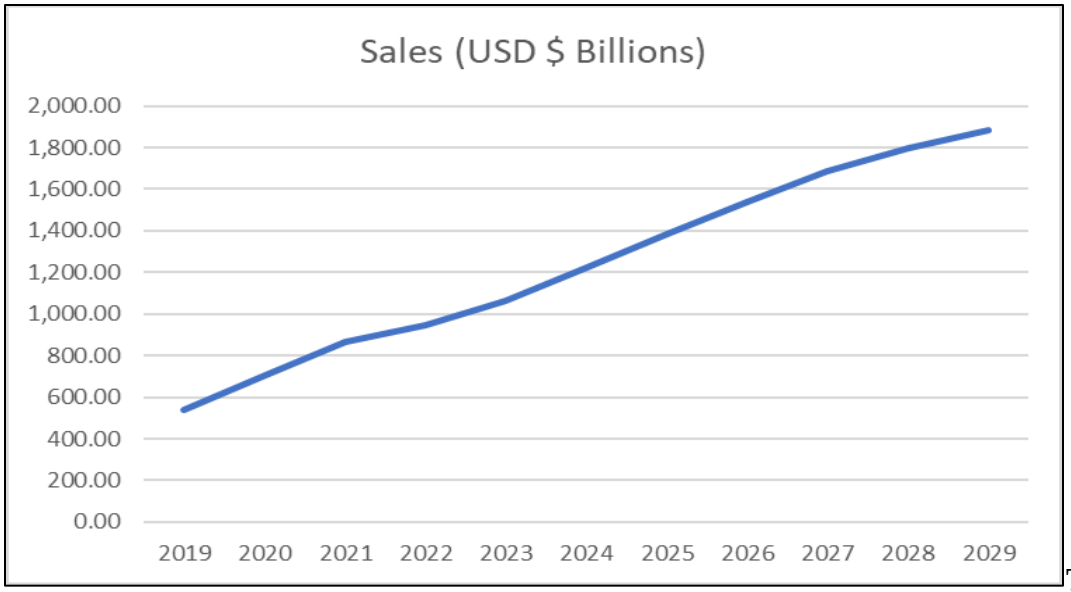
Table 1.2

US E-commerce Retail sales forecast from 2019-29 (source – Statista Website)

Year	Sales (USD $ Billions)
2019	539.43
2020	702.43
2021	866.07
2022	943.89
2023	1,065.68
2024	1,222.85
2025	1,381.74
2026	1,540.59
2027	1,685.41
2028	1,796.11

Figure 1.2

US E-commerce Retail sales trends from 2020-26 (source – Statista Website)



The DOT-COM bubble burst (2000-01)

The late 90's contributed to greater than 90% of the e-commerce revenue and registrations of new e-commerce ventures. Most e-commerce ventures benefited from being early players. This phase is known as dot-com bubble. By the first trimester of 2000's, the NASDAQ stock exchange tanked ~35% while the internet index of Dow Jones dropped ~53.5%. The stock prices of all major internet shares dropped between 25% to 75% for example Amazon shares dropped by ~30%, eBay by ~28%, Internet Capital by ~72% and Verisign by ~60% (Cassidy, 2002 as cited in Tian, 2008). This phase became known as dot-com bubble burst. During 2000-01, the IPOs of multiple internet companies were cancelled while certain companies like Boo.com and Value America filed for bankruptcy (Cassidy, 2002, cited in Tian, 2008). Almost 338 dot-coms domains were unregistered or taken offline in 2001 (Adams, 2004, cited in Tian, 2008) and caused a loss 30,000 direct jobs along with 80% dot-com domains going out of business in San Fransisco Bay area (Nevaer, 2002, cited in Tian,2008). Although in 2023 the 338 domains may not seem much, during pre-adolescent era of e-commerce, it was a huge setback.

It has been pointed out by several researchers and experts in the field that the dot-com crash is largely attributed to pre-mature and overvalued investments due to the non-realistic anticipations from e-commerce and internet companies. This event was expected to cause a decrease in investment, economic and productivity slowdown and decrease in corporate revenues (Cassidy, 2002, cited in Tian, 2008).

In contrast to the predictions and bankruptcy of many internet-based companies, the e-commerce revenue growth remained on the positive side. The e-commerce sales during the fourth quarter (Q4) of 1999 were $5.27 Billion against the Q4 2000 revenue of $8.88 Billion and Q4 2001 sales of $10.4 Billion. The e-commerce revenue for 2001 was estimated to be $34.6 Billion, which was 19.6 higher than 2000 revenue, thus suggesting the viability of e-commerce (Tian, 2008).

2023 and Future –

Builtwith.com websites confirms that there are 14.4 M ecommerce website currently active in United States. This website also provides information on the globally active e-commerce website as of 30-12-2023 which is ~ 27.6 million. Although this website is dedicated to the technology on which each of the websites has been built. For example, Shopify based websites capture 17.66% of all globally active e-commerce portals followed by Wix (10.65%) and WooCommerce (8.51%). The top 10 countries with the most e-commerce websites are provided in Table 3 and an exhaustive list is provided for 239 countries in a separate Tables and Chart section. United States of America is a clear winner here. It has almost 14.4 million active e-commerce websites which is followed by United Kingdom which has close to 1.3 million, the gap is more than 10% (BuiltWith, 2023).

Table 1.3

List of countries with the Top 10 active e-commerce websites (Kin, 2024)

Country	E-commerce websites
United States	14365089
United Kingdom	1294237
Brazil	808996
Germany	746305
Australia	706910
France	591423
Russia	556872
India	507229
Italy	498136

Considering United States e-commerce market since 2000, there has been several folds increase in the sales. In comparison to $27.4 billion in 2000, it was $169.1 billion in 2010 and $813 billion in 2020. The year 2020-21 was a dreadful year for humanity and global finance due to the COVID19 outbreak but it served as a steroid boost for the e-commerce industry. The consecutive lockdowns forced the existing e-commerce companies to update their inventories and strengthen their supply chain while the traditional bricks and mortar stores started their online journey either by listing as a seller on existing e-commerce platforms or starting their online stores. In the US, between 2019 and 2020 there was a 43% increase in e-commerce sales, which is the peak year on year (YoY) growth for the e-commerce industry ever since its inception. The e-commerce sales crossed $1 trillion in 2022, a remarkable milestone for this industry in United States. With the existing retail infrastructure in the states, the share the captured by the e-commerce business model during the last 30 years. From <1% in 2000, e-commerce contributes almost ~ 15% of total retail sales in the US in 2020 and 2022. Demonstrating a similar trend of growth during the COVID19 period, the ~15% of total retail contribution is the highest during the last 30 years (Table 4). This data suggests that

almost 85% of the transactions in the US retail market are still out of the bricks and mortar store (U.S. Census Bureau, E-Commerce Retail Sales, 2024).

Table 4

*Percentage of Total sales of retail (*U.S. Census Bureau, E-Commerce Retail Sales, *2024)*

Year	% of Total Sales
2000	0.925
2001	1.125
2002	1.425
2003	1.75
2004	2.075
2005	2.45
2006	2.9
2007	3.4
2008	3.6
2009	4
2010	4.45
2011	4.875
2012	5.4
2013	5.85
2014	6.4
2015	7.125
2016	7.925
2017	8.775
2018	9.65
2019	10.575
2020	14.6
2021	14.7

2022	14.625
2023	15.3

The Capital one shopping research website has outlined the retail statistics. As per the report, the worldwide total sales for retail will reach a total of $29.3 trillion by the end of 2023 with projected sales of $39.4 trillion by 2030. US total retail sales crossed $7.48 trillion in 2022 and are expected to reach $9.31 trillion by 2030. While global e-commerce retail sales are expected to cross $6.31 trillion in 2023 and by 2030 it is projected to reach $14.8 trillion. The US figures for e-commerce retail sales are expected to be around $1.20 trillion in 2023 and are forecasted to reach $3.32 trillion by 2030. Walmart was the biggest American retailer with net sales of $606 billion in 2022. Out of the 2.73 million retailers in the US, the physical stores are 1.07 million. The 2023 worldwide retail sales have settled to the pre-COVID19 level, with YoY increase around 3.87% from 2022. The brick-and-mortar retail constituted ~79% of the total retail sales and e-commerce sales contributed ~21% and it has been estimated that global retail sales will grow at a compound annual growth rate (CAGR) of 2.35%. The US retail growth compared to QTD 2022 is 1.94% higher and is expected to cross 3.56% by end of 2023, this also suggests that US contributes 21% of global retail revenue, if the US retail sales are distributed between in-store and online (e-commerce), the former contributes ~85% and the latter has a share ~15%. With these trends the US retail CAGR is projected at 3.96% between 2023 and 2030. This research also provides interesting insights into the retail customers in the US, for example it suggests that it is very unlikely that a customer will make an expensive purchase online and as per the purchasing capacity on average an individual spends ~$19.6K/year on retail. The research also suggests that the bricks-and-mortar store grew 50% more than e-commerce (6182 new stores were added in 2022 which ~48.2% more than 2021). When we look at the worldwide retail sales statistics, it lags the US. For example, global retail sales in 2022 were around $28.2 trillion which

grew 8.31% YoY, the e-commerce (online) revenue for 2022 accounted $5.72 trillion which has increased 9.71% from 2021 while the brick-and-mortar stores sales soared to $21.6 trillion in 2022 which is 7.96 % higher than 2021 with a projection of in-store reaching $28.9 trillion by 2030. Retail cannot sustain without a significant consumer base. As per the website, the consumer is a person who can spend $10/day on average purchasing goods and services. Based on this distinction, there are 4.56 billion retail consumers in 2023, and this figure will reach 5.6 billion by 2030. Between 2017 (3.51 billion) to 2023 (4.56 billion), the growth of new consumers involved in retail shopping increased at the rate of 5.41% on average per year. The US data suggests 136.3 million consumers in retail shopping in 2023 which will reach 146.3 million by 2030. The online consumers trends suggest 2.46 billion consumers shop online in 2023 worldwide out of 263 million consumers from US shops online. With the above information we conclude a detailed B2C (Capital One Shopping, 2024).

The same website also publishes complete e-commerce statistics which include the B2B market as well, which is the major source of e-commerce revenue. As per the website, for the US market the total e-commerce sales in 2023 have been projected to be $6.31 trillion, which is 10.4% higher than 2022 ($5.72 trillion). While the retail e-commerce sales will reach 1.21 trillion by end of 2023, which is 16.3% more than last year and can reach over $2 trillion by 2027. As per this report, Amazon leads the e-commerce retail segment while Microsoft leads in the B2B segment of e-commerce. The 2023 Q3 e-commerce increased 7.6% YoY while it was 2.3% during the 2022 Q3 previous year. Since September 2022 e-commerce has grown 88% faster in the retail segment, when compared to percentage growth e-commerce has registered an increase of 3.22% in retail sales YoY while also in 2023 the e-commerce sales have increased 7.13% YoY. When compared to the worldwide statistics, the total e-commerce sales totaled $25.26 trillion in 2022 and are expected to reach $40 trillion in 2025. E-commerce retail sales grew 8.22% YoY in 2022 and is expected to reach $7 trillion by 2026, which makes the current share of e-commerce in the worldwide retail market around 20.9% and will reach 24.1% by

2025; this report also suggests the social media e-commerce reported a massive increase of 102% between 2021 to 2022 ($992 billion). On the other hand, B2B worldwide e-commerce market is $26.16 trillion in 2023 which will reach $56.9 trillion by 2028 which more than double. Between 2022 to 2023, the B2B e-commerce recorded an increase of 18.0% with a projected CAGR of 12.9% during 2023-28. The size of U.S. e-commerce market in 2023 is $3.6 trillion which will grow to $6.629 trillion by 2028. Wikipedia defines Gross Merchandise Volume (GMV) as the average sales price per item multiplied by number of items sold for an e-commerce retail, this is also known as Gross revenue. The worldwide e-commerce GMV crossed $22.172 trillion in 2022, which shows a growth of 20.5% YoY. With a CAGR of 14.7%, the worldwide GMV grew 50.9% between 2016 to 2019. With 78% of total GMV, Asia (Asia + Asia Pacific) is the world's biggest market for B2B e-commerce while the U.S. sees a declining B2B e-commerce at 14.2% in 2022 which 3.71% lower than in 2021, in 2023 the B2B e-commerce sales increased by 14.4% while the U.S. global share (13.8%) of B2B e-commerce was down by 3.06% from 2022. The B2B e-commerce contributes 74.9% in U.S., that would mean $8.07 trillion e-commerce sales in 2023 which is expected to reach $9.87 trillion by 2028. The Asia and Asia pacific (APAC) B2B e-commerce market is $20.07 trillion in 2023 and is almost 421% larger than the 2nd largest B2B market, North America. Between 2020 to 2022, the APAC market grew at 49.1% which is 0.82% faster than the North American market. While the North American B2B e-commerce market is smaller than APAC, yet it is 122% bigger than the European market. European B2B e-commerce is $1.762 trillion in 2023 making it 6.3% of the global market, growing at 52.1% from 2020 to 2022. The rest of the world B2B e-commerce share remains at $78.489 billion, which is roughly 0.3%. It is interesting to note that the U.S. share in the global B2B e-commerce has been declining steeply, which is evident by looking at the last 10 years of data. In 2016 U.S. B2B e-commerce global share was 65.9% while in 2023 it has reached 25.1%. Between 2020 to 2022, the U.S. B2B marketplace sales increased 360%, the e-commerce sales reached 3.56% of all B2B sales in 2022 which was only 1.11% during 2020 i.e., 221% increase. The research suggests that one purchase is made by 88% of all the Global

B2B buyers through the e-commerce platforms while 35% of the B2B buyers made 50% of their purchase via the e-commerce platforms. A quarter of the global B2B buyers make 50% to 74% of their purchase from e-commerce platforms and only 9% of B2B buyers make over 75% of their purchase from the e-commerce platform. Having an e-commerce portal increases the chance of engaging the buyer for a B2B purchase. We have also provided a channel wide contribution for B2B business. The B2B e-commerce market value is expected to become 315% higher than B2C e-commerce. The annual worldwide GMV for B2B e-commerce will exceed the B2C e-commerce GMV by 73.1% in 2023. In 2023, the U.S. B2B e-commerce is almost ~200% bigger than the B2C e-commerce although the B2B e-commerce market will be 9.97% lower than the B2C e-commerce during this period. The research also indicates that the e-commerce sales will continue to grow globally at a higher pace in comparison to U.S. In 2023, the combined global e-commerce revenue of B2B and B2C is nearly $32.47 trillion which was $25.26 trillion in 2022, by 2025 this will reach $40 trillion and $70 trillion by 2030. The U.S. figures for this period is $4.808 trillion and this is expected to reach $19.154 trillion by 2028. The global B2B e-commerce sales contribution is 80.6% as compared to U.S. where B2B contributes 74.9% of the total e-commerce (B2B+B2C) (Capital One Shopping, 2024).

As of December 2023, CapitalOne Shopping research also published the Global e-commerce. As per the report, in 2023 the global e-commerce retail will reach $6.31 trillion by 2023 which is 10.4% higher than $5.72 trillion of 2022 and is expected to reach $8.03 trillion by 2027. The U.S. e-commerce is up $1.21 trillion by 2023 *i.e.*, 16.3% increase last year and will reach $2 trillion by 2027. Amazon is the biggest online retailer worldwide in the B2C segment while Microsoft is the biggest B2B e-commerce company. This is also a source of information for Markinblog which provides deep insight into global e-commerce growth. As per the Markin blog, as of June 2023, there are 26.5 million e-commerce sites globally, which keeps on increasing daily. There has been a 300% growth in the e-commerce sites during 2019 to 2023 *i.e.*, from 9.2 million to 26.5 million (Kin, 2024).

Successful E-commerce venture across the Globe

Although US was the pioneer in the e-commerce space, but the current data suggests China leading the e-commerce space. We will quickly summarize the e-commerce across the rest of the world –

- **China** – China boasts it presence as the largest e-commerce market in the globe with yearly online sales of ~$3 trillion. Alibaba, Tmall, JD.com and VIP.com are a few of the successful multibillion-dollar brands (Fairlie, 2024).
- **United Kingdom** – With an annual e-commerce sale of $195 billion, UK is a key e-commerce market. Amazon UK, eBay UK, Asos, Sainsbury and Tesco are a few of the successful online stores (Fairlie, 2024).
- **Japan** – Japan's online sale revenue is closer to that of UK's ~ 193.4 billion. Rakuten and Yodobashi are their premier online marketplace (Fairlie, 2024).
- **South Korea** – South Korea has a yearly e-commerce sale of ~ $147.4 billion. The biggest players in this region are – Coupang, SSG, Gmarket and Himart (Fairlie, 2024).
- **Germany –** Germany is a major e-commerce market in Europe with a yearly revenue of ~ $97.3 billion. Otto, eBay and Amazon are one of the key players in this region (Fairlie, 2024).
- Other prominent e-commerce havens include Indonesia, Canada and France. (Fairlie, 2024).

In the above sections we looked at how the U.S. and global ecommerce is trending. We also saw the contribution of the B2B and B2C components of the e-commerce market. We will now discuss India's journey into the e-commerce space.

India's e-commerce journey started with Fabmart.com in the 1999, this venture also had a brick-and-mortar store in Fabmall, it was acquired by another Indian conglomerate and rebranded while Fabmart.com went to be known as IndiaPlaza with a dot com and dot in domains registered for operation. Initially a department store, it quickly expanded its

footprint into other categories including groceries, books, movies and watches. Due to larger competition from its peers and newcomers during the early 2010's, the company went out of business (Wikipedia contributors, 2024).

E-commerce arrived in India along with internet during 1995. Initially it started with only with the support for B2B transactions and by the late 1990's expanded to B2C transactions. The initial B2C websites were majorly centered around matrimonial and online recruitment. Year 2002 is a major milestone in the history of Indian E-commerce, IRCTC, an online reservation portal by Indian Railways was launched which led to the online travel booking as a front runner in the e-commerce race. The authors conclude their work identifying the gaps in e-commerce penetration in tier-2 and tier-3 cities (or semi-urban and semi-rural). As per the authors, the COVID19 pandemic is expected to boost e-commerce acceptability and spread across the country in an exponential manner. This paper highlights the supply chain and logistics challenges which are majorly dependent on the infrastructure and industry policy (Nougarahiya et al., 2021).

The Indian Government project ONDC (Open Network Digital Commerce) has gained significant attention among the sellers and buyers. This initiative has been a positive influence on the existing and upcoming e-commerce expansion. The authors have described the potential of this initiative among the small, medium and large companies leveraging this platform (Dash *et al.,* 2022).

The Indian Brand Equity Foundation (IBEF) publishes the e-commerce industry data and forecast. IBEF projects the Indian e-commerce industry to surpass USD $325 billion by 2030 which as of 2023 was USD $102 billion, this projection is based on the growing internet user base which stood ~ 936.2 million as of 2023. The Gross Merchandise Value (GMV) reached $60 billion during 2023 registering a 22% growth over the previous year. The growth of e-commerce will be fueled by friendly government policies specifically around 100% foreign direct investment in the B2B space. Quick commerce has gained significant attention and attraction due to the entry of superfast delivery commitment by companies like Big Basket, Zepto, Blinkit etc. Currently this service is more prominent for groceries, but this has added additional pressure on retail giants like Flipkart and

Amazon for quicker delivery of the rest of the products as well. Overall, the Indian e-commerce story seems promising and exciting and is seeing huge traction from the industry and consumer alike (IBEF, 2024).

1.2 Research Problem

India's potential as e-commerce powerhouse is evident from the data published by different market research and government agencies. The e-commerce investments and growth is being powered by the rapid urbanization, mobile internet and digital payment infrastructure. The growth of this industry will require strategic decisions including product pricing and customer focussed offers.

While there has been significant research in the optimization of cost to maximize profit and minimize the waste (return, cancelation and refunds), pricing strategy for surviving the dynamic pricing in the market (Schlosser et al, 2016), maximizing the profit of the supply chain (Huang and Lee, 2020) and price discrimination strategy that makes it difficult for buyers to compare the prices of alternative product offerings (Shin, 2001, Bakos, 1998), but there is no significant work done towards analysis of comparative pricing among the e-commerce providers in India or elsewhere. Hence, this research is targeted in this domain especially targeting the Indian e-commerce market.

1.3 Purpose of Research and Questions

As an emerging market and the fastest growing economy, we see a huge e-commerce activity in India and a great amount of new online companies are competing for the customer base and market share with offers and promotion for the customers. This study will enable an understanding on how the price of different products vary on different e-commerce platforms, this will also enable us to uncover if the same sellers sell this product at different prices on different e-commerce platform and if there is a specific trend the pricing for same product either by same seller or different sellers is being

followed on the same or different e-commerce platform. At the same time, we can also analyze if the customer feedback has any effect on the product pricing on the e-commerce platform

1.4 Significance of the Study

There have been papers and studies where the growth of e-commerce has been discussed widely. The researchers have presented models for price competitiveness, platform fees, dynamic pricing, customer benefits due to e-commerce but there are very few studies and discussion that compared the prices of products listed by different e-commerce sellers (that too are not related with India Market). This study is an attempt to understand the price variance for selected group of products by different e-commerce sellers. We hope our study will help us understand –

1. How product prices vary among different e-commerce sellers
2. Which e-commerce platform shows most price variance for different products.
3. We also expect that this study will help both customers and sellers to take right decisions on purchases and pricing respectively

CHAPTER II:
REVIEW OF LITERATURE

2.1 Introduction

In the previous chapter we gave insights on the e-commerce market both global and Indian, major e-commerce organization, problem statement that this research attempted to investigate. It included the background of the problem, its context and the objective and goals of this study along with the research methodology and research contributions. Finally, the outline of the structure of this thesis was provided.

This section provides the relevant literature which has guided our research purpose and objectives. The section begins with the Introduction of ecommerce, its status, benefits, drawbacks, risks and limitations, followed by the state of ecommerce in India. The Buyer seller relationship is introduced and finally the section for seller competition across different ecommerce portals has been discussed. Before we proceed further, considering the fact an online marketplace can be host a company and an Individual seller, lets establish upfront that the firm, management, marketing and sales team can be considered as the same person for an individual seller.

2.2 Theoretical Framework

2.2.1 Preliminary Studies on Pricing

Out of the four key elements of marketing, the first three elements, viz. Product, Promotion and Placement, are activities to create an organization's value. While the last element, which is pricing, works significantly differently than the rest of the three. Out of the four, pricing is the only element that contributes to organizations' attempt in capturing certain value based on the profit it earns. Pricing strategies lead to the profitability of organizations, which according to research carried out by Deloitte, offers a better chance for exceptional performance than revenue growth or value creation. With the current cutthroat competition, organizations brainstorm on effective and sustainable pricing which customers will be willing to pay and yet would help the organization to

earn profit. It is also noteworthy that the authors consider sales profitability as a priority instead of an afterthought. Pricing remains a major differentiator and the approach on how to arrive to the right price depends on the different processes which lead to successful or unsuccessful pricing, commonly known as Strategic pricing. Strategic pricing depends a lot on when, how and who, when making the pricing decisions. When there are alternatives for a customer for a product or a service it becomes important to determine the right economic value which would help customers choose what you present instead of alternatives. It is very important for the management and sellers to define the right and transparent pricing policies and procedures which are consistent with the goals of the company or sellers. This requires the right relationship between the marketing and finance teams towards finding the right balance between customers' wish to obtain high value and firms' goal for earning the profit alongside covering the cost (Nagle and Müller, 2018).

This work also discusses the different pricing strategies organizations use. Below are some of these –

1. Cost-plus pricing (cost driven pricing) – This is the most common approach which derives the pricing by allocating the costs equally and wholly such that each of the services and product will return the desired return overall the costs that was spent on developing the product or providing the services. This principle comes with its own challenges as in the real world it's very difficult if not impossible to determine the actual cost due to the fixed and dynamic nature of certain cost components which may depend on multiple factors, hence become painful for determining the unit cost before the price. This approach assumes a level of sales volume and further assumes that the price can be set without affecting that volume. Thus, without accounting the effect price on volume and the effect of volume on cost, the pricing decision may undermine profits. The higher price to cover the costs can again cause a chain of declining sales and increasing unit costs and further increase the price. Another loop in the theory is, if the sales are higher, the fixed cost is spread across the volume of sales, which means lower average costs and will in theory, prompt for reduction in the

price. Based on this approach, a strong market will lead to underpricing while a weak market will require overpricing and hence this approach is not ideal for pricing. The near sure path to profitability lies in letting the anticipated price determine the cost incurred and not the reverse. The later theories have different approaches which will be discussed (Nagle and Müller, 2018).

2. Customer Driven Pricing – With the shortcoming of cost driven approach, the organizations started looking for alternate methods, one of these was the realization of pricing to be dependent on market conditions which is consistent with the value-based pricing. Based on this approach the pricing decisions are best suited for the marketing and sales teams who are in a much better position to understand the value to the customer. Although in the real world, it has been observed that if the pricing decisions are handled by such teams, short-term sales become their primary objective undermining profitability. This loop creates a trap for the sales and marketing team where the pricing is decided by what customers are willing to pay instead of what the product or service is worth. The authors establish that the goal of strategic pricing may not only be to create customer satisfaction. In theory, customer satisfaction can be achieved by underpricing products and services and over delivering value. This can result in increased sales and give an illusion of marketing success. On the other hand, strategic pricing is to create value alongside increased profitability, which may or may not generate more sales. In this theory when taken in account the buyers' perspective, two immediate problems seem to be more prominent –

   a) The transparency and honesty on what an actual buyer will be willing to pay.
   b) Pricing needs to be decided on the worth of the product and/or services from a subset of satisfied customers and then it needs to be explained to the uninformed customers (Nagle and Müller, 2018).

3. Share Driven Pricing – This theory explores the idea of competitive pricing or competition driven pricing. In this context, pricing becomes a tool to gain market share. In the last section we saw the best way to achieve the sales objective is to lower the price,

which is usually a poor decision considering profitability. Certain market share objectives also depend on matching the competitor's prices for a service or product. The easiest way to get there quickly is to price the product or services such that competitors cannot match the price cut to that level. This cannot be an acceptable pricing strategy in the long run due to a toll on the profit margin and keeping up with the competitors pricing for market share. The marketing strategy, unique product or service value and product or service availability or reach may not be as good as a price cut in increasing the sales, but it has been found to be more sustainable and cost effective during the long run. As per this theory, the goal of pricing should be an optimized process which needs to find a sustainable way of maximizing profitability and market share. As per the authors, at times the most profitable price is the one that restricts the market share as compared to its competition, for e.g., Apple iPhones®, theoretically it should gain substantial market share if priced lower or near to the competitors but there is a high likelihood that in its pricing strategy it has positioned itself as a profitable and a high priced brand and there is a chance that this will be compromised with a market share approach (Nagle and Müller, 2018).

With all three pricing approaches that we have discussed above, strategic pricing depends on effective trade-offs between the price and volume working in tandem to maximize the profit. Economists have proposed demand curve estimation-based pricing for products and services and then arriving at an optimized price alongside taking care of incremental cost of services or production. Theoretically it seems correct but practically demand curve remains unpredictable and un-stable and hence making it nearly impossible to measure. The theory of increasing demand at times is ironic and contradictory, sometimes the price for a service or product going up can directly be attributed to an increase in demand. Price Elasticity of demand is one of those metrics that is frequently used by economists, which is explained formula –

Price Elasticity of demand = (% change in sales) / (% change in price)

One of the better approaches for estimating the price elasticity is to identify the minimum elasticity to justify a price change, which would ideally mean how % change in sales

would be required to maintain the same profit level with the proposed price change, a concept also known as *breakeven sales change*. One of the key goals of successful strategic pricing is profitability along with customer perception of the value and satisfaction that the product or services offered at that price. Pricing strategies are majorly of three known types – value-based, proactive and profit-driven (Nagle and Müller, 2018).

a) Value-based Pricing – Pricing decisions are decided on the value guaranteed by the product or services to the customer and pricing revisions takes place to justify the value for price behavior for example reduction of demand would require lowering prices. Although practically, unless a similar service or product of a competitor has gone through a price cut, till then there may not be any need for a value-based reason to revise the price (Nagle and Müller, 2018).
b) Proactive pricing – In this type of pricing the pricing decision takes place based on competitive planning and anticipating disruptive events like threat to competition or customers churn etc. Instead of a reactive approach where the price revisions in response to actions of a competitions or customer, this approach works proactive pricing decisions as a planned mitigation for any future risks in terms of customer retention and competitors marketing strategies (Nagle and Müller, 2018).
c) Profit-driven Pricing – Profit-driven strategic pricing relies on every pricing decision being tied up with profitability of the product or services. This is one of the most sensitive and complicated modes of pricing. While profitability is what any product or service yearns for, there seems to be a challenge in the ideal price in comparison to customers' willingness to pay. So, a lower price may not be ideal for the profit targets while higher prices may just limit the customer base. Profit driven pricing depends on the higher margin of a product and services by investing more towards the value created for the buyers (Nagle and Müller, 2018).

The authors propose a six-point pricing strategy known as Value Cascade, which focusses on creating value for the customer which is the only goal of a product or service. Based on this theory we extract the value and price management chain together – **value**

creation, value communication, price structure, price policy, price setting, price competition. Every time the word value is discussed in the context of pricing, please consider it as the amount buyer will be willing to pay for a service or product in other words the worth of the product or services trying to be sold (Nagle and Müller, 2018). In general, the products or services are engineered and manufactured by the product or services team based on the requirements or ideas that seem worthy, these steps require investments and incur the cost of development. This cost is then calculated by the finance team to determine the price of the service or product. The marketing team is then tasked with demonstrating the value of the services or products to justify the price. The problem with this approach is the revision of price with every update or extension of service or product or to meet sales objectives, hence making the cost-based pricing approach a bit immature to handle the price change and profitability in the long run. On the other hand, value-based pricing estimates the price based on the value of the service or product instead of the cost. It is very important to understand that the arriving at desired price may get more tedious than what we see in the theory, for a buyer, there can be endless possibility of market full of alternative product which despite of creating the similar value are priced lower or coupled with some lucrative offers as a part of the competitor strategy. In most cases buyers have found to explore similar products before making their purchase, which makes the value of communication of prime importance. This becomes both an Achilles heels and an opportunity for the organizations to earn the loyalty of their prospective customers by communicating the value earned by purchasing the product or services is worth the amount spent (Nagle and Müller, 2018).

As per the authors, value is key to pricing and requires extensive research to understand the features, services and benefits that create value to a customer, once this is understood, it can be worked towards a cost-effective value proposition for customers. Value is directly dependent on the customer's need and circumstances, even if the goal is to provide low value for low pricing. Customers perceive value based on their information or requirements within the new context. One of the key functions of marketing is to influence the customers' brand choices not only by offered value and price but also by

changing context what customer perceive both in value and fair pricing, for e.g., Apple phones have enjoyed a lot of success in the last two decades despite their high-end pricing due to their management of customers perception and delivery of value. Authors also use strategic value management as an ideal and more meaningful term for Strategic pricing. As per economists, the term value is also known as **use value or utility** gained by the service or product (Nagle and Müller, 2018). It is to be noted that instead of the use value**, economic or exchange value** is used to derive the effecting pricing strategy. This value is recognized or estimated first based on the alternatives available for the customers. Economic value itself is of two types namely, Monetary and Psychological, both the types can be used to estimate the amount the customer would like to pay. The monetary value constitutes the cost savings or additional income that a customer can augment on purchasing a service or product and on the other hand, psychological value how the purchasing a product or service can influence the satisfaction level of a customer (in other terms cause a positive feeling or feeling of pleasure about a purchase). In theory, a more common approach for calculating the total economic value (TEV) is the sum of price of best alternative that customer can refer to and the price of the additional value that your product or service is expected to offer, it is noteworthy to understand that the additional value is the deciding factor on whether the price of the product or services is expected to higher or lower than the competitors. One of the most critical factors which influence a customer's choice is the availability of alternatives, which is also known as the next best competitive alternative (NBCA). In some cases, NBCA may not be available, and the buyers may come up with a self-crafted or customized solution on their own. The differentiation value or DV is one of the key metrics that is calculated based on the net benefit of the product or service over and above NBCA. After identifying the NBCA, the next ideal step is to calculate the competitive reference price (CRP). Arriving at the competitive reference price requires gathering pricing information available in the market (the internet-based price aggregators are one of those options) and a comparison of the same with the price of the product or service in question. The data collection source both primary and secondary can be a starting point and can lead to statistically

significant value of the CRP. Data collection strategies can also include customer surveys and interviews to get first-hand information on the prospective customers' willingness to pay for a value (Nagle and Müller, 2018).

The research also provides information for calculating monetary and psychological value. Both these methods require different approaches to estimate and quantify. The monetary value is quantitative and hence requires quantitative estimation techniques.

Understanding how the product or service influences the cost and revenue for a customer is the first step in this process. Quantification of monetary value is a challenging task given the dynamic nature of the business operations and the effect of any product or services on the customer's profitability. The research proposes an assessment of customer's business model (CBM) to understand (calculate) the ability of a product or service to create value for a customer or an organization, who in turn plan to create a value for their end customers and along with reduction in operation cost, this process can be as simple as few mathematical formulas depending on the CBM. Once the value is derived from the CBM study, it is augmented by customer specific data to calculate the monetary value. This can be as specific as individual interviews or focus groups and surveys. The purpose of this activity is to develop steps to create formulas and methods to estimate the value of each unit of product or the service that carries value as per the customer (Nagle and Müller, 2018).

Psychological value on the other hand depends on satisfaction, happiness, security and positive feeling, which is not quantifiable, at least directly. Due to its subjective nature, researchers rely on multiple quantitative techniques to derive the psychological value of the product or services. The widely preferred techniques used are the *Conjoint analysis* (and extensions of these techniques), which is instrumental in finding the hidden value the customers perceive from a product or service. This technique divides a product or service into multiple features and gathers information on customers' preference on each of those features. With this analysis the customers' willingness to pay and decision to purchase a service or product can be derived (Nagle and Müller, 2018).

The paper also elaborates the concept of Customer value modeling (CVM), which is based on customers' perceptions and judgement on the pricing and attributes of a product or service. It assumes that customers are more likely to purchase a product or services that offers them the best perceived benefit, which can be quantified to cost per feature. This method comes with drawbacks and overestimates the more differentiated product and underestimates the poorly differentiated product (Nagle and Müller, 2018).

Value based market segmentation (VBMS) is one of the key differentiators for product or services marketing. This process creates groups or segments of the market and provides the target audience among these segments and helps in creating a much more efficient and effective pricing process. The conventional segmentation strategies in many organizations may not be specifically directed at those attributes that decide pricing. The VBMS models, which are based on the pricing of the actual value realized and delivered to the customers, are more useful and effective. This helps the marketing teams to set customer segments specific pricing to maximize the profitability of a product or service (Nagle and Müller, 2018).

Now that we are aware of the basic pricing strategies, we can move on to the next sections for online pricing strategies and existing models on the same.

2.2.2 Phase 1 – Initial years of e-commerce (1995-2005)

Early research related to strategic pricing in e-commerce during 2000 studies the pricing behavior of the e-commerce firms/sellers. The researchers hypothesized that there is no rationale behind the price competition between firms and this could be catastrophic for the profitability of all the competitors. They measured this hypothesis against the price action of one seller responded and outmatched by competitor 24 hours and hence confirmed the reactive approach taken competitors or in other words following the leader. This theory held true with low price goods and services during a shorter period which may be due to the fear of the impact of larger revenue generated by low-cost goods and services (Kauffman & Wood, 2000).

One of the studies carried out during 2001 in Sweden, compared the price difference between the online and brick-and-mortar (B&M) stores. The authors have compared the

prices for items like CDs, books and other goods both online and B&M stores, as per their initial findings the online price includes the packaging and delivery cost which as per their argument needs to be considered as payment for services and convenience and excluded while performing this study. When the authors compared the prices for different products, they found that the minimum online price of most products under study is lower than minimum price for most of the products on the B&M stores. The study also found the online stores have a higher price range than those on the offline stores. There was a trend which was consistent for online and offline stores for the product with strong competition (in this case best seller CDs), both online and offline stores had smaller variances in price. The authors further suggest that for customers shopping online, ordering multiple products together will make more sense due to the packaging and shipping cost. The researchers also propose that based on their research, the stores operating in hybrid mode (Brick and Mortar alongside online stores also known as Bricks and Clicks (B&C) store), have higher prices than the purely internet stores. The study also concluded that prices of the completely online stores are lower than the B&M stores regardless of the transportation and packaging costs. It was also found that B&C firms do not cut the prices in their B&M stores. The increasing dominance of B&C firms will limit the pro-competition, avoiding the lower margin of completely online stores. The e-commerce industry is still nascent and new theories of profitability and pricing will come in place with growth of the internet user base (Friberg et al., 2001).

Another paper by Stahl, 2000 studies the pricing strategies and advertising patterns. This paper tries to study and model the seller pricing behavior to maximize the reach to the customers via internet-based advertising and search. The social media marketing and google page ranking were some of the features that did not exist until the next decade, hence the internet advertisement and promotion was different than today. The researchers propose a model which is well suited to e-commerce pricing and advertising, characterizing the Symmetric Nash equilibrium (SNE, which is a concept in game theory where all players use the same strategy). The theory tests the advertising margins as a function of the price and suggests that the product or service which has less price can

spend more on advertising than those with higher prices. If the advertising costs tend to a lower end or become too small, the SNE price distribution can be expected to be closer to the Bertrand price and if the advertising costs increase the same can reach the monopoly price. On the contrary, if the search costs are reduced the SNE price converges at a higher price than the production cost. As per the authors, the two different information channels have distinct effects on the pricing. The authors also propose that with a greater number of sellers the advertising cost decreases while the SNE price distribution tends towards the monopoly price. As per this paper, when the author tries to find the selling price, the statistical results are biased towards the lower priced products and services. When the demand is constant, as per the authors, there is over advertising. The increase in customers or demand may or may not be linked to an increase in sellers and hence as per this model the increase in sales or competition can have a negative impact on the competitive pricing (Stahl, 2000)

We will now go through another research on Dynamic pricing for e-commerce written during 2001. The authors propose that internet-based shopping and information on the price has resulted in decreasing customer loyalty and has caused more dynamic pricing from the sellers to keep up with the buyers' expectations. Online technology provides a means for the seller to update the price with much ease and quicker pace. The pricing cannot ignore the profitability and needs to be pro-competitive instead of cannibalistic. The authors argue that previously used manual techniques for pricing which required knowledge of the market, experience of the domain etc. are insufficient for the pricing analysts to adjust to the price competitiveness. The paper suggests the use of near real time pricing analytics tools that would enable pricing analysts to set the correct pricing based on the customer usage data and pattern. The authors also describe the internet as a new laboratory for pricing where the demand and pricing behavior can be studied and improved. The authors also provide information on the Segmented price sensitivity that clarifies the customers response in relation to the price (Marshall, 2001). Almost 80% of smaller businesses and buyers agree to price as the most important factor in their online purchasing which is in line with the traditional research techniques like interviews, focus

groups, surveys etc. (that take weeks to complete), effective price sensitivity should be near real time based on actual customer purchase data instead of assuming something that a customer is likely to purchase. This work talks about solving dynamic pricing using technology instead of theorem and theories related to pricing. The authors discuss dynamic price management software (ZDPM) from Zilliant vendors available during that time. This software provides useful algorithms and interface for setting up segmentation and pricing rules for testing the price sensitivity in near real time. The tool provided system integration with major databases and programming languages (Marshall, 2001) One of the early papers on e-commerce was written by Ancarani (2002). In his paper he discusses the frictionless status of e-commerce and argues the concept of customer loyalty, which was supposed to be untainted even with internet-based commerce. The author also argues on the early proposition and assumption made during the initial era of digital commerce including increasing price competitiveness among the sellers, lower buyer search costs, and decreasing cost of transactions. The author takes reference to multiple research papers which delve deeply between the myth and reality of frictionless e-commerce and suggests e-commerce plays both ways by providing customers with easy access to price search and the sellers with lower costs of search for their customers. The author suggests better segmentation, smart and dynamic pricing, versioning price and product, bundling and unbundling price for a suitable pricing strategy. This paper also identifies two challenges in digital pricing – customer lifetime value (CLTV) pricing and multi-channel pricing (MCP). As per this research, online customer sensitivity is always lower than offline. Contrary to what we have seen in the previous studies, this paper suggests that prices are higher online and lower offline, although the price of pure online retailers is lower than the B&C retailers suggesting multi-channel retailers employing smarter pricing strategies. Price dispersion is strong online and persistent, which is extremely important for pricing and marketing practitioners. The high price dispersion provides an opportunity for the firms to design a customer value-based pricing strategy. The author in this paper studied the price dispersion both online and offline for two products namely CDs and books, in this it was found that books are 6% cheaper online

(Pure price) excluding shipping and packaging, and it costs 10% more than offline price if the shipping and packaging is included. CDs are 4% lower than offline price considering the pure price while 12% higher than offline price if shipping and packaging are considered (Ancarani, 2002). The author confirms that there is an efficiency in the pure price on e-commerce although the deviation increases with the shipping costs, thus confirming the theory of internet pricing paradise is unrealistic. Further in this paper, how the internet can serve as a pricing paradise is described by focusing more on the firms and price strategists instead of the technology (*i.e.,* internet) itself. Using the internet as an enable the author suggests the firms to resort to customer segmentation, smart pricing, dynamic pricing, price discrimination, product and price version, feature bunding, improved value proposition, brand trust propagation, improved user experience and finally, the multi-channel pricing along with CLTV. The paper proposes multiple flexible pricing techniques viz. fixed pricing, periodic price revision, dynamic price revision, negotiated pricing, auction-based pricing (classing and reverse). Price itself is considered as a paradox in the digital economy, and within the internet it can serve both as weapon and useless. With the increased information firms may be competing for customers under the same price segment for similar products, falling under a commodity trap, hence rendering the price as a useless weapon. On the other hand, with the information available on the internet firms can derive competitive pricing strategies and turn profitable (Ancarani, F., 2002).

2.2.3 Phase 2 – Initial years of e-commerce (1995-2005)

In the above sections the researchers have studied the early expectations from e-commerce to create a competitive environment for buyers and sellers. This works still do not give an idea on how the prices can be derived for gaining the edge in price competitiveness. However, there is certain work available about the algorithms and statistical methods related to e-commerce pricing that we will discuss below.

Early research related to the analysis of price setting algorithms for e-commerce was published by Minga *et al.* (2003). This paper studied the demand and price elasticity by modifying the demand sensitive model of the existing price setting algorithm customized

for a seller selling single type of commodity only. This model suggests that an increase in demand volume causes an increase in profit margin and decrease of incremental or marginal costs thus causing the profit and incremental cost is dependent on the demand volume while demand volume remains independent. The change of price hence depends on the demand volume (Minga et al., 2003)

In one of research, the authors use collaborative filtering algorithms to help online sellers study the effect of multiple product attributes on buyers purchasing preferences, enabling the sellers to update the price against the competition. This paper studies the scenario where the buyers' preference is directly dependent on product price published by the seller. The seller can learn from the historical purchase preference of the buyer and predicts the future preference from the usage pattern through algorithms like Hidden Markov Models (HMM) or Moving Target functions, which the author feels could be more prominent in e-commerce during the future. In this work author also feels the use of Q-learning and MOEA (multi objective based evolutionary algorithm) can help in seller profitability and finally discusses the trade-off in the accuracy and performance of the machine learning or AI algorithms for profitable pricing in the competitive e-commerce market (Dasgupta and Hashimoto, 2004). The dynamic pricing algorithm was analyzed by researchers in 2006 for DVD sales although the authors were not sure of the exact profit growth due to the dynamic pricing. This paper was able to provide mathematical proof of the experience and black-box portion of the dynamic pricing and was also able to develop the benchmark pricing concept that leads to personalization of the e-commerce web pages. The dynamic pricing algorithm proposed by the authors seems useful for firms or sellers with lower sales and products or services prone to frequent price change. During the time of writing this paper the integration of dynamic pricing tools with ERPs based inventory management systems was not achieved (Hwang & Kim, 2006).

Another paper in 2006 studies the optimal pricing strategy that software companies create by extracting data from e-commerce sites. This paper highlights the opportunities and challenges from the available pricing data from the e-commerce websites, which would mean the accuracy and viability of the inference derived from this data. One of the

challenges identified is the poor quality of the estimation of demand due to the inconsistent time-based granularity of the e-commerce data. The authors argue that this is due to the nascent stage of e-commerce and is expected to mature with the growth of this sector. This research benchmarks the data from two vendors viz. Amazon.com and Buy.com, there was a significant difference which could be due to the time difference between the two sources and the benchmark dataset itself. The use of user feedback serves as the measure for product quality and customer perception. This feedback is studied by multiple marketing and aggregator firms as a part of their e-commerce research (Ghose & Sundararajan, 2006).

2.2.4 Phase 3 – The global years of e-commerce (2014-till date)

Most e-commerce websites use personalization algorithms for dynamic pricing and discrimination, this was revealed in a study carried out in 2014. In this paper 16 top US-based online sellers and travel agencies were selected and studied for the variation in their pricing strategy. This study concluded using personalization algorithms to steer price by 4 e-tailers and 5 travel websites. The personalization majorly considered user browsing history, navigation patterns of the user and A/B testing for the pricing strategy (Hannak et al., 2014)

An interesting outcome came from research in 2015, where the authors concluded that a trusted seller or seller trusted by the buyer's provided more price discounts than the non-trusted sellers. This study was carried out under the C2C engagement model (esp. eBay and auction mechanism) of the e-commerce dataset and suggested the discounts are higher on expensive products due to the positive product price coefficient. The study also showed the trusted sellers would be preferred by buyers even if the discount provided is less than those of the untrusted sellers. In C2C e-commerce, sellers are advised to create better pricing and service strategies to retain higher feedback ratings by providing better discounts than the B2B and B&M stores, the higher discounts and lower prices have been found to be positive influence on the buyer's (Joo, 2015).

One of the research projects related to dynamic pricing and algorithmic price was conducted on Amazon marketplace in 2016 where the researchers were able to detect the algorithmic sellers using the target price time series. Their work is able confirm the sellers who were using the algorithmic pricing were able to list as major Buy Box sellers, high sales volume, generate more sales and collect better feedback than non-algorithmic sellers. Based on the observations, price change by the sellers' multiple time during a single day can be tedious, tricky and difficult to manage for multiple products, the authors assume the use of automated platforms like Sellery and Feedvisor for doing this. The algorithmic pricing creates an imbalance in the e-commerce ecosystem making it difficult for non-algorithmic sellers to compete by creating a huge disparity in Buy Box price and secondly the transparency of healthy competition becomes difficult to measure or monitor. The impact of dynamic pricing on customers has not been measured but the frequent update in the price of products may confuse customers (Chen et al., 2016).

An interesting work was carried out in 2016 where the authors partnered with one of the used book sellers (Adanbo) from the Amazon marketplace and compared their pricing strategies with that of the seller. This approach used the sellers existing rule-based pricing algorithms and authors' data driven strategy for two similar test sets. The data driven approach was able to generate more profit based on a less aggressive approach which was found to be a 20% cash-in increase per book. The model provided a discount variable that helped in higher sales with control over the dynamic or aggressive nature of the strategy (Schlosser et al., 2016).

One of the theses published in 2016 discusses the price sensitivity due to the competitor pricing. It proposes a predictive change in price response model (CPRM) to determine optimal price by referring to the competitor's prices. This model was used to test 13 different product categories and Monte Carlo Markov Chain (MCMC) was used for obtaining parameter estimates. The CPRM model is based on Bayes modelling method for modelling sales and price effects. This model predicts the demand curve w.r.t price information. The higher value of price elasticity contradicts with the findings of previous research, which is attributed to the e-commerce specific use case. As per the author, price

elasticity is higher for costly goods and services than that of the low-cost products and services. The price sensitivity is higher for the product with the lowest cost. The model forecast accuracy doesn't improve over the existing models, but it is helpful to determine the optimal pricing (Hartveld, 2016).

An algorithm for estimating the optimal pricing in e-commerce using noisy and sparse data, was proposed in research during 2018. The outcome of this research suggests an increase in profitability and growth of revenue on using this algorithm. This paper suggests customers remain sensitive to the high-priced product, satisfying such customers will require lowering or fine tuning the price. When this method was applied on food items sold online, it displayed huge susceptibility to price variance. The paper suggests the use of the ensemble technique of gradient boosting tree as an acceptable solution for predicting dynamism of demand (Bauer & Jannach, 2018)

An algorithm was developed by a group of researchers in 2018 that can influence the seller's online reputation by predicting the optimal discount on the price using historical data. Ramp-up time for a new seller or e-tailer is the time required to gain to earn customers' trust measured in the term of reputation. This algorithm derives the optimal discount factor and uses this factor along with a stochastic bandit technique on the sellers' historical data to generate lower and upper bound values. The authors test of this approximation algorithm on the dataset from eBay showed a 60% increase in profit with a 40% reduction in ramp up time for short term which during a long term can increase the sellers' profit by at least 20% (Xie et al., 2018)

An interesting work carried out in 2019 considers the pricing process as Markov Decision process (MDP) and proposes a deep learning-based reinforcement learning model which uses a reward function for pricing. When applied for pricing thousands of SKU products in real time it outperformed the baseline methods suggesting the accuracy of this model. As per the authors' this is the first use of deep learning-based reinforcement learning model for dynamic pricing use case. This framework groups or clusters similar products together which is handy during low volume of training via transfer learning. The model also outputs pricing products for each product distinctly by using only the required

features with a limitation of advanced level scenarios evaluation like promotion or subscription-based pricing (Liu et al., 2019)

It is well known and accepted that an e-commerce initiative doesn't require the seller and the buyer to be present in the same or nearby location, although the speed of delivery can significantly increase relative to the distance between the two. In an ideal e-commerce ecosystem usually, the retailers fulfil their orders through geographically distributed warehouses known as fulfilment centers (FCs). The shipping charges and speed of delivery are dependent on these FCs. One of the papers in 2019 discusses optimal pricing strategies for a retailer/seller fulfilling the orders through geographically distributed FCs. The authors came up with a unique prescriptive-predictive analytics model to maximize profitability by optimizing the FC and pricing allotment based on the historical sales data. The simulation results on real data resulted in increased profitability of the retailers (Vakhutinsky et al., 2019).

A 2020 paper discusses the use of PLS regression-based models for dynamic pricing. The paper suggests that e-commerce companies can use the proposed model for personalized pricing due to an increasing number of factors. They discuss the advantages of the PLS based model which can identify the hidden predictors from multiple collinear factors, delivers better results, performance even with huge data and a smaller number of observations. This algorithm is available via open-source libraries and can be used without costing much (Chornous & Horbunova, 2020).

In the same year another e-commerce research which was specific to a fashion e-tailers pricing strategy was published. The authors identified the pain area for the fashion e-tailers as deciding an optimal price and daily discounts on the products to maximize the profit and net revenue. The paper discusses a three-step model for this, the step predicts the next day demand followed by simulating the demand for every product at multiple price points and finally, generating an optimized price for product which would maximize the revenue output using a linear programming algorithm. On applying this model in real time, it was able to increase revenue and profitability (Kedia et al., 2020).

One of the studies focused on the effects of COVID 19 on the revenue and market value of 5 major e-commerce companies of the world. Amazon, Alibaba, Rakuten, Zalando and ASOS were considered during this study. The authors formulated multiple variables that can affect the performance of these organizations viz. cumulative case of infection, total COVID 19 cases and cumulative deaths. While the most influential factor Amazon and ASOS was the cumulative cases of COVID 19, Alibaba and Rakuten was found to be affected by the total COVID cases, Zalando on the other hand was majorly influenced by cumulative death variable (Abdelrhim & Elsayed, 2020).

Researchers in 2021 studied customer reviews and pricing information by scraping data from two e-commerce websites and comparing multiple products. Each of these products are sold by multiple sellers on these portals with the aim of maximizing the sales and profit along with customer loyalty, this can motivate the sellers to opt for unfair means that include fake and paid reviews. The researchers in this paper have created a simple web-based user interface which allows users to check the trustworthiness or authenticity of the product using a trust score compared to the e-commerce marketplaces (Nandi & Mary Posonia, 2020).

The start of 2020 until mid-2022 is what the world will know as the COVID 19 crisis. We have discussed this in the introduction section so we will not repeat the same. COVID 19 caused a major shift towards e-commerce (it is yet to be determined if this shift was permanent or only temporary). Chopra *et al* (2021) published their findings on the pricing strategies adopted by the companies during the COVID-19 pandemic. In their work they found the drawbacks in the existing financial and supply chain framework of the companies which will require them to adapt to a modern and robust architecture to sustain during such a situation. This will also require revisiting their existing pricing strategies and modifying them as per the target market. Pricing is expected to be the most crucial variable during the economic recession triggered due to COVID-19 and formulating a pricing strategy becomes extremely challenging for the managers while still adhering to the ethics and values along with profitability. The pricing model needs to find the right balance between the cost and optimization methods to create an equilibrium

between the demand management and supply chain fulfilment, techniques like dynamic pricing and price slashing will be of high significance (Chopra et al., 2021).

In 2021, one of the project teams used Data mining-based techniques to create a dynamic pricing model. This model was used to analyze the auction-based system and resulted in recommendations on pricing strategies, authors suggested this model can also be used to enhance customer experience and purchasing capacity. The dynamic pricing models were integrated with the enterprise systems of the e-commerce firm or sellers to study the effect of dynamic pricing at multi-product level. The author recommends further deep dive is required to study the effect change in plan on commodity pricing (Yin & Han, 2021)

As already mentioned, e-businesses need to be highly competitive to survive and stay ahead of their competition. Amazon.com is a major e-commerce platform in the world. As of 2021, it has 300 million active users and there cannot be a better example of dynamic pricing than Amazon itself. The study shows Amazon updating the price 2.5 million times a day against the competition, this dynamic pricing has helped increase the profitability of 25% since 2016. The consolidation learning technique if used with dynamic pricing can provide change of hierarchy of the competitors, thereby helping with competitive price (Enache, 2021).

One of the works during 2021 is based on the pre-ordering. Pre-ordering is one of the common trends that has picked up on the e-commerce marketplace during recent years. A pre-order is equivalent to advance booking before the launch of the product in the respective markets. This has gained attention due to the price guarantee (PG) offered by the e-tailers, creating enthusiasm among the buyers due to the lowest price guarantee on opting for the pre-orders. Brands/e-tailers opting for pre-order on their product have started using this technique as their marketing and sales strategy coupled with the pricing strategy. Based on the predicted demand for a product and interested customer segment, the authors suggest that the PG offer can be an optimal pricing strategy for that product while the same may not be true for any other product. Based on the study conducted on Amazon.com, the digital category like DVDs and video games respond well to the pre-

order PG than the rest of the digital categories like TV, Camera etc. It was found that due to the uncertainty of demand under preorder the PG profit increases, which means the seller/retailer can opt for pre-order if the demand uncertainty is high. If the demand uncertainty is medium or low then pre-order PG is not a good strategy, in the scenario where pre-order demand is uncertain (not medium or low), the retailer's profit initially decreases and then increases. It depends a lot on consumer behavior and e-tailers/sellers can study the same and come with their pre-order PG strategy (Pang et al., 2021).

The COVID-19 pandemic was measured by the social distancing and government as well as self-imposed lockdown. This clearly resulted in the decline in the orders or sales from the physical stores (B&M stores), which meant the use of non-physical means for shopping *i.e.*, e-commerce. Although e-commerce sales did not boost globally, the response to the adoption of e-commerce was highly inconsistent, with peaks and slopes, among different economies and people (Rindita et al., 2021) . During the pandemic more traditional bricks and mortars (B&M) sellers started selling online either by listing on the existing e-commerce platform or launching their own online shopping portal. The groceries and household goods saw a huge increase via online shopping. Data suggests a huge increase in the consumption of baby products, medical, health and nutrition, games, food, and toys, while a significant drop was seen in the sectors like aviation, travels, hotels, automobile, jewelry, clothing and fashion etc. A comparison between e-commerce revenue between 2019 and 2020 suggests a significant increase in the revenues and net sales. This study concludes that if the services are available online and provided the basic availability of basic digitization infrastructure, people will resort to online shopping due to the pandemic circumstances which are crucial for the development of certain sectors of the e-commerce categories (Rindita et al., 2021).

A study carried out on the profitability of the Chinese e-commerce platforms during COVID 19 was published by researchers based out of China during 2021. As per the study, online shopping became more common during the epidemic due to availability of the products and the comparatively lower selling price. The e-commerce platforms selling products related to hygiene, disinfectants and fresh produce witnessed more revenue and

growth. The bigger firms with better logistics and supply chain network saw better sales, profit and increased market share. With Jingdong as an example the researchers suggested three measures that can help with profitability and market share (a)Market positioning and development strategy to build the brand for improving the reputation and increasing the intangible assets. (b) Improving gross profit from sales by saving and optimization in warehousing, logistics and expenses. Expansion of reach to increase sales with stable growth of the business assets. Positive results were found by implementing this strategy by JD.com within China which the authors mention as the limitations of these approaches as well (Han et al., 2021)

A thesis published in 2022 contributes to our understanding of e-commerce managers' perspective on product pricing. It discusses multiple iterations of the pricing strategies that managers have worked out based on the market conditions, profit margins, customer retention and their personal judgement. The managers need to be market ready and aware of the product's worth and value, which would help them make the right decision while setting the price. One of the reasons e-commerce firms struggle with the right price is due to the intangible nature of the product or service that makes it difficult to put a price on it (Hoang, 2022). The thesis does suggest an unconscious bias that could influence the pricing decision at the same time as the price setting process is not provided with enough time and resources and is usually reactive. This would mean the pricing is majorly cost and competition based instead of customer or value based and there is a chance that managers' understanding of the product value may be vague instead of practical. It is also possible that customers' expectations can be just out of assumption instead of actual discussions and interviews (Hoang, 2022). Pricing decisions are ruled by promotions, discounts and other offers in a competitive environment. Personalized pricing based on customer purchase and browsing data collected plays a key role in customized offers for the customer in some cases and sometimes managerial intuition in the pricing decision. In conclusion the managers need to be particularly careful around the pricing strategy which is derived using intuition or biased consciousness (Hoang, 2022).

At times profitability goals of e-commerce sellers can lead to suspiciously higher pricing and extremely low pricing. The anti-trust and anti-competition laws exists to prevent the same, Hanspach et al (2024) in their paper based on e-commerce marketplace in Netherlands and Belgium, discuss in depth about the algorithms and automated pricing. In their research they conclude that algorithms-based pricing which results in low prices forming the monopoly market can be inefficient and inaccurate. This was evident based on their analysis of thousands of product prices under a sellers' portfolio which had inaccuracy in their profitability-based pricing towards becoming the monopoly price. The authors propose a heuristics-based approach for identifying algorithmic sellers and discuss the identifiable pricing patterns based on the pricing algorithms. There is consistent correlation between the algorithmic sellers, higher margin and higher pricing, which requires anti-competitive screening to look for algorithmic pricing in case high price. The authors argue the suspicious nature of high pricing over time and debate the need for anti-trust agencies to flag these instances. Although this paper cannot predict or identify collusion, the goal is to correlate the high price of products and pricing algorithms in the real world, thereby creating screening techniques to narrow down the algorithmic collusion and direct the agencies towards the right scenarios (Hanspach et al., 2024).

One of the Research carried in 2024, studies the customer perception towards any online marketplace based on its country of origin. This study was based on online skincare stores which are based out of China and South Korea. It was found that customer perception of usefulness of South Korea was better than China and customer perceive the former as less risky (Gedmontaitė, 2024). This study advises online businesses to gain customer's trust and store image and ratings. The author proposes the following measures for the sellers to succeed with the foreign customers -

a) Reducing risks related to user privacy, payment security and friendly return and replacement policies (perceived risk)

b) Focus of businesses on innovation, product quality, positive customer experience and usability (perceived usefulness) (Gedmontaitė, 2024)

c) Positive perception towards a country can influence users' perception for cross-border shopping (country image perception)

In conclusion this paper emphasizes the image of the country of origin which users perceive as an important factor while cross-border online shopping (Gedmontaitė, 2024).

Another paper based on machine learning based study to detect collusion in algorithmic pricing in e-commerce suggests that differences in quality of products and quantity of products can lead to collusive pricing in e-commerce sellers/firms using algorithmic pricing. Although the authors were unable to generalize their findings to products and services, they conclude their techniques to be useful for all markets (Yalçn & Öztürk, 2024).

A parameterized Bayesian technique, which is a hybrid machine learning method, helps with predicting the probability of purchase by any customer. In this paper the authors studied XGBoost based models, MPG (modified Poisson Gamma model) based model, stacked model (XGBoost + MPG). This technique outperforms the standard methods by at least 3 folds increase in the buyer conversion in the real world and has replaced the tele calling based manual approach. The authors suggest the use of this method for both buyer level and product level (De et al., 2024).

In one of the works, it has been pointed out that price competition is an effective way to keep the price reasonable level and reduction of operating cost for the firms. However, the pricing strategy depends on the competitor and market conditions. Price competition is only the primary stage of market competition, other deciding factors include quality, services and innovations. Sometimes the price wars can be lethal for the competitors, revenue of the firm, profitability and sustaining manpower and finally the society. The rational firms do not let themselves in the price wars (Liu et al., 2019).

One of the research projects in Spain analyzed the different price for same products depending upon whether it was sold online or the traditional establishment. They concluded that they did not observe significant price changes between the two markets. Also, they found similar characteristics of price dynamism in both the markets. Even

though e-commerce has nurtured business competition in Spain but there was evidence of effects on corporate profits (Lacuesta et al., 2020).

The research that was discussed before was majorly focused on B2C e-commerce, let's examine a few research papers which are more inclined towards B2B e-commerce. An early work in B2B e-commerce pricing was by Bichler et al (2002). This study discusses the two types of flexible pricing – differential and dynamic pricing in the B2B e-commerce. As per the paper, the reduction in transaction costs along with uncertainty and volatility in demand are leading to flexible pricing in e-commerce. The paper is aligned on the findings of the previous research which suggests the lower cost for searching for information on pricing and products, especially with use of search engines and bots. As per the researchers' price and product differentiation is the key to the growth of an e-commerce venture. If a seller/firm can differentiate its offering from the competition, the more monopoly it has and is regardless of the consumer awareness over the price. The authors point towards the use of personalization, recommendations, promotions and customer retention benefits as a key differentiator (Bichler et al., 2002). On the other hand, price differentiation is a difficult feat to achieve as it directly affects profitability in the long run. As per this paper the price differentiation is of three types –

a. 3rd Degree Price differentiation – Based on the detailed customer information and customer specific billing the price differentiation requires pricing specific to a customer or group of customers which would mean different price for different customers or group of customers, this is usually accomplished by providing discounts and segment-based pricing (Bichler et al., 2002).
b. 2nd Degree Price Differentiation – In this type of price differentiation, instead of customer-based pricing the pricing is product or service quantity based. A customer purchasing the same quantity pays the same price (Bichler et al., 2002).
c. 1st Degree (Perfect) Price Differentiation – In this type of price differentiation, the seller/firms the price varies based on the volume of the service or product and different customers may be charged differently for their purchase (Bichler et al., 2002).

As per the authors, Airline industry has been a pioneer in differential pricing. The product and price differentiation are promising but they fall short where the prior knowledge of competition is not available or the price for a product or service is uncertain, the paper suggests dynamic pricing is more suitable during these cases. Auction and competitive bidding are couple of dynamic pricing techniques, eBay for example, successfully runs live auctions (Bichler et al., 2002). The B2B e-commerce businesses are expected to shift towards dynamic pricing, as per the research cited in this paper, bidding and other forms of price negotiations are expected to prove more successful in e-commerce. While the fixed price theory of the traditional marketplace is expected to stay but e-commerce is aligning the balance towards dynamic pricing. As discussed during the beginning of this research paper, dynamic pricing is a part of what the authors have described as flexible pricing, we will be referring to the same during rest of the review for this paper. For a B2B business flexible pricing is challenging for both buying and selling part of the supply chain (Bichler et al., 2002). This brings attention to tight integration of both buy and sell systems so that the operational data flows in almost real time. The authors provide an example of auction services to explain flexible pricing on the selling side, when the demand increases the auction amount keeps on increasing until there is no more demand. It seems the computer system manufacturers like IBM and Sun Microsystems were selling their machines (servers) through the auction mode, Request for Quote (RFQ) being the other mode where sellers or vendors bid for the RFQ from the buyer. The buying side modes of flexible pricing techniques are majorly reverse auctions, RFQs, price and service negotiations, out of these reverse auctions are gaining prominence and popularity. The authors argue the need for real time analytics tools for the organizations to process real time information, optimize their operations and value chain (Bichler et al., 2002).

One of the research projects published during 2020 discusses the RFQ submitted online in a B2B e-commerce. The paper identifies the manual pricing process of RFQ by the RFQ responders as a tedious process and is currently dependent on people as pricing information is done by a team member who has experience with determining the cost of

service or product along with profitability. This process is highly competitive and enables the client or service/product seeker to eliminate most of the suppliers based on their cost proposals. Responding to the RFQ requires determining the price without compromising the quality of delivery, in the current competitive market this requires analysis of multiple factors and variables. The authors propose a fuzzy model based on association rule mining and fuzzy logic collectively in a single application known as Smart-Quo. This application is expected to assist the sellers/suppliers with the decision support for the RFQ process (Leung et al., 2019). Internally this application can identify and analyze the relationship between product pricing and customer purchase patterns and provide pricing related recommendations. Smart-Quo decreased the response time for the seller and was able to provide them with a better pricing strategy there by increasing their profit margins and helping the supplier with submitting a better proposal. This paper concludes emphasizing the integration with technologies like big data, artificial intelligence and blockchain etc. (Leung et al., 2019).

All this work has been extensive and has helped our understanding of different aspects of e-commerce pricing strategies and behavior. Based on the literature evidence, we found very rare attempts on studying the product-seller specific pricing strategies and behavior. The e-commerce organizations and brand managers keep track of competitive pricing which is reflected in the sales and profitability of the organization, although the details of this aspect of study we found missing in the existing literature. We take an attempt to study this behavior by collecting the price information for various products for different Indian e-commerce sellers and try to understand the pricing behavior for the same.

2.3 Summary

We went through some of the great and pioneering work done in e-commerce domain. We also went through dynamic pricing strategies and recommendations by researchers. Despite all these wonderful studies, the existing literatures do not provide information on the certain aspects of product pricing under a competitive market specifically for diverse e-commerce marketplace like India. There also seems to be a huge gap in the seller and

product performance on e-commerce portals. We went through major work done towards price comparison and price competitiveness targeted specifically towards Indian e-commerce, we were not able to find any work related with the product/seller level price comparison or pricing behavior study to that extent. In this thesis we have tried to study multiple products at a brand-model level and study the pricing behavior of these products for different sellers (e-commerce platforms).

CHAPTER III:
METHODOLOGY

This chapter is structured to provide details of the problem we have identified, how we intend to solve this problem, how we have collected the data, why we have collected this data, what tools and techniques we have used to collect, pre-process and analyze the dataset and finally how we expect this data to answer the identified problems in context to this thesis.

3.1 Overview of the Research Problem

In chapter two we did our survey on existing literature on the e-commerce pricing most of these research were majorly in the optimization of cost to maximize profit and minimize the waste (return, cancelation and refunds), pricing strategy for surviving the dynamic pricing in the market (Schlosser et al., 2016), maximizing the profit of the supply chain and it becomes difficult for the buyers to compare an alternative offer due to the price discrimination strategy (Shin, 2001, Bakos, 1998), but we did not find any suitable literature or reference that studies the price comparison between multiple e-commerce platforms (sellers) for similar products. The similarity in this context is the same make, year, model, color and brand of the product under the study. This product needs to be listed on multiple e-commerce marketplaces during the same date and time of the data collection period.

As we concluded in chapter #2 regarding the lack of literature and research towards analysis of comparative pricing among the e-commerce providers in India or elsewhere. The existing literatures do not provide information on the below specifically for India marketplace. There also seems to be a huge gap in the seller and product performance on e-commerce portals in India. During our survey of the existing literatures, we were unable to find exact and explicit work in an Indian e-commerce perspective, we found the detailed answers for the below question were either not available or else not covered in the context of Indian e-commerce –

- Product-wise price variance displayed by a specific e-commerce seller
- Price variance of a specific product by different e-commerce sellers
- Comparison of price listing of a specific product by both retailers and manufacturers over e-commerce

The overall objective of the study is to gather insights into the seller pricing behavior on same or different e-commerce portals for similar products. Based on the existing gaps in this domain, we would like to look at the following high-level questions to derive the actual research questions.

- Is there a visible competition on the Indian e-commerce platforms?
- Does the Indian e-commerce seller get involves in the competitive pricing to boost sales?
- Does the manufacturer and retailers mutually exist on the e-commerce platforms?
- Does the dynamic pricing by sellers follow a specific trend?

3.2 Operationalization of Theoretical Constructs

There have been multiple theories that define research and research processes. There is no complete definition for the same and can vary based on domain to domain and researcher to researcher. For example, Wikipedia defines research as creative and systematic study for the pursuit of knowledge. We will refrain from the other definitions and will try to summarize how we have leveraged these theoretical principles into our study.

Data collection is the backbone of our study, and we have leveraged the real-time (live), historical data from data aggregator and source websites. In one of the papers, the benefits and accuracy of the online crowdsourcing market (OCM) for the foundational theoretical testing has been discussed (Steelman et al., 2014). One of the papers discusses the use of Big Data in e-commerce. The authors suggest that the use of Big Data helps

with accurate information on the market, competitors and customers and enables quicker decisions and better return on investment (ROI). This research studies customer sentiment using Machine Learning based approaches, but the dataset is still collected from the internet (Zineb et al., 2021).

Our study also collects data from the internet. Our study is diversified with the existence of multiple products and sellers. We use the world wide web to build our database of products and sellers (i.e., selecting the population for the study). We apply the primary and secondary data collection procedure by crawling and scraping the data directly from the sellers (e-commerce) webpage as well as the price aggregator websites. We use the latest tools from the open-source community to clean and prepare the data. Using statistical procedures like measure of central tendency we get rid of the outliers and finally, we build a workable dataset by creating a semi-aggregated data mart.

3.3 Research Purpose and Questions

The overall objective of this study is to provide an insight into the seller pricing behavior on same or different e-commerce portals for similar products. Based on the existing gaps in this domain, we would like to look at the following questions:

- Is the same product sold by different e-commerce sellers during the same period
- Does the price vary for different e-commerce sellers for the same product during the same period
- Does the same e-commerce seller update the price for different products during any period
- Is the price update for different products a constant trend by the e-commerce sellers
- Are any of the products sold by the manufacturer on its e-commerce portal
- Is product sold directly by the manufacturer on its e-commerce portal has more competitive pricing than other retailers and dealers
- Is it possible to predict the next pricing decision by the e-commerce sellers

3.4 Research Design

As discussed in chapter #1 and #2, India is a fast-growing major economy of the world and with the most populated country with 1.4 billion people and the recent digitization initiatives have opened enormous opportunity for companies and sellers to target selective internet and social media loving population. The internet is flooded by e-commerce vendors and promoters, which creates a huge scope for both existing and new players. As per a Forbes blog, as of March 2023, there are 880 million internet users in India. (Dipen Pradhan, 2024). India will have 427 million online shoppers by 2027 and will turn into a USD $300 billion revenue market by 2030. With significant investments by companies like Zepto, Blinkit, Swiggy, Zomato towards superfast delivery of daily essentials, the household penetration of e-commerce is gaining a favorable acceptance (A Minhas, 2024). We have discussed the status of Indian e-commerce in details in chapter #1, hence we will be skipping the further discussion here. Before designing this study, we did a thorough analysis of the existing sources of e-commerce data available and literature available both online and offline. While the literature covers the work done in certain areas of e-commerce price competitiveness, our study would like to explore the price competitiveness in the Indian e-commerce industry. While the major studies have been dedicated to the seller-consumer relationship. This study is targeted at the competitiveness of prices among the sellers on different and/or same e-commerce platforms.

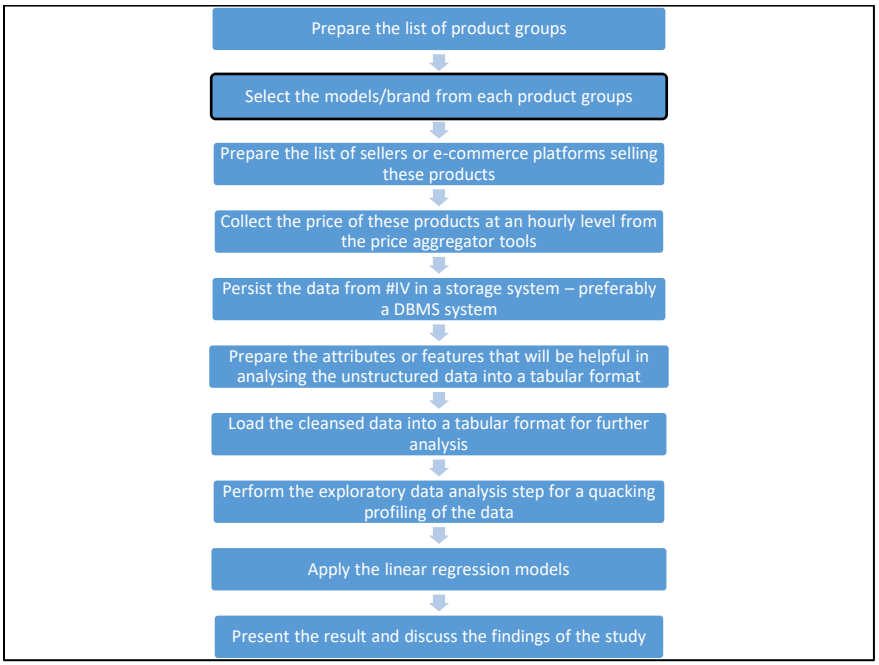
Below is how we have designed the research –

a. Select the list of the potential group of products that would be included in the study
b. Prepare the list of model/brands from each group of products from #I that would be included in the study
c. Prepare the list of sellers or e-commerce platforms selling these products
d. Collect the price of these products at an hourly level from the price aggregator tools
e. Persist the data from #IV in a storage system – preferably a DBMS system

f. Prepare the attributes or features that will be helpful in analyzing the unstructured data into a tabular format
g. Load the cleansed data into a tabular format for further analysis
h. Perform the exploratory data analysis step for a quacking profiling of the data
i. Apply the general linear regression models at:
    a. Seller + model + intraday (hourly)
    b. Seller + model + daily
j. Suggest the best performing model
k. Present the result and discuss the findings of the study

Figure 3.1

Research design flow chart (source – self)



3.5 Population and Sample

This studied is concentrated on the Indian e-commerce retail (B2C). Instead of focusing on the customers, we aim to study the pricing behavior adopted by Indian e-commerce

platforms/sellers. As per the Amazon India business blog published in 2023, the characteristics that helps a product being sold majorly depends on –

- Uniqueness of the product which would mean the unique selling point
- Product demand holds the key to the success of any product
- The value of the product and usability
- Availability, accessibility and reach

As per this blog, below products have been the most sought after by the Indian customers –

- Smartwatches
- Air purifiers
- Gym/Fitness equipment
- Tea
- Candles
- Apparels and clothing
- Jewelry
- Wireless speakers
- Food supplements
- Power Banks
- Wireless chargers and headphones
- Home and kitchen utilities
- Air fryers
- Footwear
- etc.

This is not an exhaustive list, and the complete study is published by the Amazon Business blog (Amazon Business Editorial Desk, 2023)

This list is not consistent with research published by different organizations or market research industries regarding the demand for different products which helps us to assume

that the above list may be based on internal research or customer behaviour within the Amazon e-commerce platform. For example, another blog published by Seamedia.in suggests the most sold products online from the below categories (Prajosh vm, 2024) –

- Electronics and smartphones
- Apparel and Fashion
- Home and Kitchen appliances
- Books, movies (DVD's), video games, e-books, music
- Furniture and home decorations
- Health and wellness
- Groceries and daily usable
- Baby products
- Toys
- Automotives

Another research conducted by Statista in 2024 suggests that the below demand for the product categories is based on the survey conducted on a total sample size of 4053 users with diverse age group between 18 yrs to 54 yrs (Umair Bashir, 2004) -

- Clothing
- Shoes
- Cosmetics & body care
- Food and Beverages
- Accessories
- Consumer electronics and smartphones
- Medicines and health products
- Bags and Luggage
- Home appliances
- Books, movies, games and music
- Baby products
- Sports and wellness

- Stationery
- Furniture and household goods
- Pet products
- DIY and garden products

Another major e-commerce player in India, Flipkart has published a similar article in their blog where they advise their sellers about the most profitable products to sell online (Flipkart seller blogs, 2023)–

- Decoration lamps
- Home/wall decoration
- Bedsheets and curtain
- Locks and latches
- Bottles and utensils
- Apparels
- Bicycle and accessories
- Inverter batteries
- Air cooler and fans
- Handheld blenders

A similar article was published by Qikink which advises on the top products to sell in 2024 (Sundari M, 2024) –

- Clothing & Accessories
- Baby Products
- Bags, Wallets and Luggage
- Car and Motorbike Accessories
- Computers & Accessories
- Electronics
- Garden and Outdoors
- Gift Cards
- Grocery and Gourmet Foods

- Health and Personal Care
- Home and Kitchen
- Home Improvement and Home Decor

Likewise, there have been several articles and market research guiding the sellers on the top selling products that a user is likely to purchase online. Based on this data, we have shortlisted the below products for study at a higher level. We limit our focus to the below subset based on the popularity and utility level of these group products among the customers –

- Smartphones
- Television
- Laptop
- Grocery

Within these categories we further classify the selected products based on existing information about the sales and popularity of the brands and models of the product purchased through various e-commerce platforms. It needs to be defined that these categorizations and segmentation of different domains of products are further granularized at a brand-model level. This is beyond any question that it is near to impossible, at least for this study, to extract the information for all possible brands and their models. For this study we define the population as all brands and their models sold online across multiple ecommerce platforms in India. The sample size is the population that we selected for the sake of this study. There is an exhaustive list for which data was collected for the products, while we present our findings and analysis only on a subset of this population.

- List of samples collected for Laptops (refer Table 1 Appendix 1)
- List of samples collected for Smartphone (refer Table 2 Appendix 1)
- List of samples collected for Television (refer Table 3 Appendix 1)
- List of samples collected for Grocery (refer Table 4 Appendix 1)

3.6 Participant Selection

After selecting the products, it was crucial for us to identify the sellers who were engaged in selling these products online in India. We took the below approaches to identifying the sellers –

Approach 1 – Identifying the sellers based on the google (internet) search results

Approach 2 – Identifying the sellers based on data available price aggregator websites

We combined both approaches and based on the above two approaches, we identified the sellers selling the identified products. There were multiple sellers selling the same product (same or different variant) of the product, we categorized and define the sellers as below (exhaustive list available in Table 5 Appendix 1) –

a) **Manufacturer** – The seller who is the manufacturer of the product as well and along with distributing the products to other retailers operates its own online marketplace, for example Samsung India, Dell India etc.
b) **Retailer (Ecommerce Marketplace)** – The seller is onboarded to an e-commerce platform as a marketplace merchant along with other sellers and the e-commerce platform has a wide range of products, for example Amazon, Flipkart, Shopclues, Jiomart etc.
c) **Retailer (Self owned online platform)** – This type of seller may have started an online venture of their own. These sellers may also operate a physical store along with an online marketplace. It is worth noting that this can be a homogenous shop (for example selling only mobile phones) or a heterogeneous retailer (for example a supermarket or electronic store like Vijay sale, Reliance Digital, Croma etc.)
d) **Retailer (Refurbished/Used/Renewed products)** – This type of seller can be a part of either of three sellers discussed above, the only difference would be these sellers are selling the used or refurbished versions of the products.
e) **Retailer (importer)** – The final category of retailer is the one who ships or fulfils the demand by exporting the product from a foreign location (For example Ubuy).

Our database became extremely large due to multiple product-seller combinations. The next step was to create a sample size for the study with valid product-seller combinations. We arrived at final sample size of - 55 product models for 157 sellers based on the price variance observed for the product group.

Table 3.1

List of final set of product participants for study

Model	Category
Apple iPhone 13 (128 GB/Blue) New	Smartphone
Apple iPhone 13 (128 GB/Blue) Old	Smartphone
Apple iPhone 13 (128 GB/Pink) New	Smartphone
Apple iPhone 13 (128 GB/Pink) Old	Smartphone
Apple iPhone 13 256 GB Blue New	Smartphone
Apple iPhone 13 Pro 512 GB Graphite New	Smartphone
Apple iPhone 13 Pro 512 GB Graphite old	Smartphone
Samsung Galaxy S23 Ultra 5G Black (512 GB/12GB/New)	Smartphone
Samsung Galaxy S23 Ultra 5G Green (512 GB/12GB/New)	Smartphone
Samsung Galaxy S23 Ultra 5G Green (512 GB/12GB/Used)	Smartphone
Samsung Galaxy S23 Ultra 5G Black (256 GB/12GB/New)	Smartphone
Samsung Galaxy S23 Ultra 5G Black (256 GB/12GB/Used)	Smartphone
Samsung Galaxy S23 Ultra 5G Green (256 GB/12GB/New)	Smartphone
Samsung Galaxy S23 Ultra 5G Green (256 GB/12GB/Used)	Smartphone
Infinix Hot 10S Heart of Ocean (4 GB/64 GB/New)	Smartphone
Infinix Hot 10S Heart of Ocean (4 GB/64 GB/Used)	Smartphone
Infinix Hot 30i Blue (8 GB/128 GB/New)	Smartphone
Infinix Hot 30i Black (8 GB/128 GB/New)	Smartphone
Motorola Moto G82 White Lily (8 GB/128 GB/New)	Smartphone
Motorola Moto G82 Meteorite Gray (6 GB/128 GB/New)	Smartphone
Nokia C32 Breezy Mint (4 GB/128 GB /New)	Smartphone
Nokia C32 Breezy Mint (4 GB/128 GB /Used)	Smartphone
Nokia C32 Beach Pink (4 GB/128 GB/New)	Smartphone
OPPO F23 Bold Gold (8 GB/256 GB /New)	Smartphone
OPPO F23 Cool Black (8 GB/256 GB /New)	Smartphone
OPPO Find N2 Flip Astral Black (8 GB/256 GB /New)	Smartphone

OPPO Find N2 Flip Astral Black (8 GB/256 GB /Used)	Smartphone
OPPO Find N2 Flip Moonlit Purple (8 GB/256 GB /New)	Smartphone
OPPO Find N2 Flip Moonlit Purple (8 GB/256 GB /Used)	Smartphone
POCO X5 Pro Astral Black (8 GB/256 GB /New)	Smartphone
Samsung Galaxy F12 Celestial Black (64 GB/4 GB /New)	Smartphone
Samsung Galaxy F12 Celestial Black (64 GB/4 GB /Used)	Smartphone
Samsung Galaxy F12 Celestial Black (128 GB/4 GB /New)	Smartphone
Samsung Galaxy F12 Celestial Black (128 GB/4 GB /Used)	Smartphone
OnePlus 10 Pro Volcanic Black (128 GB/8 GB /New)	Smartphone
OnePlus 10 Pro Volcanic Black (128 GB/8 GB/Used)	Smartphone
Samsung Galaxy Z Fold 4 5G Beige (256 GB/12 GB /New)	Smartphone
Samsung Galaxy Z Fold 4 5G Beige (256 GB/12 GB/Used)	Smartphone
Xiaomi 12 Pro Blue (256 GB/12 GB /New)	Smartphone
Xiaomi 12 Pro Blue (256 GB/12 GB /Used)	Smartphone
vivo Y16 Gold (128 GB/4 GB/New)	Smartphone
vivo Y16 Gold (128 GB/4 GB/Used)	Smartphone
Daawat Rozana super Basmati rice (5 KG)	Grocery
Fortune Biryani Special Basmati Rice (5 KG)	Grocery
Tata Iodized Salt (1 KG)	Grocery
Vim Fresh Lemon Dishwash Bar (200 g)	Grocery
Milky Mist Salted Butter (100 g)	Grocery
Amul Salted Butter (100 g)	Grocery
24 Mantra Organic Chana Dal (1 KG)	Grocery
LG 139 cm (55 inches) 4K Ultra HD Smart NanoCell TV	TV
Mi 139.70 cm (55 inch) Ultra HD (4K) LED Smart TV	TV
Samsung 7 138 Cm 55 Inch Ultra HD 4k Led Smart Tizen TV	TV
Sony Bravia 139 cm (55 inches) 4K Ultra HD Smart LED Google TV	TV
HP Pavilion 14-ek0078TU x360 Intel Core i5 12th Gen laptop	Laptop
Lenovo IdeaPad Flex 5 Intel Core I3 Laptop	Laptop

3.7 Instrumentation

After the research design and participant selection, it was very important for us to select the right tools and software techniques to conduct the research. The tools and techniques required for this study have also been discussed. This study requires the below –

Hardware Requirements – A standard laptop was used for this study with the below configuration -

1. Processor – Intel Core i7 6th generation
2. RAM – 16GB
3. OS – Windows 10 Home 64 Bit
4. Graphics – NVIDEA 4 GB

Software Requirements – Multiple software was part of the data extraction, processing and analysis.

1. R programming language – 64 Bit
2. RStudio – community edition
3. Python – 3.10.5
4. Spark – 3.3.0 (Hadoop 2.7)
5. Java – Amazon Corretto 17.0.12 (Open JDK)
6. Power BI Desktop / Jupyter notebook
7. Office 365 (Word, Excel and PowerPoint)
8. Google Drive/Docs
9. Edge/Chrome browser
10. Internet Connectivity – 300 Mbps broadband connectivity

High-level Solution Architecture –

We have followed the solution architecture as in the Figure, for collecting the data, cleansing, transforming and persisting the data from an unstructured format into a structured tabular format. Below are steps followed in the high level architecture –

1. Using a R based Web-crawler the seller (R Core Team, 2024), price, user feedback and product metadata was crawled and scraped from the internet for each product every hour until December 2023 and sporadically during Jan 2024 and May 2024.

2. The unstuctured data was stored along with certain audit columns like – date added, product model and hour in the MariaDB relational database (MariaDB Corporation, 2024).
3. Using MariaDB stored procedures and PySpark (Apache Spark, 2024) data cleaning functions, the data was cleansed and transformed- cleaning involved extracting price, rating and seller name, model description from the unstructured data (the was no exact regex based pattern)
4. From PySpark the data was initially convered to the parquet based raw data table (Apache Parquet, 2024).
5. From the Raw Data the data was reconciled with the dimensions to generate the dimension tables for date, sellers, product model and bridge tables for product date and product-seller-date were created.
6. The final processed and transformed tables were then loaded back into the MariaDB database for further analysis.
7. Post this step, we started analysing the data for each product and seller combination and segregated the refurbished version of the same.
8. The data was aggregated and minimum and maximum price for the product-seller combinations were determined
9. At the same time we aggregated the data for the Linear modeling as well. The objective was to predict or extrapolate the subsequent price based on the current and historical pricing data by visualizing the plot using Plotly (Plotly Technologies Inc., 2024).
10. The hourly and daily granularity of data was used for this purpose.

Figure 3.2

High Level solution architecture for the study (source – Self)

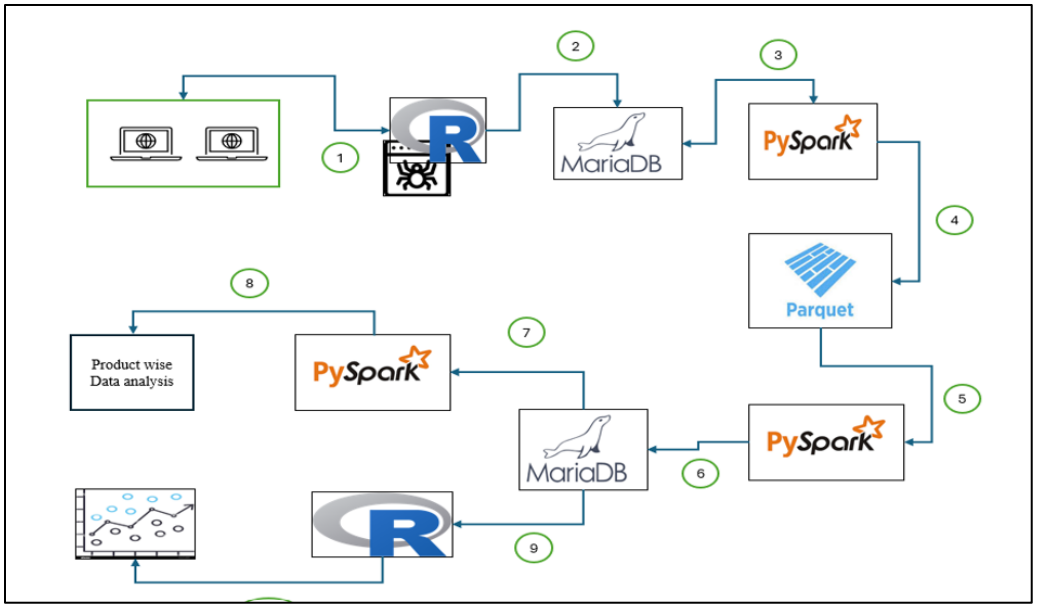
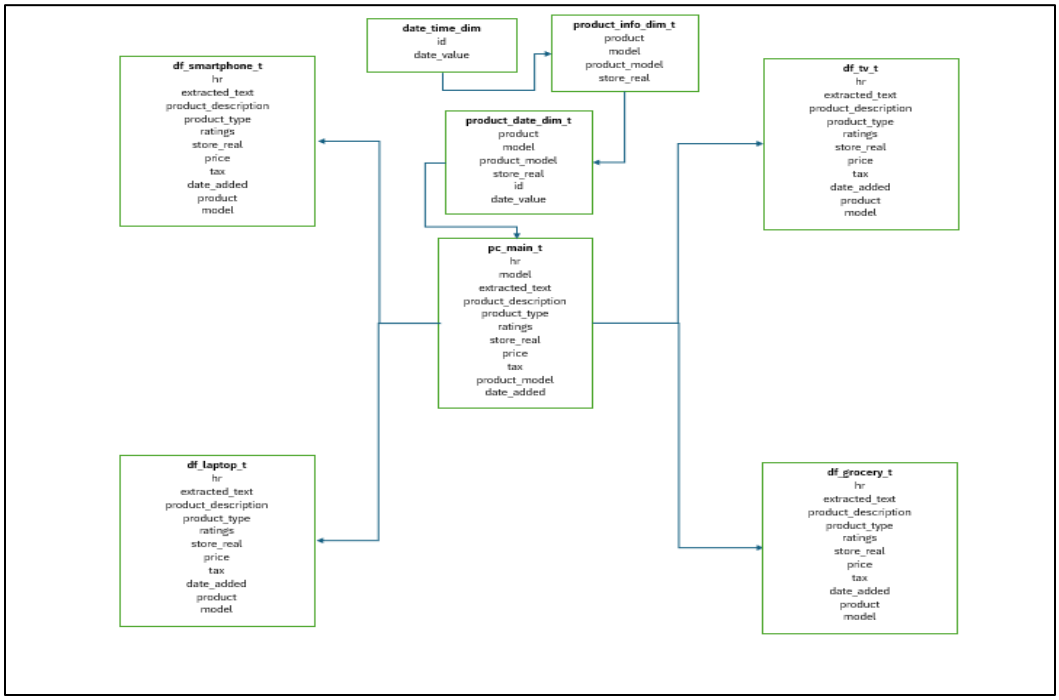


Figure 3.3

Dimensional Modeling for the price competitiveness database (source – Self)



3.8 Data Collection Procedures

The data we collected for this study is available on different websites, price aggregators, product review websites, market research websites. We used the the below procedures for the data collection –

- **Selecting the products** – We manually collected the data studing multiple market research websites and blogs for selecting the products. For e.g., for the Smartpohes the websites like 91mobiles (Krishna, 91 Mobiles, 2023), Counter point research (Counter point research, 2024), Gadgets360 (Gadgets 360, 2023) and Statista (Sun ,Statista, 2023) etc.
- **Collecting the product price from different sellers** – In the above step we identified the products that were selected, post this the next challenge was to extract the prices for this product among multiple online sellers on an hourly basis. The real time price and seller data was extracted by automated web crawling and scaping from Google shopping (Google shopping, 2023), Xerve online price aggregator (Xerve, 2023), Smartprix (Smartprix, 2023) etc. The data from these websites was crawled and scaped by generating a specfic URL for each of the product.
- **Storing and persisting the data** – The data storage and persisting was a key requirement for the further analysis of the data. Hence while scraping the data from the webs pages, we also persisted the raw data in unstructured format in a Relational Database Management System (RBDMS)

Web scraping as a data collection method–

1. A metadata repository of the products and their URL for pricing among different online seller
2. The hourly pricing for each of the product among different sellers was scraped from the live websites during the period of study. The benefits of scraping as data collection method has been discussed in one of the paper in 2021, where the use of Natual Language Processing (NLP) based methods for effective data cleaning during

the scraping of HTML pages and the required studies before scraping the website (Khder, 2021).

3. Another approach as an alternative to conventional HTTP (Hyper text transfer protocol) was proposed by a group of researchers in 2018. This method, although superior in its quality of scraping is non-portable and higher latency etc. (Gheorghe et al., 2018)
4. Another paper in 2022 proposes Selenium and BeautifulSoup libraries as tools for webscraping. As per the authors they found BeautifulSoup as a better tool for scraping low complexity or static websites while use of selenium was found more suitable for scraping complex and dynamic content based websites
5. One of the papers on scraping product price information from e-commerce websites suggests the efficacy of the extracted information. The researchers compared the price of iPhone from Snapdeal and Flipkart and found the price slightly lower on Flipkart (Srividhya & Megala, 2019).
6. One of the researchers has discussed the democratization of information using the scraped data but at the same time mentioned the challenges of server overload and stress on the systems due to the unlimited requests from the users and robot extracting the data using web scraping which presents legal challeges as well (Hadasik, 2024)
7. In a work released in 2022, the researchers use YOLO and Tesseract LSTM based artificial neural network and ResNet libraries for intelligent data collecting from different e-commerce websites. The use of deep learning methods in e-commerce is expected to revolutionize the data scraping process for e-commerce (Selvy et al., 2022).
8. There are many more research citing the benefits of web crawling and scraping as a data collection methodology for research study.
9. We have used a similar R based crawler and scaper to extract the data for the product sample size in a completely automated manner

10. As discussed earlier, the data is persisted in a database and as described in the solution architecture the cleaning and transformation step are carried out for converting the unstructured data into a structured table.

3.9 Data Analysis –

Data analysis in research study can be accomplished by multiple statistical and mathemetical methods. While all research starts with testing a hypothesis, the methodology of studies may differ from study to study. Analysis of variance is a core part of major studies (ANOVA) which may be one-way or two-way, probability distribution, regression analysis, Bayesian inference are key component of certain research (Weerahandi, 2013)

Data Analysis Steps – Data Analysis for this study was carried out in multiple stages.

a. **Choosing the population for study (product selection) -** The analysis of data started with the selection of population based on the information on the popularity and sales of the product from multiple market research organization, e-commerce blogs, product reviews on google. The data analysis in this case was purely manual and we took the mode (frequency) of products reported by majority of market research websites and blogs and prepared the list of products required for this study
b. **Extracting the readable data from scraped HTML pages –** We scraped the data for each product using R based scraping algorithm. The raw data is an XML based tree of nodes and is not readable (Figure). This initially requires extracting the meanignful element from the HTML page. The extracted data is readable but not yet meaningful (Figure). This is a continuous activity and each product price is scraped on an hourly basis for the time period of the study. We used system generated timestamp field along with the product metadata to create the first structured entity for this study. This record (Figure) was inserted into a database table.
c. **SQL based Data analysis** – Once the data was available in DBMS layer. Below data analysis steps were carried out –

i. The first task was to clean the data by removing non-meaningful records, removal of duplicate records
ii. Extracting meaningful attributes like product description, product variant (color/storage/memory/volume), price, user review, seller, taxes and shipping price and type of product (New or refurbished – valid for Smartphones and Laptops for this study).
iii. By comparing the minimum, maximum and average daily, weekly and monthly price of the product-seller combination, we identified the outliers and excluded them from this study
iv. By analyzing the variance between the prices of the products-seller combination, we compared the price variance existence and selected those products which demonstrated significant variance among the group.
v. We visualized the final results using MS Excel based Tables and Charts.

d. **R based Linear modeling** – We also leveraged R based linear regression library for fitting the linear model. We used one of the papers as a reference for this work where the authors predicted the stock price an organization using the information from the previous day as features. The authors achieved better prediction with higher R^2 values, the authors concluded that the higher R^2 values were observed when the previous day price was included as a feature (Cakra and Trisedya, 2015). We considered this work as our baseline in creating the price pediction model.

3.10 Research Design Limitations

Our research suffers from the below limitations –

a) Among the infinite list of product brands, we have only considered a subset of the products
b) Our study completely excludes the brick-mortal level price variance or competition due to the physical stores
c) We have only considered few products from Smartphones, Grocery, TV and laptops while the exact category segregation is much diverse and bigger than this.

d) For product selection we have referred to the data available from the internet by the 3rd party marketing research firms and blogs.
e) We have only considered the 3 months of continuous (hourly) data collection and post that sporadic frequency of data collection was done.
f) For extracting the price and seller information we have used the price aggregators like google shopping etc. This approach can eliminate non-listed or non-indexed sellers
g) We have excluded the tax, shipping, in-page discounts (coupons/cashback and bank discounts) for this study.

3.11 Conclusion –

In this section we have discussed our approach for conducting our study and the significance of this study. We explain our top-down approach for answering the question as a part of this study. We also provide the list of products and seller and how we have classified different categories of products. The methodology along with the high level design and data modeling has been discussed. Finally, the data analysis steps were explained along with the limitations of this study.

CHAPTER IV:
RESULTS

In this chapter we will discuss the results of our study. From the study population discussed in Chapter III, we have discussed the major product where we found significant data related to pricing and variety in sellers. We have aggregated the hourly data into daily data for the linear regression study and for the study of the price variance we have aggregated the minimum and maximum price listing by each seller for each product. Based on the attributes collected and derived we also propose a linear regression model for deriving the next day's product price. This model relies on the data collected and prepared during this study –

Case 1 – If the user rating for the product is available –

Predicted Price = store+ trailing price + ratings (user feedback in #'s)

Case 1 – If the user rating for the product is not available –

Predicted Price = store+ trailing price

For calculating the price variance for the product-seller combination we have used the formula – **price_variance = ((max_price -min_price)/ min_price) * 100**

Based on the questions we are trying to answer, the below results have become extremely crucial. We expect to answer the following questions with the results obtained. The results provide detailed information on the price range among different product within and across different sellers. –

1. Is the same product sold by different e-commerce sellers during the same period of study?
2. Does the price vary for different e-commerce sellers for the same product during the same period?
3. Does the same e-commerce seller update the price for different products during any period?
4. Is the price update for different products a constant trend by the e-commerce sellers?

5. Are any of the products sold by the manufacturer on its e-commerce portal?
6. Is product sold directly by the manufacturer on its e-commerce portal has more competitive pricing than other retailers and dealers?
7. Is it possible to predict the next pricing decision by the e-commerce sellers?

4.1 Detailed findings of the Research Questions -

Smartphones

Apple iPhone 13

- Apple iPhone 13 – iPhone 13 launched in 2021 is one of the best-selling phones across the globe. It has a wonderful user base with India too. In India, this product is available both online and offline stores. Although this product has multiple variants based on the storage, colour and memory features, for this study we have considered the below variants –
- Storage Size – 128 GB/256 GB/512 GB
- RAM – 4 GB
- Colour – Starlight, Midnight, Blue, Pink, Red, Green
- We extracted data for 92 sellers selling this variant online during the period of study. We will be comparing nearly 30 sellers based on the factors discussed in the previous chapter.

Apple iPhone 13 (128 GB/Blue) –

- The Apple iPhone 13 (128 GB/Blue) is sold by 21 sellers, out of these sellers, 8 sellers sell the refurbished version of the product and only eBay sells both new and refurbished versions of the product
- We compare the minimum, average and maximum price for this product for each seller during the period of the study and based on this we calculate the % variance between the minimum and maximum price of the product when compared with the average price (Figure 4.1 & 4.2 and Appendix 2 - Table 1.1 and 1.2).

- As evident in the table and chart, Imagine-online (an Apple authorized reseller) shows the highest price variance during the period of the study which is a serious outlier. Even the refurbished products are selling higher. The lowest price offered by this store (~₹ 20 K) and the highest price offered by this store is ~₹ 70 K.
- We do not see any price variance for Triveni, Placezon, Moment Online Shopping, JioMart, Unicorn Store and Etoren, within this group. Triveni world sells this product at a uniform price of ~₹ 35 K, which is still one of the lowest prices among this group.
- Among the four major online stores viz. Amazon, Flipkart, Reliance digital, Croma, the highest price variance was seen at Reliance Digital store although the lowest price offered was still higher than Amazon. Flipkart shows the lowest price variance (~2%) between the four popular Indian marketplaces. An important observation we found here, the highest price of this product on Amazon is still lower than the lowest price offered by rest of the three stores, the price variance on Amazon is in the range of ~9%.
- We now compare the price offered by the store operated by the manufacturer itself. Apple store shows a price variance of ~13% and on average, it sells higher than any other seller (except for Etoren)
- Based on the # of user feedback, it seems that the Apple store and Amazon were among the major sellers for this product.
- Among the sellers selling refurbished products, the prices are close to the prices of the new variant. This poses an altogether different question on does a seller decides the price of the refurbished variant and what would prompt the buyers to purchase a used variant if with some additional price one can purchase a new variant which would have extended warranty among other features.

Figure 4.1

Apple iPhone 13 128 GB Blue (New) Store vs Price chart

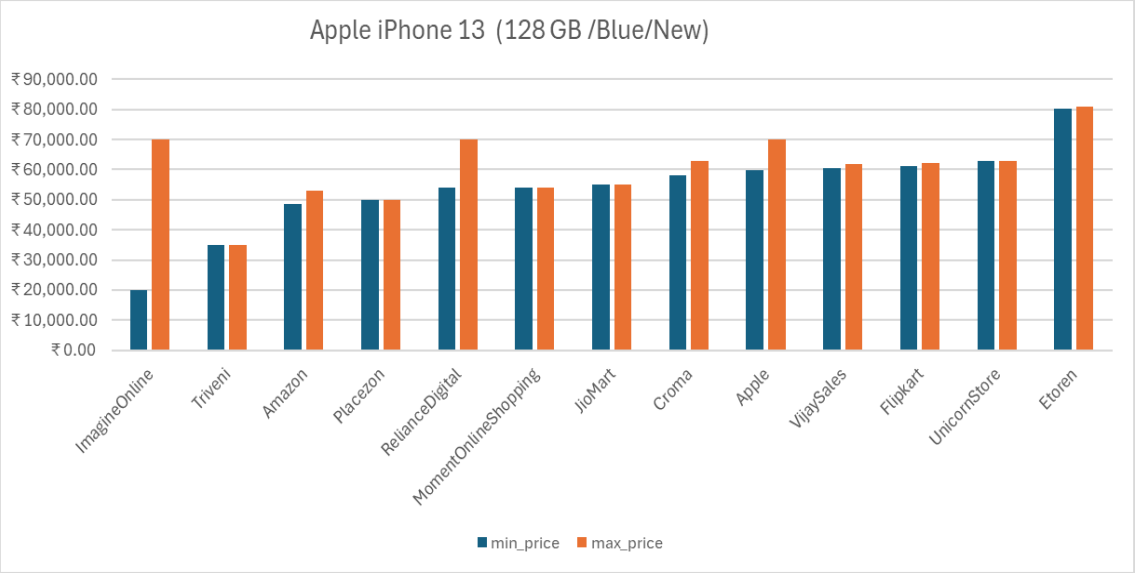
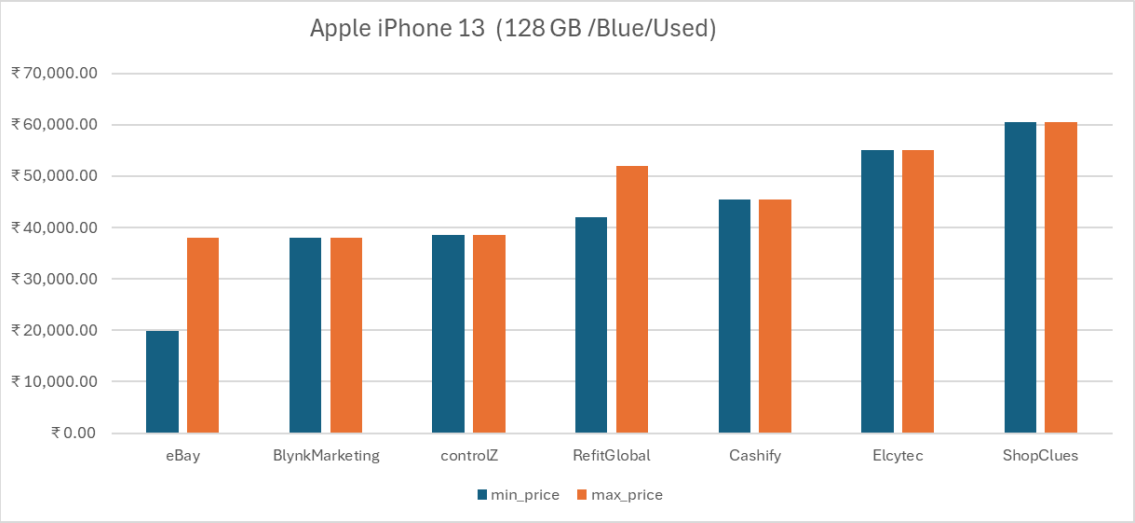


Figure 4.2

Apple iPhone 13 128 GB Blue (Refurbished/Used) Store vs Price chart



Apple iPhone 13 Blue (128 GB/New) - Linear Model for Prices

We try to predict the minimum price for the stores that showed significant variance in the product price during the period of study, in this case Reliance Digital and Apple. While the coefficients are described as below (for detailed predictions refer Appendix 2 – Figure 1.1 & 1.2)

Linear Regression Coefficients –

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
Reliance Digital	62647.3291	2045.0671	30.63	<2e-16
Apple store	71175.5308	1617.5537	44	<2e-16

Residual standard error: 3560 on 155 degrees of freedom

Multiple R-squared: 0.997, Adjusted R-squared: 0.997

F-statistic: 3.16e+03 on 16 and 155 DF**, p-value:** <2e-16

Apple iPhone 13 (128 GB/Pink)

- We found 12 sellers selling the pink variant of the model out of these 4 sellers deal in the refurbished/used products
- Compared to the Blue variant there is low price variance among the store for this model/variant (Figure 4.3 & 4.4 and Appendix 2 – Table 1.3 and 1.4).
- We see a maximum price variance for this product in Flipkart (~13%). On the other hand, Amazon has price variance in the range of ~7% but the minimum and average selling price is lower than Flipkart
- Reliance digital shows a price variance of ~5% and the minimum selling price during this period is slightly less than the minimum selling price on Amazon
- Other stores show no price variance for this model during this period. 93mobiles store sold this product at a uniform price of ~ ₹ 45.5K respectively. It also has ~40.5K user feedback for this product, which is highest among the group, this suggests that due to their lower price for this product, they have higher sales.
- The sellers dealing in the refurbished/used product for this model do not show any price variance. The price offered by Triveni being the lowest at ~ ₹33 K and ~ ₹ 51.6 K.

- It is interesting to see the gap between the sellers selling the new product at a price extremely close to the refurbished products, which may result in a follow up observation on the customer's behaviour towards the refurbished products when the New and unused variant is being offered at a highly competitive price.

Figure 4.3

Apple iPhone 13 128 GB Pink (New) Store vs Price chart

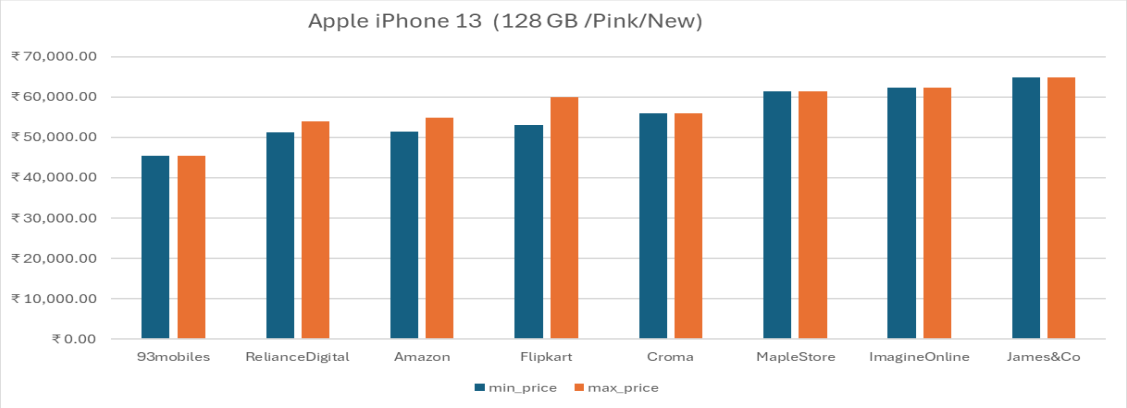
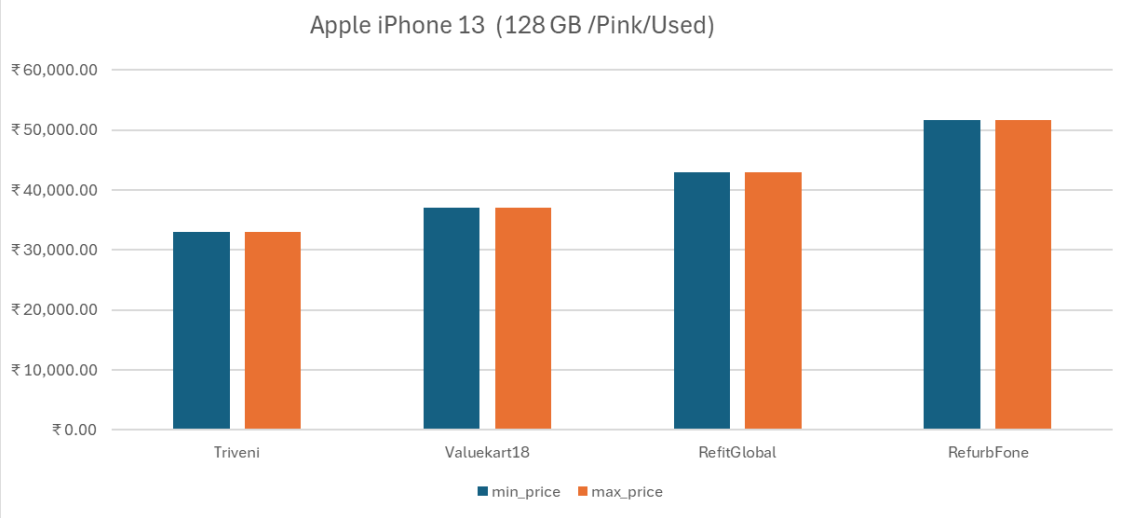


Figure 4.4

Apple iPhone 13 128 GB Pink (Used/Refurbished) Store vs Price chart



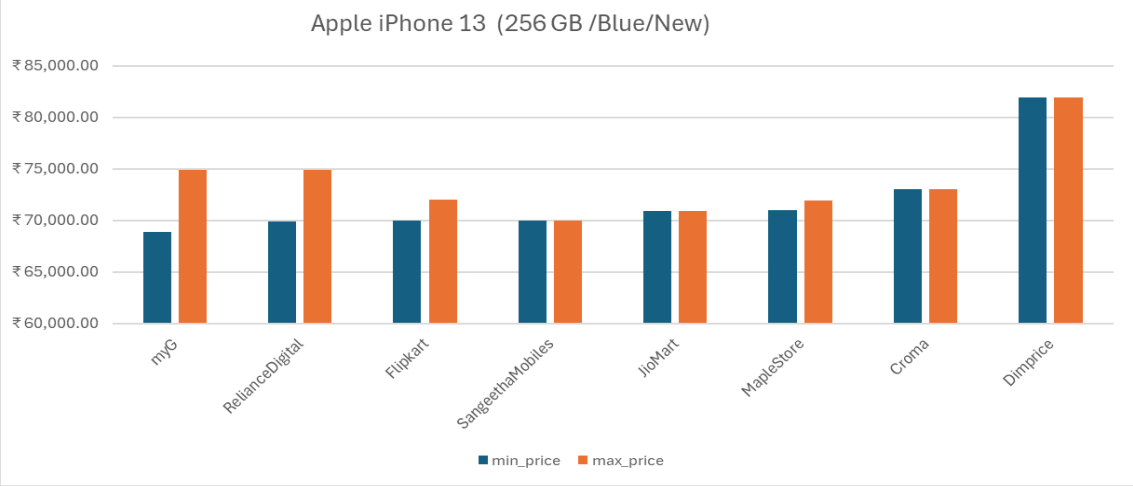
We will discuss 2 more variants of the Apple iPhone 13 with a 256 GB memory in blue colour and the other Apple iPhone 13 Pro with a 512 GB memory in Graphite color

Apple iPhone 13 (256 GB/Blue)

- We found 8 sellers selling the pink variant of this model and out of these we did not find any sellers dealing in the refurbished/used products (Figure 4.5 and Appendix 2 – Table 1.5).
- Out of the 8 sellers, 4 sellers show no variance in their prices during the period of study
- We did not find this variant on Amazon and Apple during the period of study
- Out of the big retailers like Flipkart, Croma, Reliance Digital and Jiomart, the highest price variance was shown by Reliance Digital followed by Flipkart. Croma and Jiomart do not show any variance in their prices.
- The seller Dimprice sells this variant at the highest price of ₹81K and has the highest user feedback. For the rest of the store's prices are within the range of ~ ₹68.9 K - ~ ₹74.9.

Figure 4.5

Apple iPhone 13 256 GB Blue (New) Store vs Price chart



Apple iPhone 13 Pro Max (512 GB/Graphite) –

- Comparatively it is a higher-end model than its lower variants and is sold by 6 sellers online during the period of study. One of these sellers is involved in dealing with the refurbished product (Figure 4.6 and 4.7 and Appendix 2 – Table 1.6 and 1.7).
- Except for Flipkart and Gadgets Now, none of the stores displayed any price variance during the period of study.
- Flipkart showed the highest price variance and sold this at its lowest price of ~ ₹ 135 K
- Vijay Sales is a physical store which also has a limited online presence, showed no variance at all and sold at a constant price of ~ ₹ 150.3 K.
- The user feedback shows a constant trend for the stores, which suggests healthy competition due to less price variance.
- Bid buddy online stores sells the product at a constant price of ~ ₹ 135 K, which is equal to the minimum price on Flipkart and is also the lowest price for this product among this group.
- The refurbished product is available on Hi Laptop at a price of ~ ₹ 99 K.

Figure 4.6

Apple iPhone 13 Pro 512 GB Graphite (New) Store vs Price chart

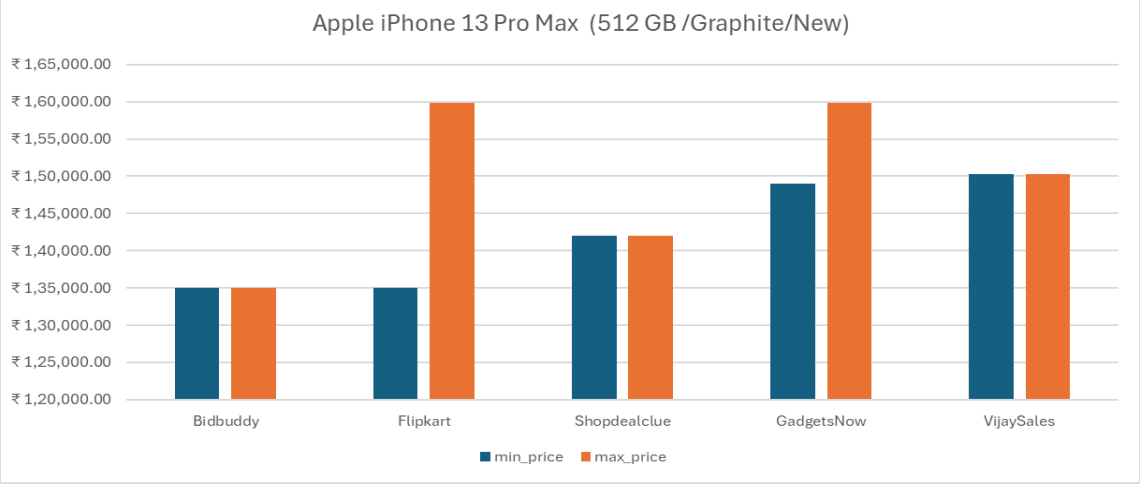
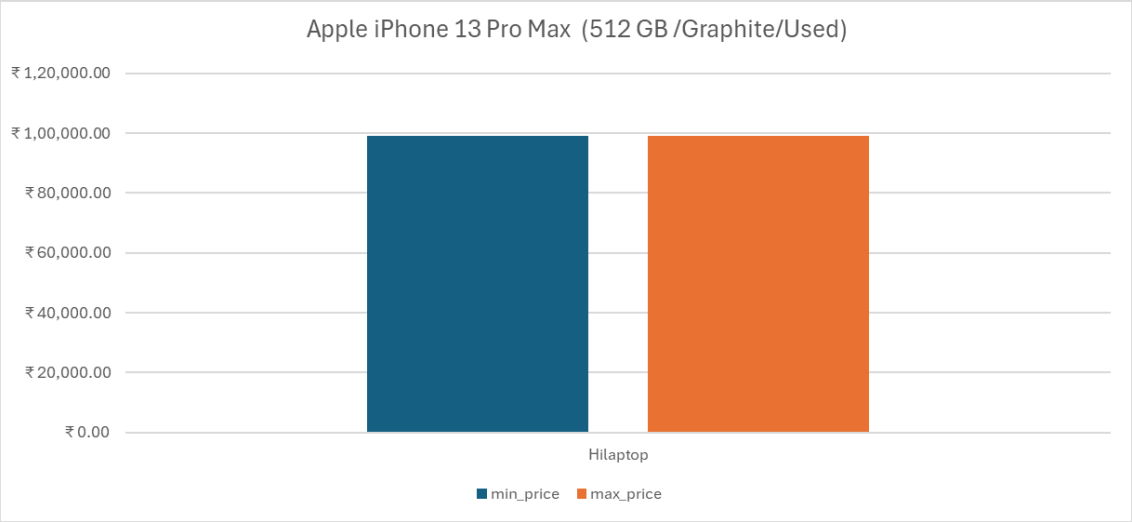


Figure 4.7

Apple iPhone 13 Pro 512 GB Graphite (Used/Refurbished) Store vs Price chart



Apple iPhone 13 Pro Max Graphite (512 GB/New) – Linear Model for Prices

We tried to predict the minimum price for the stores that showed significant variance in the product price during the period of study, in this case Flipkart. While the coefficients are described as below (for detailed predictions refer Appendix 2 – Figure 1.3)

Below are the results for general linear models created using R software -

Coefficients -

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
Flipkart	131710.8678	4063.6878	32.41	<2e-16

Residual standard error: 3960 on 110 degrees of freedom

Multiple R-squared: 0.999, Adjusted R-squared: 0.999

F-statistic: 2.1e+04 on 7 and 110 DF**, p-value:** <2e-16

Samsung Galaxy S23 Ultra 5G –

- Samsung Galaxy S23 Ultra 5G– was launched in Feb 2023 and is one of the flagship models of Samsung. In India, this product is available both online and offline stores.

Although this product has multiple variants based on the storage, colour and memory features, for this study we have considered the below variants –

- Storage Size – 512 GB/256 GB/512 GB
- RAM – 8 GB/12 GB
- Colour – Phantom Black, Green, Cream, Lavender, Graphite, Sky Blue, Lime, Red, BMW M Edition

- We extracted data for 51 sellers selling this variant online during the period of study
- Out of these sellers, 8 sellers sell the refurbished and new versions of the product, and 4 sellers deals in both new and refurbished versions of the product.
- We compare the minimum, average and maximum price for this product for each seller during the period of the study and based on this we calculate the % variance between the minimum and maximum selling price of the product when compared with the average selling price.

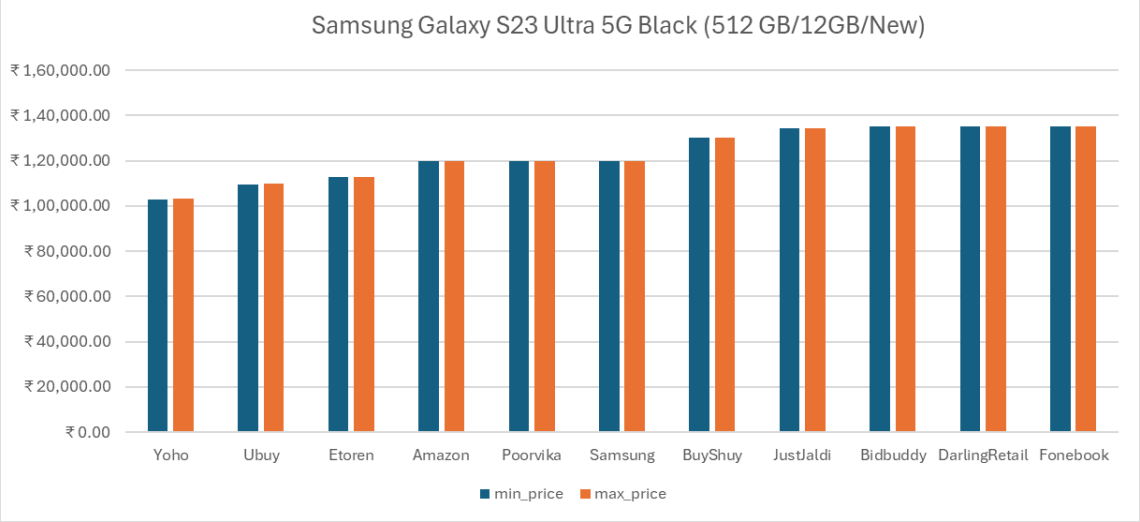
Samsung Galaxy S23 Ultra 5G Black (512 GB/12GB)

- Samsung Galaxy S23 Ultra 5G Black (512 GB/12GB) models are sold by 10 online sellers of which there are no sellers dealing in the refurbished products (Figure 4.8 and Appendix 2 - Table 1.8).
- As evident in the table and chart, none of the sellers have shown any variance in the price during the period of study, which is a rare event.
- Ubuy sells this model at lowest price among the group ₹ 111 K. This seller is an international marketplace operating out of India and provides imported products within the country. The purchase from this platform can incur custom and excise duty on the import.
- Amazon sells this product at uniform price of ~ ₹ 119.8K which is just ₹ 200.00 less than the manufacturer's online store i.e., Samsung ~ ₹ 120K
- The maximum selling price of this model is ~ ₹ 135K and 5 sellers are selling at this price
- Based on our observations for this model, we propose the below theory -

- Price variance is more common for old models than the newly launched models
- For the newly launched models, the manufacturer and the dealerships/retailers do not show much variance (at least online)
- The user feedback suggests customers may prefer platforms like Amazon, Poorvika etc. instead of Samsung's own online platform which may be due to better logistics of the former as well as the additional benefits like bank promoted cashback or interest free EMI or deals on the combo purchases.

Figure 4.8

Samsung Galaxy S23 Ultra 5G Black (512 GB/12GB/New) Store vs Price chart



Samsung Galaxy S23 Ultra 5G Green (512 GB/12GB)

- Samsung Galaxy S23 Ultra 5G Green (512 GB/12GB) models are sold by 14 online sellers of which there is only 1 seller dealing in the refurbished product (Figure 4.9 and 4.10 and Appendix 2 - Table 1.9 and 1.10).
- As evident in the table and chart, except for Etoren and Amazon none of the sellers have shown any variance in the price during the period of study.

- It was sold at ~ ₹ 86 K by Etoren which was the lowest price among the group. The same seller sold this at its highest price of ~ ₹ 108 K, which is still lower than all the sellers (except for Sangeetha mobiles).
- Sangeetha Mobiles is a Physical as well as online mobile retailer based out of Bangalore, it sells this product at a uniform price of ~ ₹ 108 K which is the lowest, next only to Etoren.
- Amazon shows a price variance in the range of -4 % to 8%. Amazon sells this product at a minimum price of ~ ₹ 120 K while the highest selling price on Amazon ~ ₹ 135 K
- Samsung sells this product via its online store at a uniform price of ~ ₹ 120 K. Being the manufacturer, one would expect more competitive pricing from Samsung when compared with other retailers although this price is still lower than the maximum listing from some of the stores.
- Among the major sellers, Flipkart, JioMart and Croma, all three sold this product at uniform price of ₹134 K during the period of study. The user feedback is rather low for these three platforms when compared to the rest of the online platform under study.
- It's rather surprising for other stores selling at a similar price and having higher user feedback than Croma, Flipkart and Jiomart. Among the most popular online sellers in India, only Amazon shows a price variance with a lower and upper boundaries in its price offering.
- We also observed that the maximum selling price listed on majority of e-tailer (online retailers) is around ~ ₹134 K with an exception Etoren, Sangeetha mobiles, Reliance Digital, Samsung and Oxygen Digital store.
- The price of the used version of the product is only sold by eBay at a very competitive price range between ~ ₹10 K - ₹24 K

Figure 4.9

Samsung Galaxy S23 Ultra 5G Green (512 GB/12GB/New) Store vs Price chart

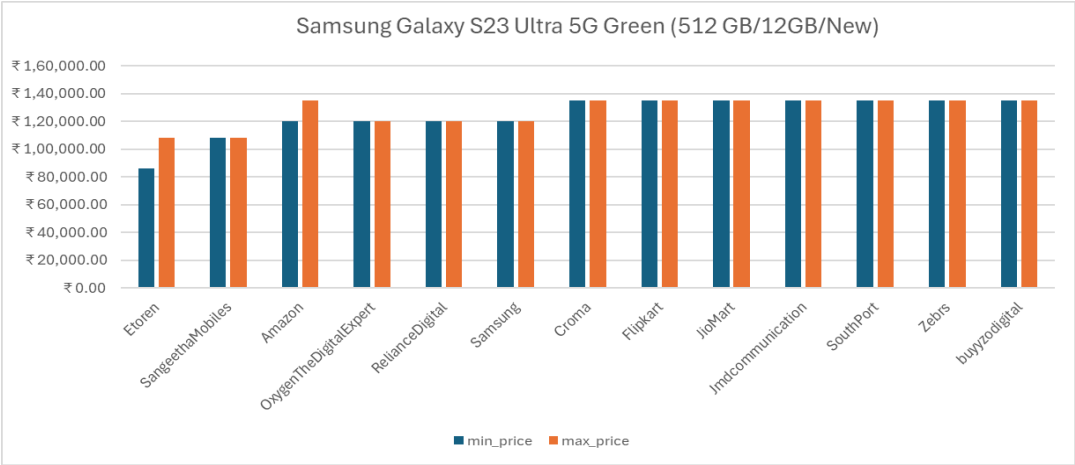
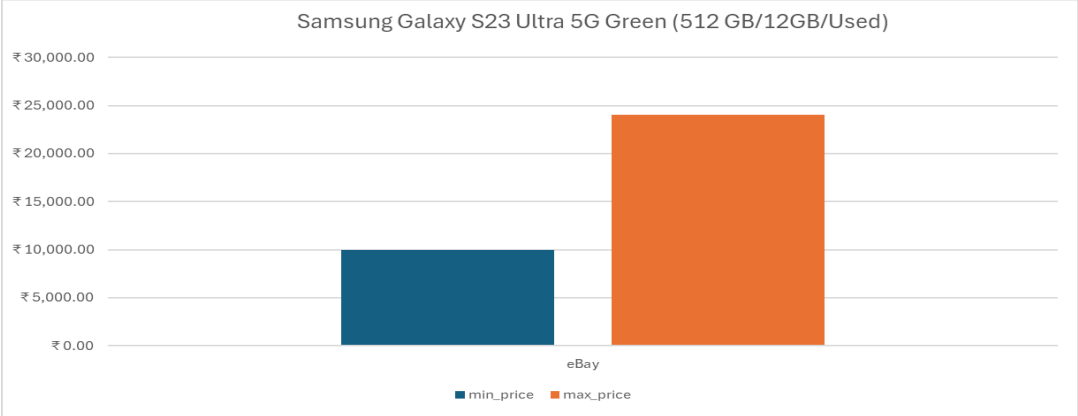


Figure 4.10

Samsung Galaxy S23 Ultra 5G Green (512 GB/12GB/Used) Store vs Price chart



Samsung Galaxy S23 Ultra 5G Black (256 GB/12GB)

- Samsung Galaxy S23 Ultra 5G Black (256 GB/12GB) models are sold by 19 online sellers of which there are 3 sellers dealing in the refurbished product (Figure 4.11 & 4.12 and Appendix 2 - Table 1.11 & 1.12).
- As per the data, out of the 16 sellers involved in the sale of the new product, 9 sellers do not show any price variance during the period of study.
- Triveni sells this product at a uniform price of ~ ₹ 85 K, which is the lowest among this group.

- Amazon shows the highest price variance of 17%, selling at the minimum and maximum price of ~ ₹ 92 K and ~ ₹ 108 K.
- Samsung, Darling Retail and myG stores sold this product at a same price variance and within the range of ~ ₹ 110 K and ~ ₹ 125 K
- Flipkart sold this product at a slightly higher lowest price of ~ ₹ 113 K
- The Samsung online store sells this product at a minimum listing price of ~ ₹ 110 K which is higher than ~ 40% of the online sellers. Samsung online stores showed a price variance 14 % for this product which seems competitive compared to the uniform price offering for 12GB/512GB variant.
- It is evident that the maximum listing price of ~ ₹ 125 K is more prominent and common among the stores and ~ ₹ 110 K is the most common lowest listing price among the sellers.
- The refurbished version of the product is being sold by 3 sellers and Mobex listing price is at par with the stores offering the new version of the product. The other two stores, Refitglobal and Elcytec sells this product at a price which is closer to couple of stores selling the brand-new version of the product and interestingly the Triveni stores sold this at a lower price than the stores selling the refurbished version of the product.

Figure 4.11

Samsung Galaxy S23 Ultra 5G Black (256 GB/12GB/New) Store vs Price chart

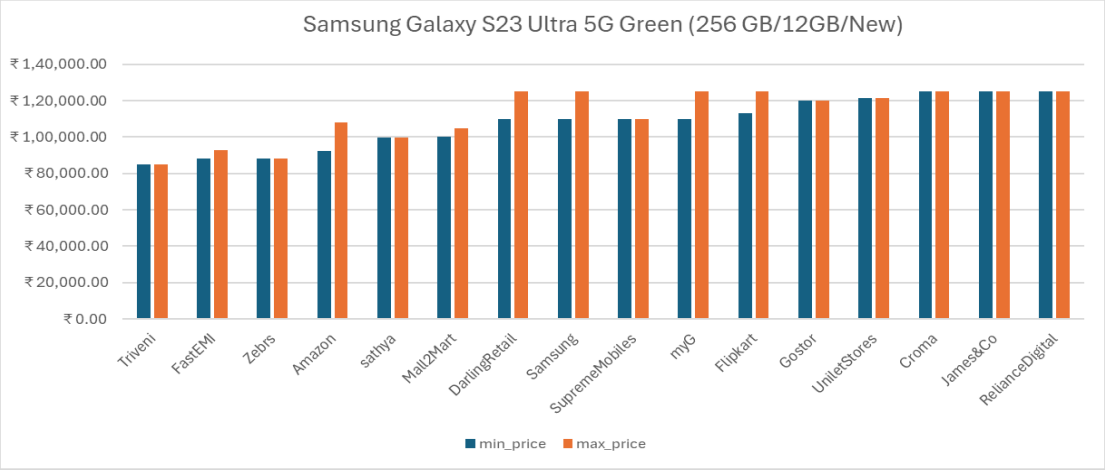
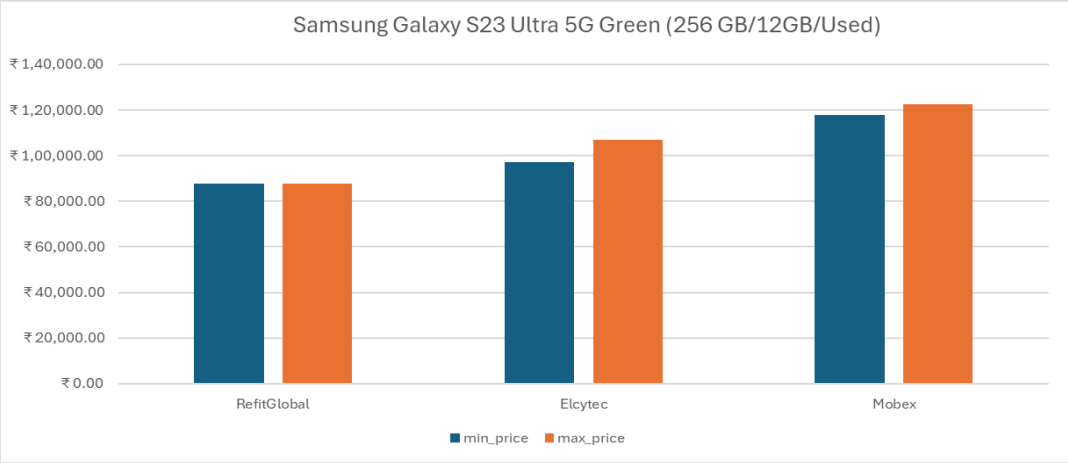


Figure 4.12

Samsung Galaxy S23 Ultra 5G Black (256 GB/12GB/Used) Store vs Price chart



Samsung Galaxy S23 Ultra 5G Green (256 GB/12GB)

- Samsung Galaxy S23 Ultra 5G Green (256 GB/12GB) models are sold by 18 online sellers of which there are 3 sellers dealing only in the refurbished product and 1 seller deals in both new and used products (Figure 4.13 & 4.14 and Appendix 2 - Table 1.13 & 1.14).
- Except for Amazon, Mall2Mart and Samsung, the other sellers dealing in the new products do not show any variance in the price during the period of study.
- The minimum and maximum listing price of the product on Amazon is in the range of ~ ₹ 87.5 K and ~ ₹ 106 K. While the minimum listing price on Amazon is the lowest in the group, the maximum listing price is available from the sellers like FastEMI, Sahivalue, Buyreal, 93Mobiles, Mall2Mart.
- Flipkart sells this at a uniform price of ~ ₹ 100K in comparison to another popular seller JioMart which has the constant listing price of ~ ₹ 110 K.
- The minimum and maximum listing price of the product on Samsung is in the range of ~ ₹ 110 K and ~ ₹ 125 K.
- Only Sahivalue sells the refurbished as well as the new version of the product. The minimum listing price of the refurbished version of the product is ~ ₹ 70 K while the

maximum listing price is in the range of ~ ₹ 70.5 K. The new version of the product is being sold by this store at a constant list price ~ ₹ 93 K.

- The rest of the stores selling the refurbished product have the listing price (either minimum or maximum) closer to the stores selling the new variant of the product.

Figure 4.13

Samsung Galaxy S23 Ultra 5G Green (256 GB/12GB/New) Store vs Price chart

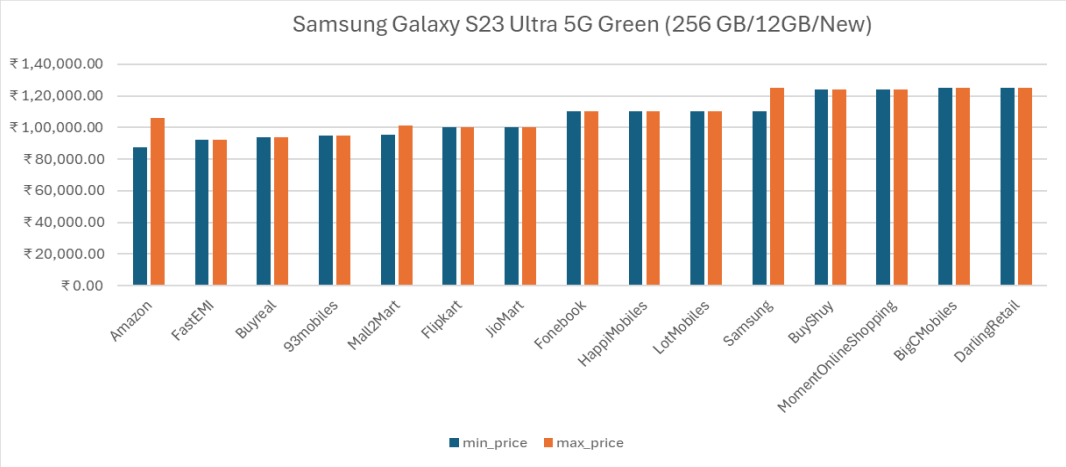
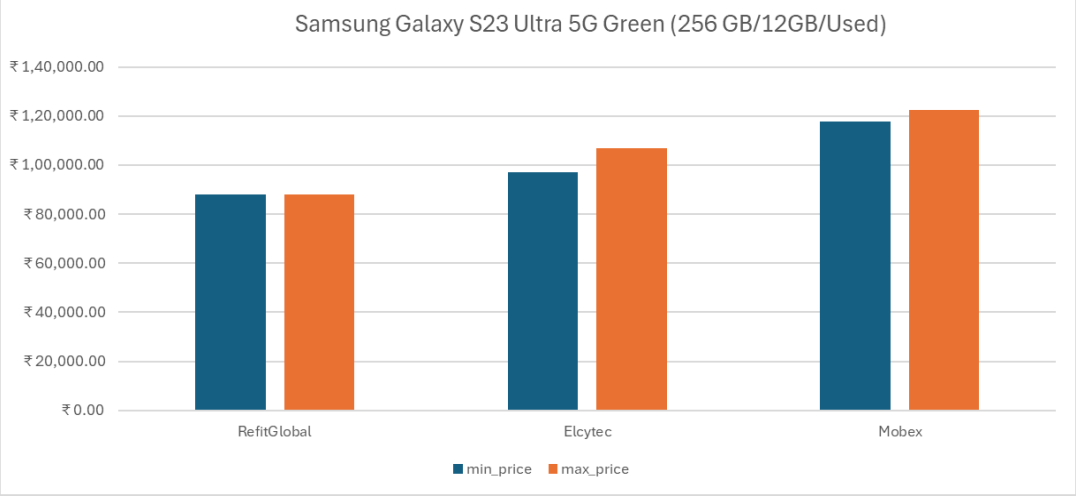


Figure 4.14

Samsung Galaxy S23 Ultra 5G Green (256 GB/12GB/Used) Store vs Price chart



Samsung Galaxy S23 Ultra 5G Green (256 GB/12GB/New) - Linear Model for Prices

We tried to predict the minimum price for the stores that showed significant variance in the product price during the period of study, in this case Amazon and Samsung. While the coefficients are described as below (for detailed predictions refer Appendix 2 – Figure 1.4 & 1.5)

Below are the results for general linear model created using R software -

Coefficients -

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
Amazon	105999.5921	4805.0096	22.1	<2e-16
Samsung	110831.0561	5003.864	22.1	<2e-16

Residual standard error: 4810 on 151 degrees of freedom

Multiple R-squared: 0.998, Adjusted R-squared: 0.999

F-statistic: 5.73e+03 on 17 and 151 DF**, p-value:** <2e-16

We now discuss some budget phones -

Infinix Hot 10S–

- Infinix Hot 10S – was launched in April 2021 and is one of the flagship models of Infinix. In India, this product is available both online and offline stores. Although this product has multiple variants based on the storage, colour and memory features, for this study we have considered the below variants –
    - Storage Size – 64 GB/128 GB
    - RAM – 4 GB/6 GB
    - Colour – Black, Purple, Morandi Green, Heart of Ocean
- We extracted data for 8 sellers selling this variant online during the period of study
- Out of these sellers, 5 sellers sell refurbished and new versions of the product.
- We compare the minimum, average and maximum price for this product for each seller during the period of the study and based on this we calculate the % variance between the minimum and maximum selling price of the product when compared with the average selling price.

- We will discuss only one variant of this product

Infinix Hot 10S Heart of Ocean (4 GB/64 GB)

- Infinix Hot 10S Heart of Ocean (4 GB/64 GB) model is sold by 6 online sellers of which 2 sellers deal in the refurbished products (Figure 4.15 & 4.16 and Appendix 2 - Table 1.15 & 1.16).
- Only Flipkart shows a variance in the price during the period of study. Flipkart sold this product at a lowest price of ~ ₹ 9.3 K while it sold the product at a maximum price of ~ ₹ 9.8 K. The variance margin is within the 4% which roughly translates to ~ ₹ 500.00 which seems low but provided the low budget of the phone, this seems fair (although at this point of discussion, we do not know what a fair variance would mean and probably one should not be able quantify it unless they are planning to buy it).
- We do not see any variation in the price for the rest of the 4 stores, although none of the stores have the same price.
- One interesting observation we make from the stores selling the refurbished models is that the minimum and maximum listing price is higher than some of the stores selling the brand-new model viz. Flipkart, Mobiles Bazaar, Gadgets Now.

Figure 4.15

Infinix Hot 10S Heart of Ocean (4 GB/64 GB/New) Store vs Price chart

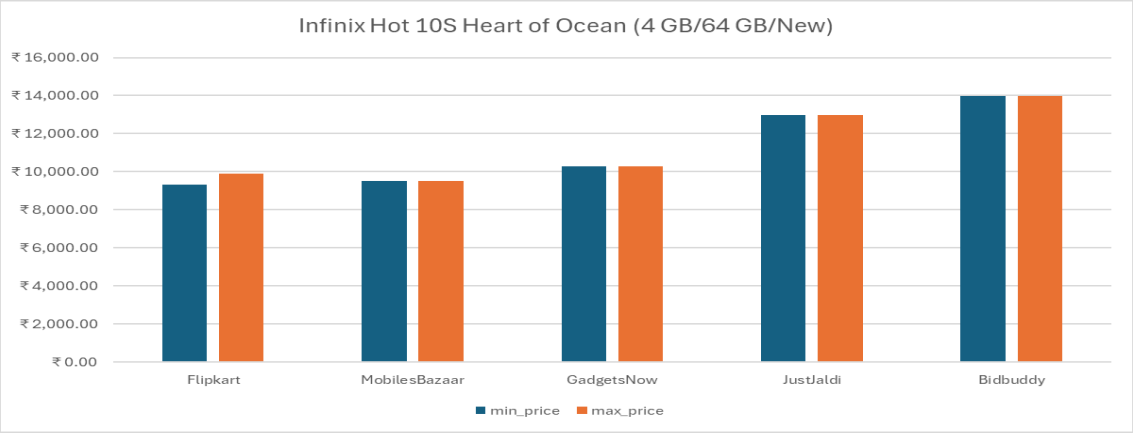
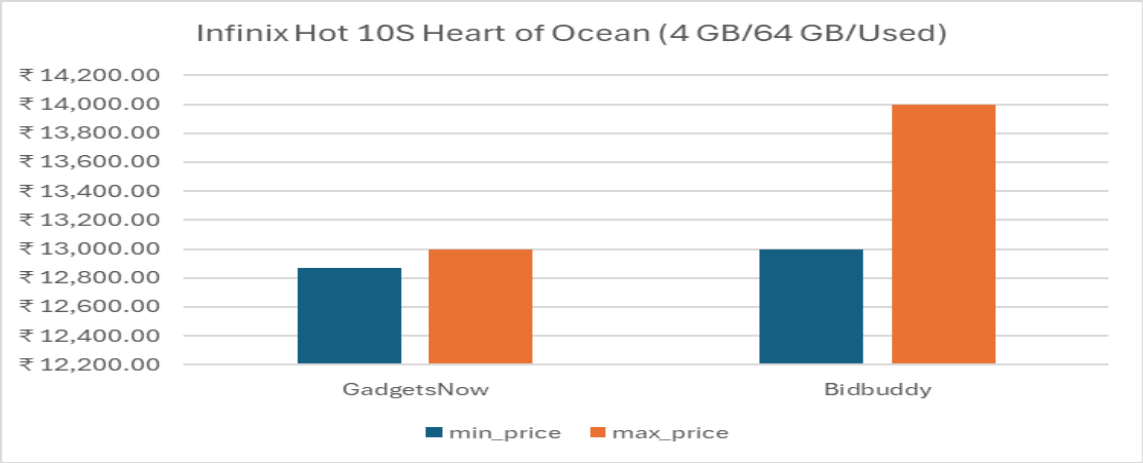


Figure 4.16

Infinix Hot 10S Heart of Ocean (4 GB/64 GB/Used) Store vs Price chart



Infinix Hot 30i Blue (8 GB/128 GB)

- Infinix Hot 30i Blue (8 GB/128 GB) model is sold by 8 online sellers of which 1 seller deals in refurbished products (Figure 4.17 & 4.18 and Appendix 2 - Table 1.17 & 1.18).
- Only Flipkart and JioMart show a price variance for this model during the period of study.
- Flipkart sold this product at a lowest price of ~ ₹ 8.3 K while it sold the product at a maximum price of ~ ₹ 9 K. The variance margin is within the 4% which roughly translates to ~ ₹ 600.00, in line with the price cut offered for the model variant discussed earlier.
- The maximum listing price by Flipkart, Amazon and Bigbuddy is ~ ₹ 9 K.
- JioMart shows a variance of 24% although the minimum price is still higher than maximum price of the Flipkart, Amazon, Bidbuddy and Ovantica
- The maximum listing price in the group is JioMart (~ ₹ 11 K) followed by Gadgets Now (~ ₹ 10 K).
- The only refurbished product is sold by Vlebazaar at a minimum and maximum listing price of ₹ 6 K and ₹ 6.5 K

Figure 4.17

Infinix Hot 30i Blue (8 GB/128 GB/New) Store vs Price chart

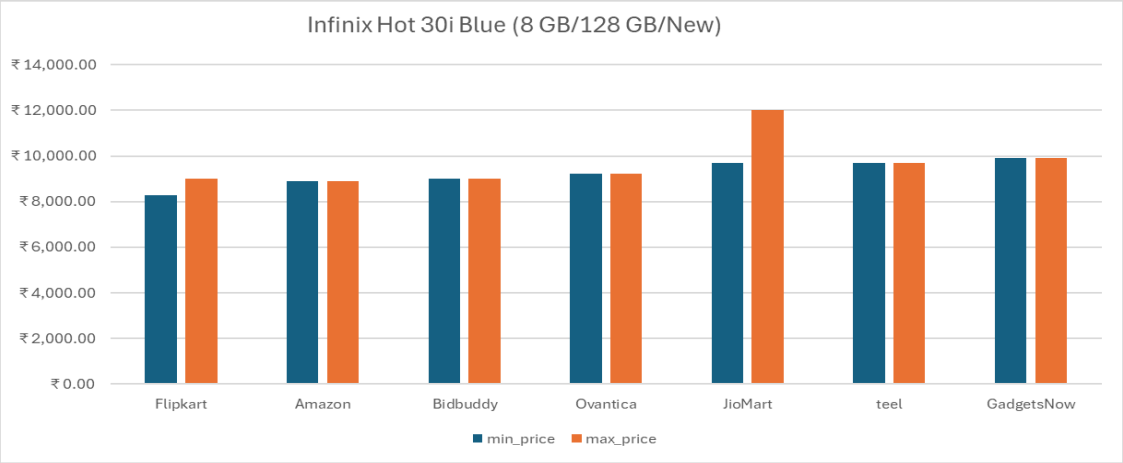
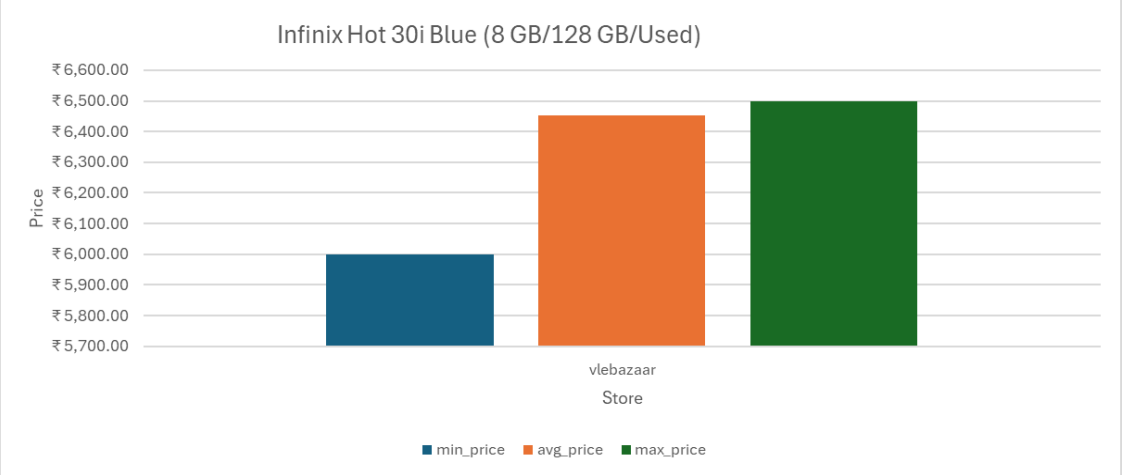


Figure 4.18

Infinix Hot 30i Blue (8 GB/128 GB/Used) Store vs Price chart



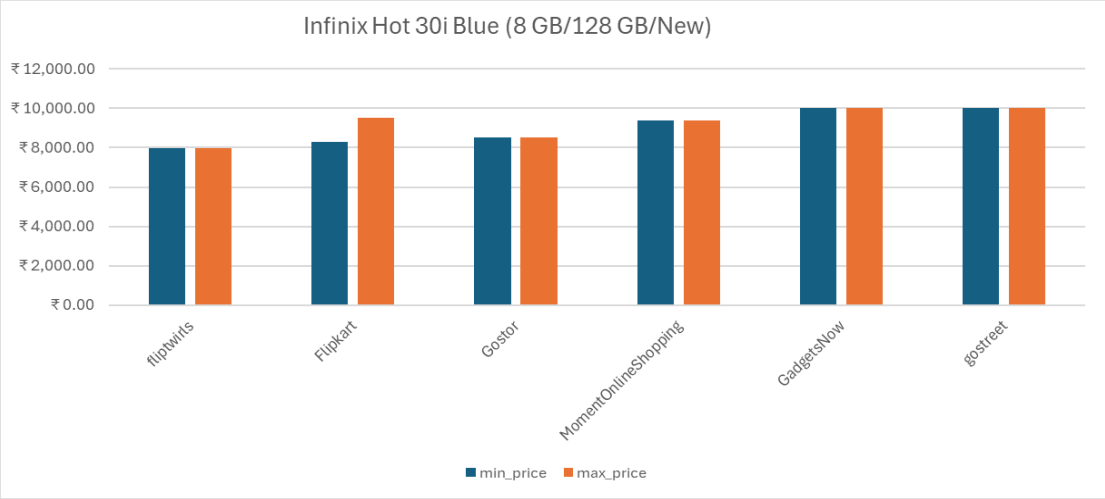
Infinix Hot 30i Black (8 GB/128 GB)

- Infinix Hot 30i Black (8 GB/128 GB) model is sold by 4 online sellers (Figure 4.19 and Appendix 2 - Table 1.19).
- Again, only Flipkart shows a variance in the price during the period of study. Flipkart sold this product at a lowest price of ~ ₹ 8.3 K while it sold the product at a maximum price of ~ ₹ 9.5 K.

- The rest of the sellers do not show any price variance. It is sold at lowest price by Flipwirls ~ ₹ 8 K and at highest price of ~ ₹ 10 K by Gadgets Now.
- For this variant we do not have a seller dealing in refurbished products.

Figure 4.19

Infinix Hot 30i Black (8 GB/128 GB/New) Store vs Price chart



Infinix Hot 30i Black (8 GB/128 GB/New) - Linear Model for Prices

We tried to predict the minimum price for the stores that showed significant variance in the product price during the period of study, in this case Flipkart. While the coefficients are described as below (for detailed predictions refer Appendix 2 – Figure 1.6)

Below are the results for general linear models created using R software -

Coefficients -

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
Flipkart	5542.138	1807.963	3.07	0.0034

Residual standard error: 332 on 52 degrees of freedom

Multiple R-squared: 0.999, Adjusted R-squared: 0.999

F-statistic: 4.69e+03 on 9 and 52 DF**, p-value:** <2e-16

Motorola Moto G82 –

- Motorola Moto G82– was launched in June 2022 and is one of the flagship models of Motorola. In India, this product is available both online and offline stores. Although this product has multiple variants based on the storage, colour and memory features, for this study we have considered the below variants –
    - Storage Size – 128 GB
    - RAM – 6 GB/8 GB
    - Colour – Meteorite Gray and White Lily
- We extracted data for 26 sellers selling this variant online during the period of study
- Out of these sellers, 5 sellers sell both refurbished and new versions of the product while 1 seller deals specifically in refurbished model
- We compare the minimum, average and maximum price for this product for each seller during the period of the study and based on this we calculate the % variance between the minimum and maximum selling price of the product when compared with the average selling price.
- We will discuss one variant of this product

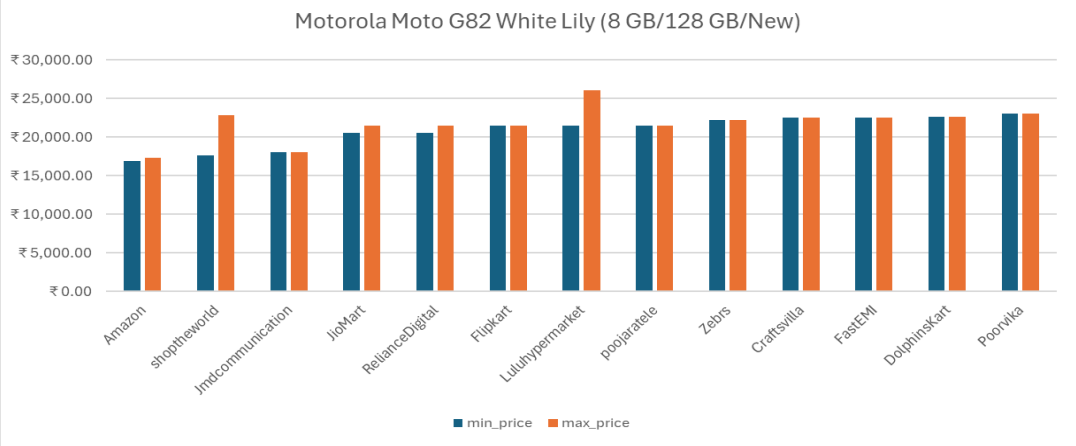
Motorola Moto G82 White Lily (8 GB/128 GB)

- Motorola Moto G82 White Lily (8 GB/128 GB) model is sold by 13 online sellers of which none deals in refurbished products (Figure 4.20 and Appendix 2 - Table 1.20).
- In this group only 4 stores show a change in price for this product viz. Amazon, Shop the world, Jio Mart, Reliance Digital and Lulu hypermarket, and the rest of the stores project uniform pricing throughout the period of this study.
- Amazon sells this product within the price boundary of ~ ₹ 16.8 K and ₹ 17.3 K. The maximum price on Amazon is still lower than the minimum price of the rest of the sellers (excluding Jiomart)
- The lowest price on both Reliance Digital and JioMart is ~ ₹ 20.5 K and it sells this at a highest price of ~ ₹ 21.5 K which is ~ ₹ 1 K higher than its lowest price.
- Flipkart sells it at a uniform price of ~ ₹ 21.5 K

- The highest listing price for this product is by Lulu hypermarket (~ ₹ 26 K). The same store sells this product at its lowest price of ~ ₹ 21.5K which is ~ ₹ 4.5 K lower than its maximum price
- Within the group, Shop the world store shows the highest variance between the minimum and maximum price, which is ~ ₹ 5.2 K.

Figure 4.20

Motorola Moto G82 White Lily (8 GB/128 GB/New) Store vs Price chart



Motorola Moto G82 White Lily (8 GB/128 GB/New) - Linear Model for Prices

We take an attempt to predict the minimum price for the stores that showed significant variance in the product price during the period of study, in this case Amazon, Lulu Hypermarket, JioMart and Flipkart. While the coefficients are described as below (for detailed predictions refer Appendix 2 – Figure 1.7-1.10)

Below are the results for general linear model created using R software -

Coefficients -

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
Amazon	12218.99	911.2256	13.41	<0.0000000000000002
Lulu hypermarket	17991.15	1282.684	14.03	<0.0000000000000002
Reliance Digital	15533.17	1041.761	14.91	<0.0000000000000002
Shop the world	14152.81	1128.411	12.54	<0.0000000000000002

Residual standard error: 636 on 227 degrees of freedom

Multiple R-squared: 0.999**, Adjusted R-squared:** 0.999

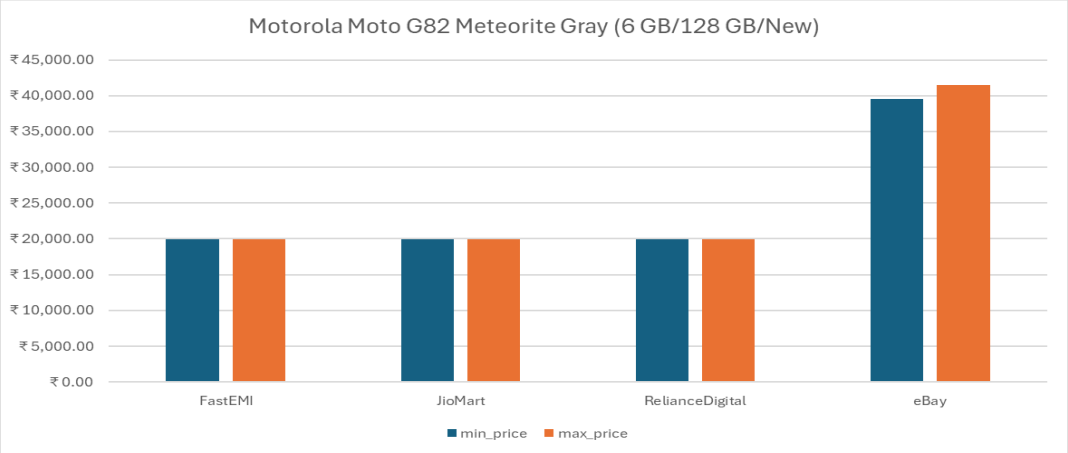
F-statistic: 1.89e+04 on 15 and 227 DF**, p-value:** <2e-16

Motorola Moto G82 Meteorite Gray (6 GB/128 GB)

- Motorola Moto G82 Meteorite Gray (6 GB/128 GB) model is sold by 4 online sellers of which none deals in the refurbished products (Figure 4.21 and Appendix 2 - Table 1.21).
- Except for eBay rest of the sellers display uniform price of ~ ₹ 20 K
- eBay on the other hand shows a price variance of 5%. The minimum list price ~₹ 39.5 K and the maximum list price of ~₹ 41.5 K. Given the listing price from other sellers in the group, eBay appears to be an outlier. This may be due to the below reason –
  - eBay ships the product from outside India which incurs custom and import duty charges
  - eBay provides the unlocked version of the product imported from the US.
- It's highly unlikely that the purchaser will be interested in buying from eBay if the cheaper options are available.

Figure 4.21

Motorola Moto G82 Meteorite Gray (6 GB/128 GB/New) Store vs Price chart



Nokia C32 –

Nokia C32– was launched in Feb 2023 and is one of the flagship models of Nokia. In India, this product is available both online and offline stores. Although this product has multiple variants based on the storage, colour and memory features, for this study we have considered the below variants –

- Storage Size – 64/128 GB
- RAM – 3GB/4 GB/6 GB
- Colour – Breezy mint, Black Grey, Autumn Green, Beach Pink

- We extracted data for 25 sellers selling this variant online during the period of study
- Out of these sellers, 2 sellers deal specifically in refurbished model
- We compare the minimum, average and maximum price for this product for each seller during the period of the study and based on this we calculate the % variance between the minimum and maximum selling price.
- We will discuss two variants of this product

Nokia C32 Breezy Mint (4 GB/128 GB)

- Nokia C32 Breezy Mint (4 GB/128 GB) model is sold by 12 online sellers of which 1 deal in the refurbished products (Figure 4.22 & 4.23 and Appendix 2 - Table 1.22 & 1.23).
- Apparently, this group of sellers displays quite a bit of price variance
- Amazon sells this product at the lowest price of ~₹ 7.5 K and a maximum price of ~₹ 8 K. Even the highest price from Amazon is almost equal or lower than the minimum price from the rest of the sellers
- Reliance digital displays the highest price variance among this group. It sells at the lowest price of ~₹ 8 K and ~₹ 9.5 K.
- As a manufacturer Nokia sells this model from its online retail store at uniform price of ~₹ 9.5 K
- The highest price for this model is being sold at Poorvika stores at ~₹ 9.9 K
- The refurbished product is sold by Trvieni stores at a uniform price of ~₹ 5.5 K.

Figure 4.22

Nokia C32 Breezy Mint (4 GB/128 GB /New) Store vs Price chart

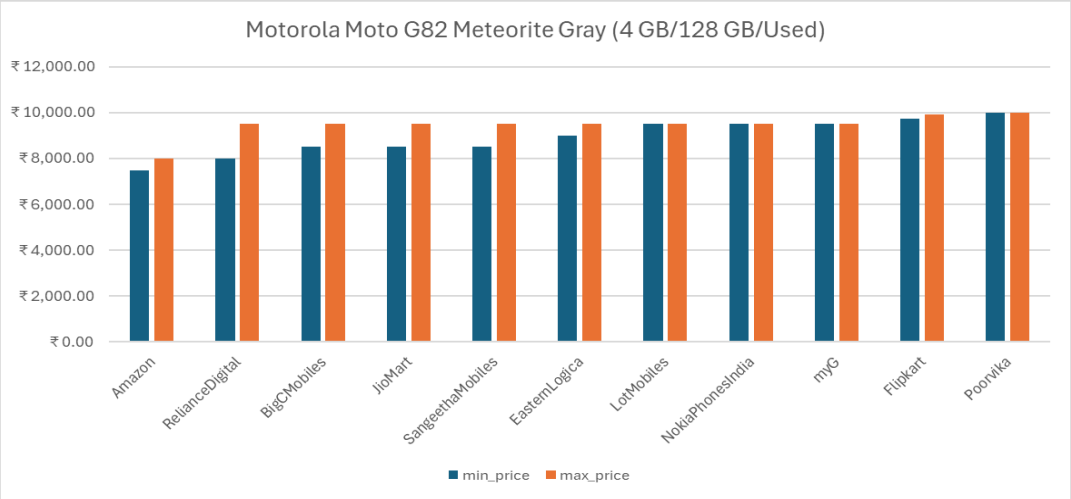
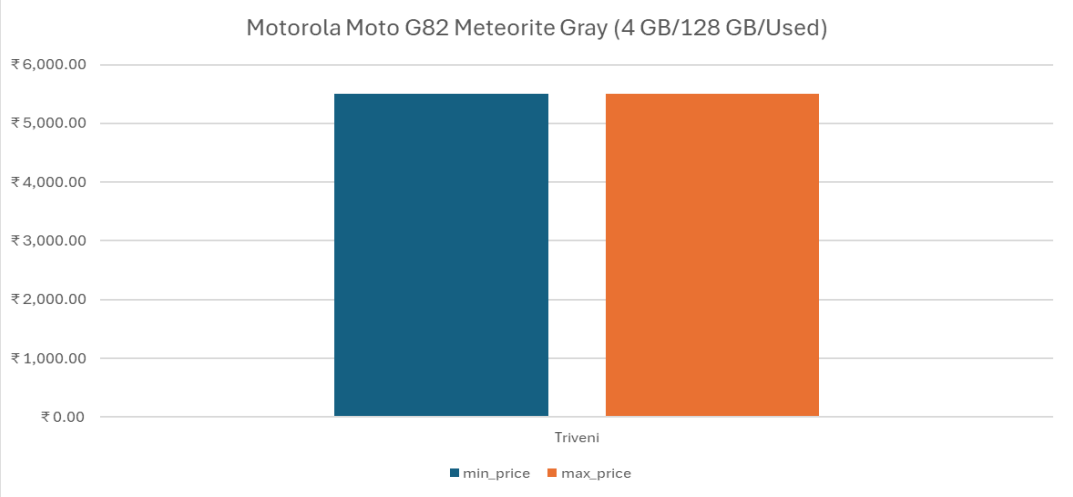


Figure 4.23

Nokia C32 Breezy Mint (4 GB/128 GB /Used) Store vs Price chart



Nokia C32 Breezy Mint (4 GB/128 GB /New) - Linear Model for Prices

We try to predict the minimum price for the stores that showed significant variance in the product price during the period of study, in this case Amazon, Reliance Digital, JioMart and Flipkart. While the coefficients are described as below (for detailed predictions refer Appendix 2 – Figure 1.11-1.14)

Below are the results for general linear model created using R software -

Coefficients -

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
Amazon	6148.249	996.8797	6.167	2.33E-08
Flipkart	6440.702	1045.336	6.161	0.000000024
JioMart	6374.621	989.5368	6.442	7.01E-09
Reliance Digital	6299.205	969.2381	6.499	5.45E-09

Residual standard error: 247.5 on 84 degrees of freedom

Multiple R-squared: 0.9994, **Adjusted R-squared**: 0.9993

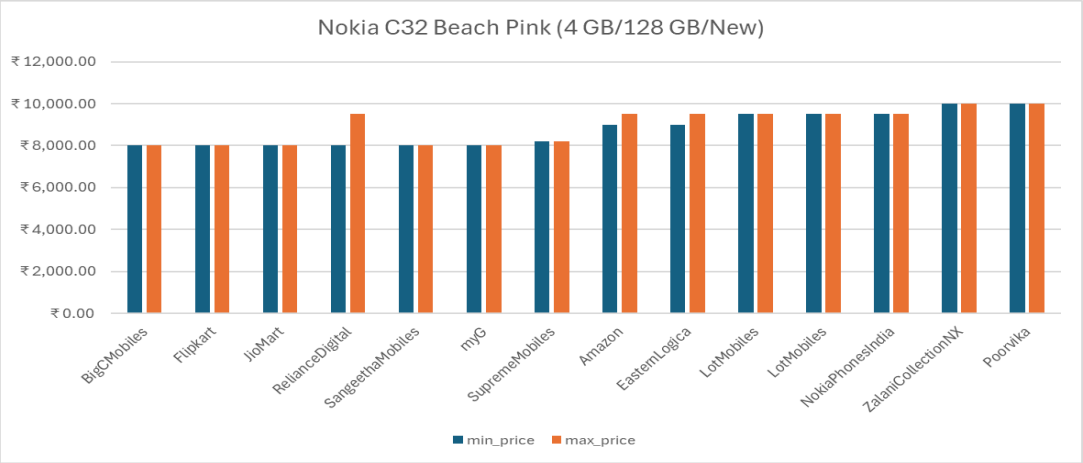
F-statistic: 1.015e+04 on 13 and 84 DF, **p-value**: < 2.2e-16

Nokia C32 Beach Pink (4 GB/128 GB)

- Nokia C32 Beach Pink (4 GB/128 GB) model is sold by 12 online sellers of which 1 seller deals in refurbished products (Figure 4.24 and Appendix 2 - Table 1.24).
- Only Reliance Digital, Amazon and Eastern Logica display price variance during the period of study.
- The highest variance is displayed by Reliance digital; the minimum and maximum listing price is ~₹ 8 K and ~₹ 9.5 K respectively.
- The minimum listing price for this product is ~₹ 8 K and has been sold at this price by multiple sellers.
- Only Poorvika and Zalani Collections NX sells this product at a maximum listing price of ~₹ 10 K.
- Among the popular marketplaces, viz. Amazon and Flipkart. Flipkart sells this product at a uniform price of ~₹ 8 K. Amazon on the other hand displays the minimum price of ~₹ 9 K and the maximum price of ~₹ 10 K i.e., Amazon sells this product ~₹ 1 K to ~₹ 2 K higher than Flipkart.

Figure 4.24

Nokia C32 Beach Pink (4 GB/128 GB/New) Store vs Price chart



OPPO F23 –

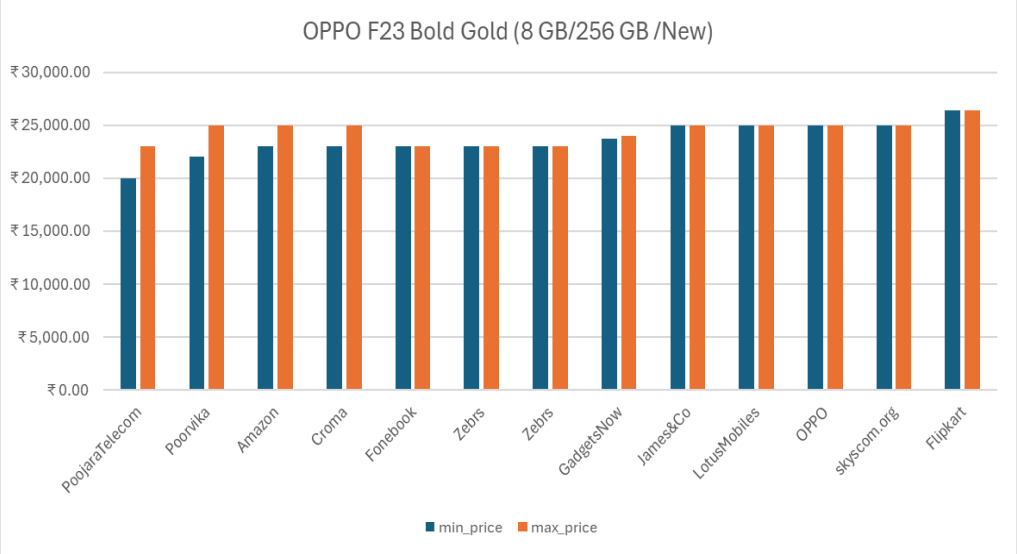
- OPPO F23– was launched in May 2023 and is one of the flagship models of Oppo. In India, this product is available both online and offline stores. Although this product has multiple variants based on the storage, colour and memory features, for this study we have considered the below variants –
    - Storage Size – 128/256 GB
    - RAM –8 GB
    - Colour – Cool Black and Bold Gold
- We extracted data for 32 sellers selling this variant online during the period of study
- 4 of the sellers deal in refurbished model
- We compare the minimum, average and maximum price for this product for each seller during the period of the study and based on this we calculate the % variance between the minimum and maximum selling price.
- We will discuss two variants of this product

OPPO F23 Bold Gold (8 GB/256 GB)

- OPPO F23 Bold Gold (8 GB/256 GB) model is sold by 12 online sellers of which none deal in the refurbished products (Figure 4.25 and Appendix 2 - Table 1.25).
- We identified 5 sellers displaying price variance viz. Poojara Telecom, Poorvika, Amazon, Croma, Gadgets Now.
- Poojara Telecom sells this product for minimum listing price of ~₹ 20 K, which is lowest among the group while it sells this product at the highest listing price of ~₹ 23 K which is either equal to or less than the minimum price offered by rest of stores except for the seller Poorvika which has minimum price offering of ~₹ 22 K.
- Among the major online stores, Amazon and Croma sells this product with a minimum price of ~₹ 23 K and a maximum price of ~₹ 25 K. Both the stores display the same price variance.
- Flipkart on the other hand sells this product at the highest price of ~₹ 26.4 K, this is not only the highest price among the major online sellers but also the highest among this group.

Figure 4.25

OPPO F23 Bold Gold (8 GB/256 GB /New) Store vs Price chart

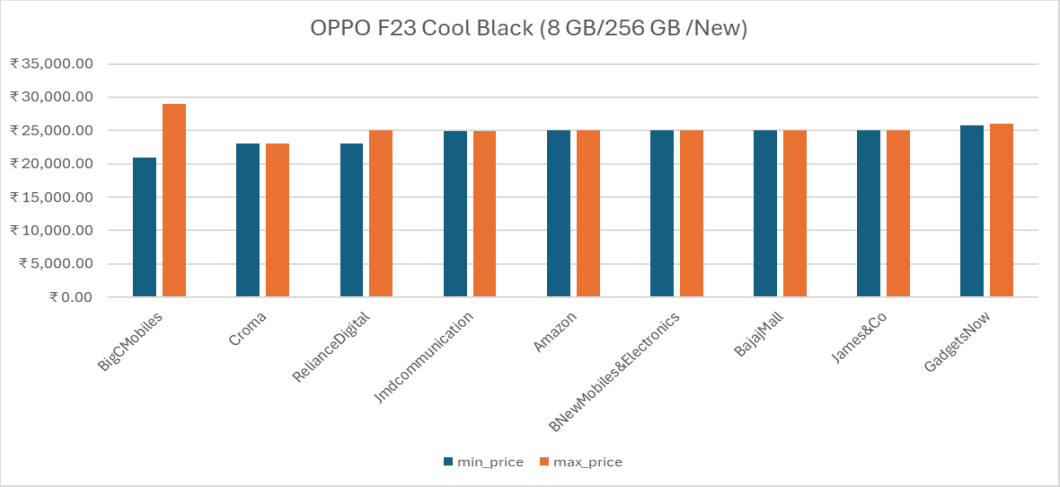


OPPO F23 Cool Black (8 GB/256 GB)

- OPPO F23 Cool Black (8 GB/256 GB) model is sold by 9 online sellers of which none deals in the refurbished products (Figure 4.26 and Appendix 2 - Table 1.26).
- We identified 3 sellers displaying price variance viz. Big C Mobiles, Reliance Digital and Gadgets Now.
- Big C Mobiles shows a price variance of 38% between min and max listing updated by the store, which is quite high. The minimum listing price for this product by this seller is ~₹ 21 K, which is also the lowest for the whole group, while the maximum listing price is ~₹ 29 K which is highest among the whole group. This would ideally explain the high variance for this seller. Based on this observation we postulate that for a seller the price cut could be high if that seller was already selling this product at a higher price than its competitors.
- Among the major sellers Croma sells this product at a uniform price of ~₹ 23 K while Reliance Digital displays a price variance with a minimum and maximum listing price of ~₹ 23 K and ~₹ 25 K respectively. Amazon on the other hand sells this product at a constant price of ~₹ 25 K.

Figure 4.26

OPPO F23 Cool Black (8 GB/256 GB /New) Store vs Price chart



OPPO Find N2 Flip –

OPPO Find N2 Flip– was launched in December 2022 and is one of the flagship flip models of Oppo and one of the first flip phones we discuss in this study. In India, this product is available both online and offline stores. Although this product has multiple variants based on the storage, colour and memory features, for this study we have considered the below variants –

- Storage Size – 256/512 GB
- RAM – 8/12/16 GB

- Colour – Astral Black, Moonlit Purple, Bold Gold
- We extracted data for 34 sellers selling this variant online during the period of study
- 11 of these sellers deal in refurbished model
- We compare the minimum, average and maximum price for this product for each seller during the period of the study and based on this we calculate the % variance between the minimum and maximum selling price.
- We will discuss 2 variants of this product

OPPO Find N2 Flip Astral Black (8 GB/256 GB)

- OPPO Find N2 Flip Astral Black (8 GB/256 GB) model is sold by 19 online sellers of which 3 deal in the refurbished products (Figure 4.27 & 4.28 and Appendix 2 - Table 1.27 & 1.28).
- For the new product, 5 of the sellers display a price variance. For this product the price variance by the sellers is a rare occurrence.
- An extreme outlier is the seller Bajaj Mall where this product's minimum price listing (~₹ 12 K) is 650% less than its maximum price listing (~₹ 90 K). We could have considered it as a data collection error, but the high price variance among the sellers (although not this high) is common among the group
- Reliance Digital sells this product at a minimum price of ~₹ 60 K while its maximum price remains ~₹ 90 K. This change in price is ~50% which would mean at some point of time (during the period of study), this product was sold at half the price.

- We see a unique pattern in the price of this product, Triveni sells this product at a uniform price ~₹ 40 K, which is the lowest selling price among all the sellers except for Bajaj Mall.
- Although JioMart doesn't show any price variance, its selling price is still lower than most of the sellers in the group and is within ~ ₹ 60 K
- Among the major sellers, apart from Reliance Digital and JioMart, Flipkart shows a price variance with the minimum and maximum listing price of the product in the range of ~ ₹ 70 K and ~₹ 90 K respectively.
- Croma sells this product at constant price of ~ ₹ 90 K as does the manufacturer Oppo's online store.
- Based on the listing price of majority of the sellers, the base price for this product seems close to ~ ₹ 90 K
- Ubuy is again an exception within this group and sells this product at the highest price of ~₹ 147 K, this may be due to the import duty involved with the purchase or likewise.
- The three sellers dealing with the refurbished product display the price close to the price of their brand-new variant, with a few exceptions noticed with the products discussed earlier.

Figure 4.27

OPPO Find N2 Flip Astral Black (8 GB/256 GB /New) Store vs Price chart

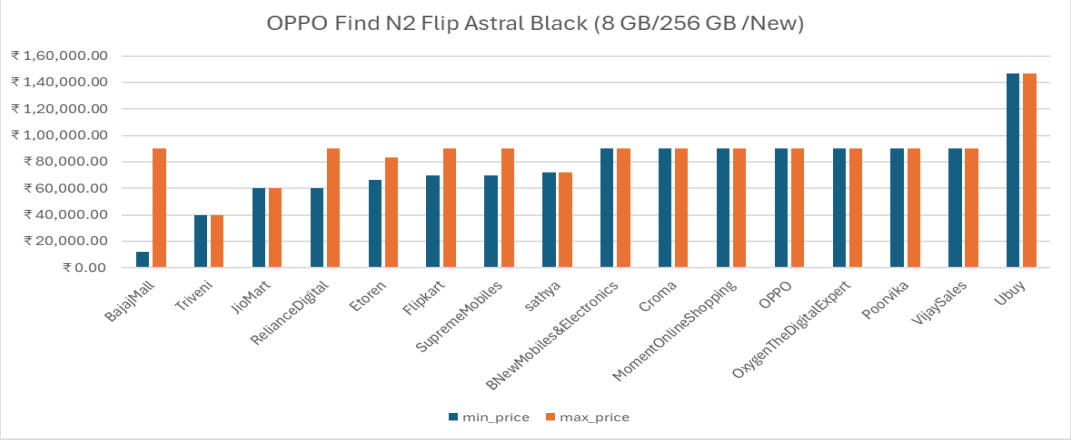
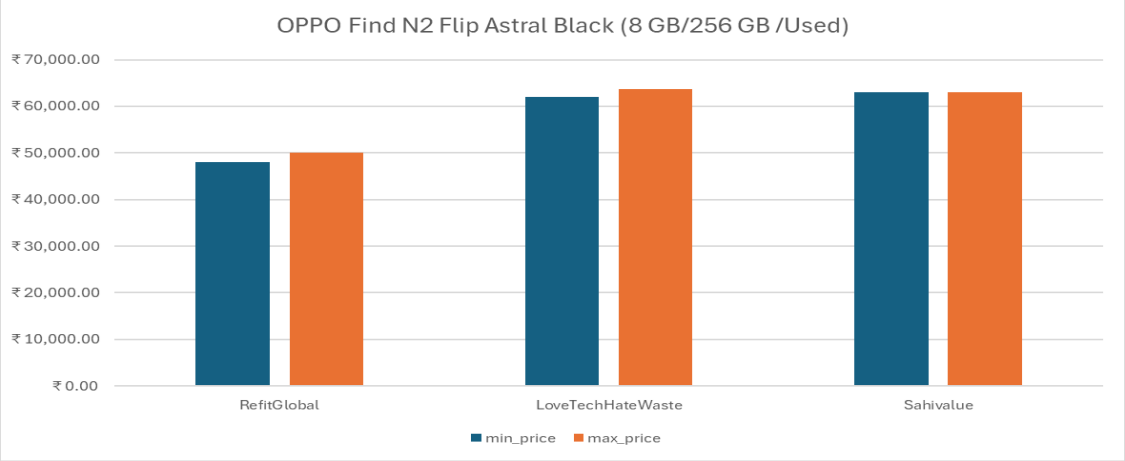


Figure 4.28

OPPO Find N2 Flip Astral Black (8 GB/256 GB /Used) Store vs Price chart



OPPO Find N2 Flip Moonlit Purple (8 GB/256 GB)

- OPPO Find N2 Flip Moonlit Purple (8 GB/256 GB) model is sold by 12 online sellers of which 4 deal in the refurbished products (Figure 4.29 & 4.30 and Appendix 2 - Table 1.29 & 1.30).
- Only one seller displays price variance during the period of study viz. JioMart. This seller shows a 50% price variance between the minimum and maximum price listings. The minimum and maximum price by this seller is ~ ₹ 60 K and ~ ₹ 90 K.
- The rest of the sellers do not exhibit any price variance for this product during the period of study.
- The minimum listing price for this product is ~ ₹ 55 K by Sathya agency/store while the maximum listing price remains ~ ₹ 90 K
- Among the major sellers Reliance digital sold this product at a constant price of ~ ₹ 60 K while Flipkart sold this product at a constant price of ~ ₹ 90 K. From what we saw with Astral Black variant of this product where these sellers displayed huge price variance, this Moonlit purple variant displays lesser price volatility among the group.
- Among the refurbished products, we found one of the major sellers viz. Amazon selling this product at a uniform price of ~ ₹ 54 K. While the rest of the sellers dealing

with the refurbished product are selling at a price closer to their brand-new variant which is consistent with our findings.

Figure 4.29

OPPO Find N2 Flip Moonlit Purple (8 GB/256 GB /New) Store vs Price chart

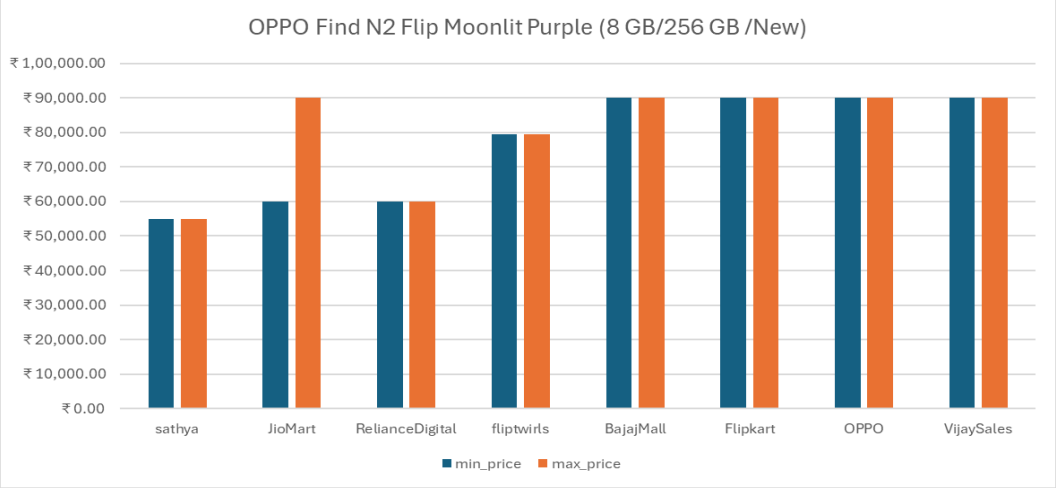
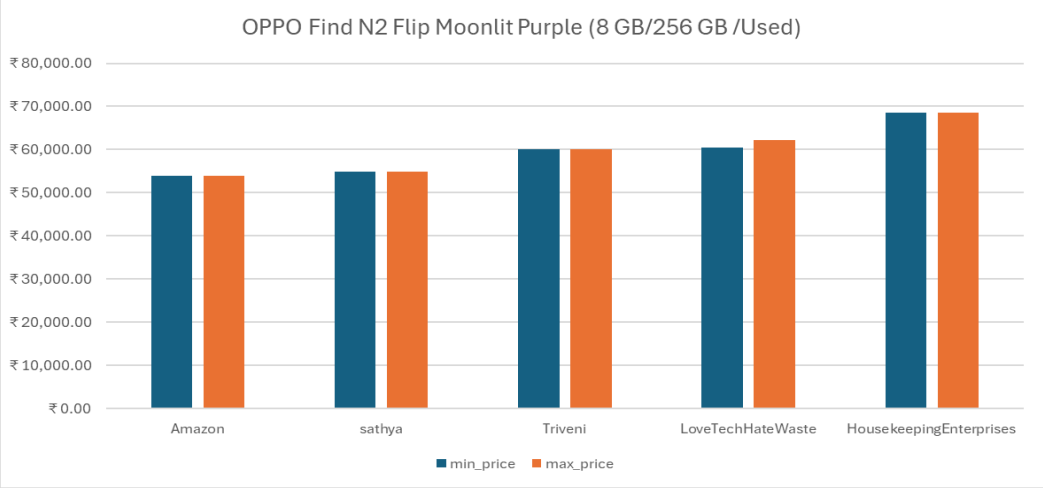


Figure 4.30

OPPO Find N2 Flip Moonlit Purple (8 GB/256 GB /Used) Store vs Price chart



OPPO Find N2 Flip Moonlit Purple (8 GB/256 GB /New) - Linear Model for JioMart Prices

We try to predict the minimum price for the stores that showed significant variance in the product price during the period of study, in this case JioMart While the coefficients are described as below (for detailed predictions refer Appendix 2 – Figure 1.15).

Below are the results for general linear model created using R software -

Coefficients -

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
JioMart	1137.29	2197.738	0.52	0.60552

Residual standard error: 3160 on 164 degrees of freedom

Multiple R-squared: 0.938, Adjusted R-squared: 0.935

F-statistic: 275 on 9 and 164 DF, **p-value**: <0.0000000000000002

Xiaomi POCO X5 Pro –

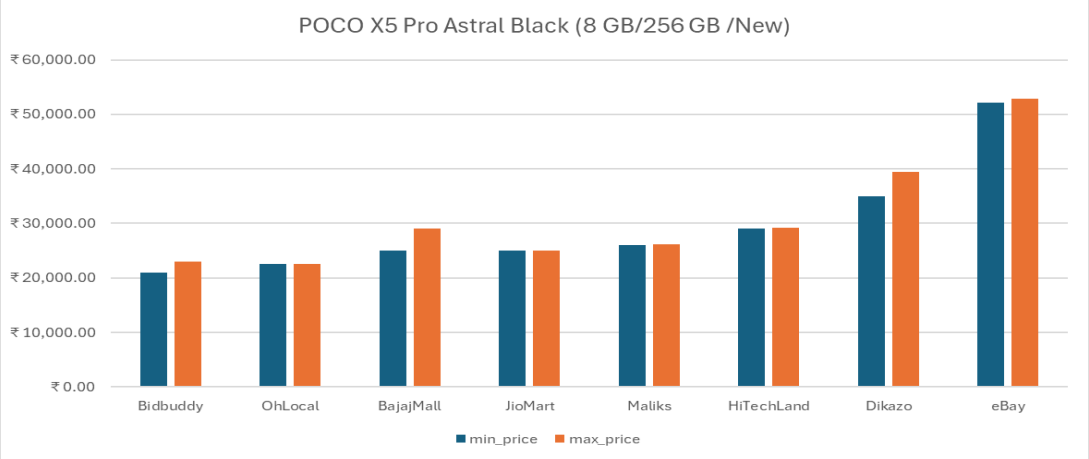
- Xiaomi POCO X5 Pro – was launched in February 2023 and is one of the flagship flip models of Xiaomi and one of the first flip phone we discuss in this study. In India, this product is available both online and offline stores. Although this product has multiple variants based on the storage, colour and memory features, for this study we have considered the below variants –
    - Storage Size – 128/256 GB
    - RAM – 6/8 GB
- Colour – Astral Black, Horizon Blue, Poco Yellow
- We extracted data for 28 sellers selling this variant online during the study period
- 5 of these sellers deal in refurbished model
- We compare the minimum, average and maximum price for this product for each seller during the period of the study and based on this we calculate the % variance between the minimum and maximum selling price.
- We will discuss only 1 variant of this product

POCO X5 Pro Astral Black (8 GB/256 GB)

- POCO X5 Pro Astral Black (8 GB/256 GB) model is sold by 8 online sellers of which none deal in refurbished products (Figure 4.31 and Appendix 2 - Table 1.31).
- For the new product, 50% of the sellers display price variance.
- BidBuddy sells this product at a minimum price of ~ ₹ 21 K, which is also the lowest price for this product within the group of sellers. This seller sells this product at its maximum price of ~ ₹ 23 K.
- Bajaj mall sells this product at a minimum and maximum price of ~ ₹ 25 K and ~ ₹ 29 K respectively.
- Among the major sellers for this product, we only found data from JioMart. JioMart sold this product for a uniform price of ~ ₹ 25 K
- eBay appears as an outlier selling the product at minimum and maximum price of ~ ₹ 52 K and ~ ₹ 53 K respectively. This is expected since eBay exists as a foreign seller.

Figure 4.31

POCO X5 Pro Astral Black (8 GB/256 GB /New) Store vs Price chart



Samsung Galaxy F12–

- Samsung Galaxy F12– was launched in April 2021 and is one of the affordable flagship models of Samsung. In India, this product is available both online and offline

stores. Although this product has multiple variants based on the storage, colour and memory features, for this study we have considered the below variants –

- Storage Size – 64 GB/128 GB
- RAM – 4 GB
- Colour – Sea Green, Sky Blue, Celestial Black

- We extracted data for 19 sellers selling this variant online during the period of study
- Out of these sellers, 7 sellers sell refurbished versions of the product.
- We compare the minimum, average and maximum price for this product for each seller during the period of the study and based on this we calculate the % variance between the minimum and maximum selling price of the product when compared with the average selling price.

Samsung Galaxy F12 Celestial Black (64 GB/4 GB)

- Samsung Galaxy F12 Celestial Black (64 GB/4 GB) models are sold by 8 online sellers of which there are 2 sellers dealing with the refurbished products (Figure 4.32 & 4.33 and Appendix 2 - Table 1.32 & 1.33).
- Only Flipkart shows price variance for this model. Flipkart sells this model at minimum and maximum price of ~ ₹ 10.5 K and ~ ₹ 12 K
- The rest of the sellers do not show any variance in the price during the period of study.
- The minimum listing price for this product is by Triveni stores ~ ₹ 10 K while the maximum listing price is by seller Flipkart ~ ₹ 12 K
- The prices from stores selling the refurbished version of this model are consistent with our finding where the price of the refurbished product seems closer to their brand-new variant in most cases. Although in this case the refurbished versions seem costlier than some stores selling the brand-new product.

Figure 4.32

Samsung Galaxy F12 Celestial Black (64 GB/4 GB /New) Store vs Price chart

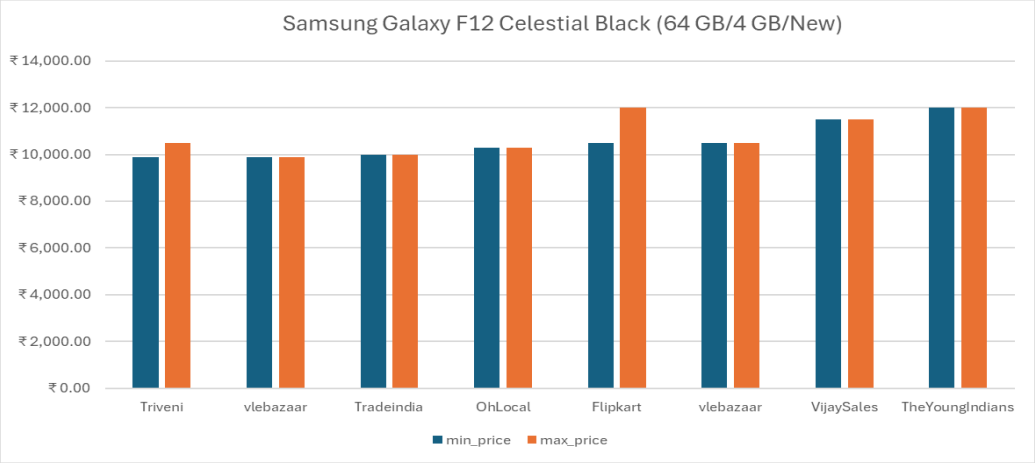
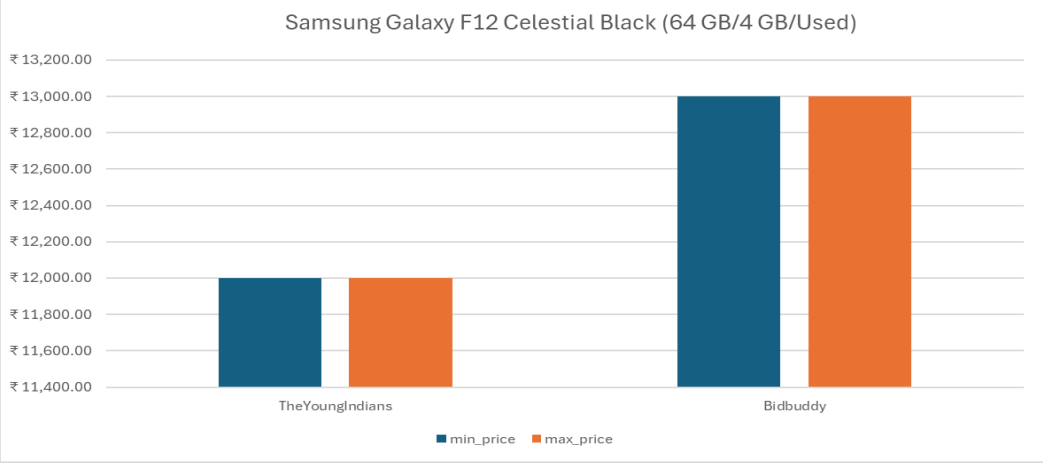


Figure 4.33

Samsung Galaxy F12 Celestial Black (64 GB/4 GB /Used) Store vs Price chart



Samsung Galaxy F12 Celestial Black (128 GB/4 GB)

- Samsung Galaxy F12 Celestial Black (128 GB/4 GB) models are sold by 6 online sellers of which there is 1 seller dealing in the refurbished products (Figure 4.34 & 4.35 and Appendix 2 - Table 1.34 & 1.35).
- Only Flipkart shows price variance for this model. Flipkart sells this model at minimum and maximum price of ~ ₹ 11.5 K and ~ ₹ 13 K.
- Regardless of the price variance displayed by Flipkart, it is not the seller which offers the best price for this product.

- The rest of the sellers do not show any variance in the price during the period of study.
- The minimum listing price for this product is by fliptwirls stores ~ ₹ 11.3 K while the maximum listing price is by seller BidBuddy ~ ₹ 14 K
- In this group we found a seller dealing in the refurbished variant of the model, Cashify that is a prominent seller of refurbished smartphones. Contrary to our observation by most of the sellers dealing in the refurbished variants of the product, this seller has a minimum and maximum price of the product within a range of ~ ₹ 7.7 K and ~ ₹ 8.7 K respectively, which 40% less than its brand-new versions.

Figure 4.34

Samsung Galaxy F12 Celestial Black (128 GB/4 GB /New) Store vs Price chart

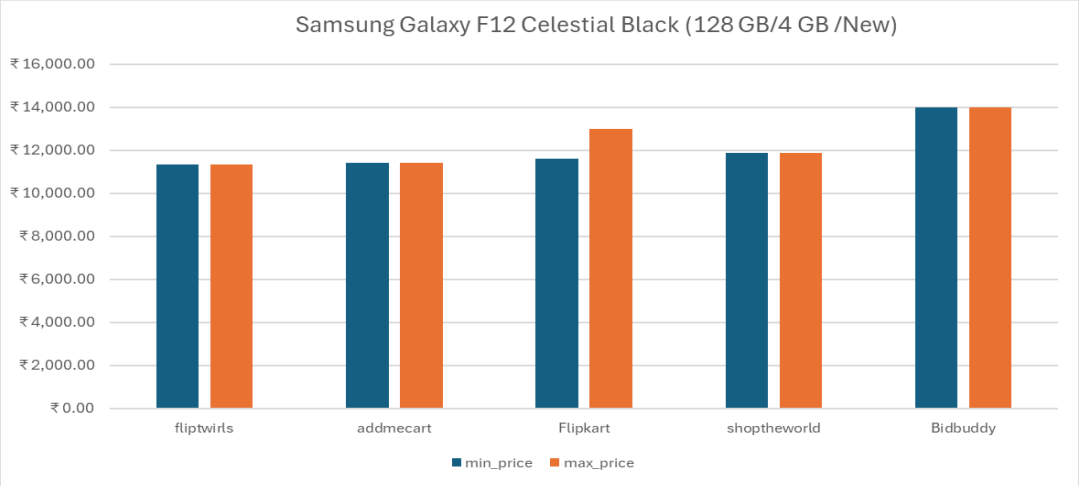
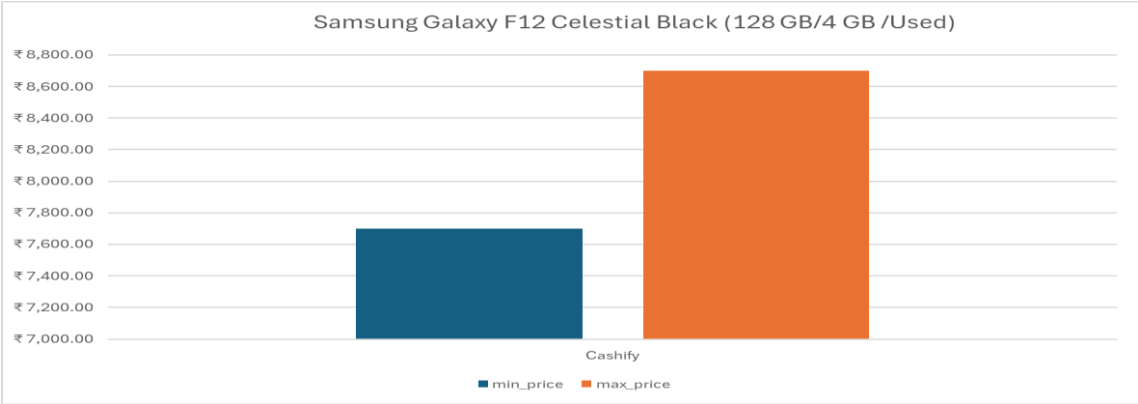


Figure 4.35

Samsung Galaxy F12 Celestial Black (128 GB/4 GB /Used) Store vs Price chart



Samsung Galaxy F12 Celestial Black (128 GB/4 GB/New) - Linear Model for Flipkart Pricing

We try to predict the minimum price for the major stores that showed significant variance in the product price during the study period, in this case Flipkart While the coefficients are described as below (for detailed predictions refer Appendix 2 – Figure 1.16).

Below are the results for general linear model created using R software -

Coefficients -

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
Flipkart	1319.329	117.3043	11.25	8.3E-14

Residual standard error: 215 on 39 degrees of freedom

Multiple R-squared: 0.969, **Adjusted R-squared**: 0.964

F-statistic: 204 on 6 and 39 DF, **p-value**: <0.0000000000000002

OnePlus 10 Pro–

- OnePlus 10 Pro– was launched in Jan 2022 and is one of the affordable flagship mid-range models of OnePlus. In India, this product is available both online and offline stores. Although this product has multiple variants based on the storage, colour and memory features, for this study we have considered the below variants –
    - Storage Size – 128 GB/256 GB/512 GB
    - RAM – 8/12 GB

- Colour – Volcanic Black, Emerald Forest, Panda White

- We extracted data for 44 sellers selling this variant online during the period of study
- Out of these sellers, 26 sellers sell refurbished versions of the product.
- We compare the minimum, average and maximum price for this product for each seller during the period of the study and based on this we calculate the % variance between the minimum and maximum selling price of the product when compared with the average selling price.
- We will be discussing only one variant of this model.

OnePlus 10 Pro Volcanic Black (128 GB/8 GB)

- OnePlus 10 Pro Volcanic Black (128 GB/8 GB) models are sold by 19 online sellers of which there are 9 sellers dealing in refurbished products (Figure 4.36 & 4.37 and Appendix 2 - Table 1.36 & 1.37).
- Except for 5 sellers the rest of the sellers do not show any price variance during the period of study, within these 5 sellers also only 2 sellers display significant variance in the price.
- Supreme Mobiles display the minimum and maximum price as ~ ₹ 40 K and ~ ₹ 67 K. The maximum price offered by this seller is the highest price within this group (except for Canadian best seller).
- Among the major sellers we were able to extract the data for Flipkart and Reliance Digital. Flipkart shows major price variance between the minimum and maximum price which is in the range of ~ ₹ 41.3 K and ~ ₹ 60 K. Reliance digital on the other hand displays no price variance and sells this product at constant price of ~ ₹ 67 K.
- Consistent with our observations regarding the sellers dealing in refurbished models, we find a similar trend for this group too. The price offered by these sellers is closer (in most instances) to the minimum price offered by most of the sellers dealing in the brand-new version of the product.

Figure 4.36

OnePlus 10 Pro Volcanic Black (128 GB/8 GB/New) Store vs Price chart

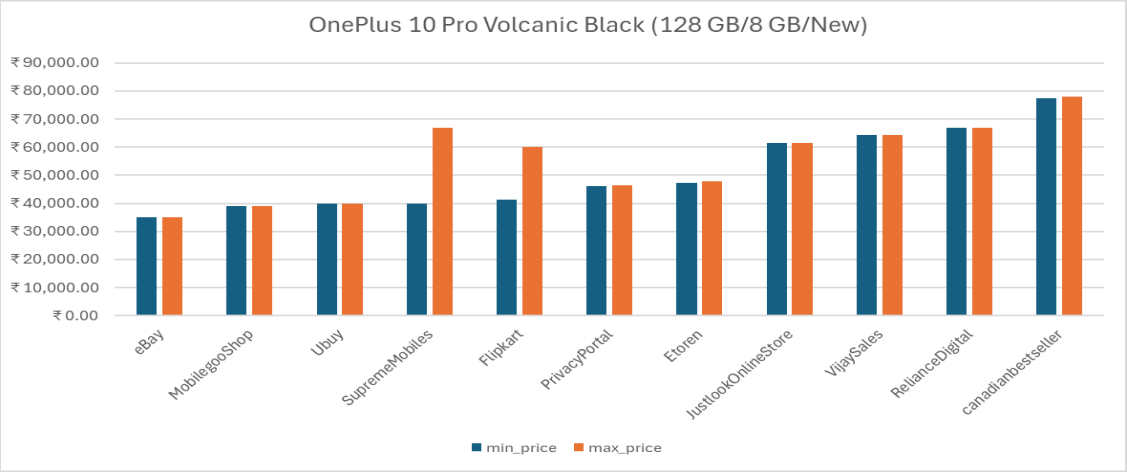
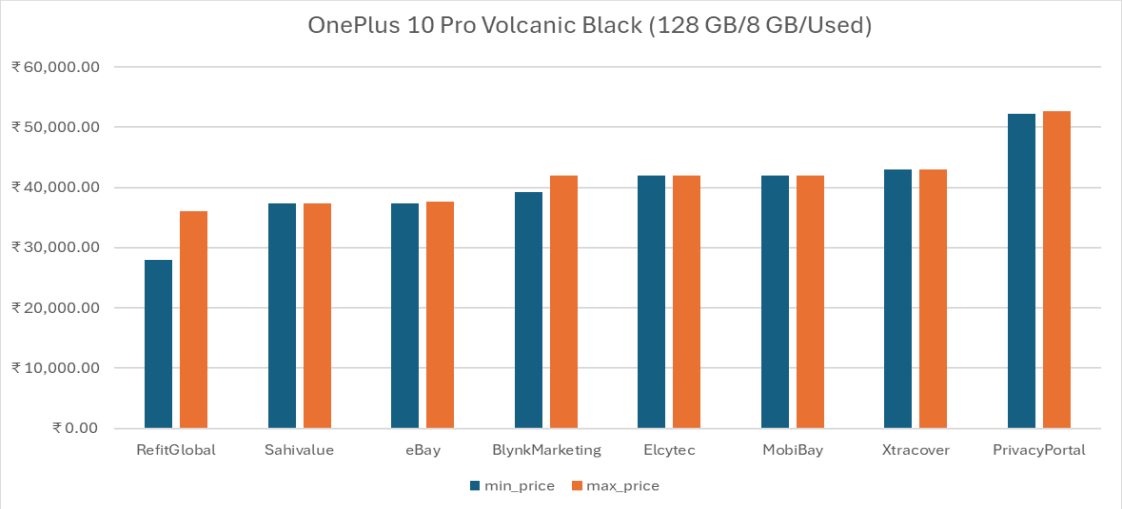


Figure 4.37

OnePlus 10 Pro Volcanic Black (128 GB/8 GB/Used) Store vs Price chart



OnePlus 10 Pro Volcanic Black (128 GB/8 GB /New) - Linear Model for Flipkart Pricing

We tried to predict the minimum price for the major stores that showed significant variance in the product price during the study period, in this case Flipkart.

Below are the results for general linear model created using R software -

Coefficients -

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
Flipkart	-29263.53	5096.527	-5.74	0.00000093

Residual standard error: 4280 on 42 degrees of freedom

Multiple R-squared: 0.888, **Adjusted R-squared**: 0.859

F-statistic: 30.3 on 11 and 42 DF, **p-value**: <0. 00000093

Samsung Galaxy Z Fold 4 5G–

- Samsung Galaxy Z Fold 4 5G– was launched in Aug 2022 and is one of the high-end flagship models of Samsung. In India, this product is available both online and offline stores. Although this product has multiple variants based on the storage, colour and memory features, for this study we have considered the below variants –
    - Storage Size – 256 GB/512 GB/1 TB
    - RAM – 12 GB
    - Colour – Graygreen, Phantom Black, Beige, Burgundy
- We extracted data for 36 sellers selling this variant online during the period of study
- Out of these sellers, 10 sellers sell refurbished versions of the product.
- We compare the minimum, average and maximum price for this product for each seller during the period of the study and based on this we calculate the % variance between the minimum and maximum selling price of the product when compared with the average selling price.
- We will be discussing only one variant of this model.

Samsung Galaxy Z Fold 4 5G Beige (256 GB/12 GB)

- Samsung Galaxy Z Fold 4 5G Beige (256 GB/12 GB) models are sold by 15 online sellers of which there are 3 sellers dealing in refurbished products (Figure 4.38 & 4.39 and Appendix 2 - Table 1.38 & 1.39).
- 6 sellers among this group display price variance for this product.

- We see a major price variance by Etoren with a minimum and maximum price within the range of ~ ₹ 76.2 K and ~ ₹ 106 K, this variance may not have much significance as the seller is exotic in nature.
- The lowest price among this group (excluding Triveni and Etoren) is provided by 93mobiles ~ ₹ 80 K which is almost half the price offered by Croma and Vijay Sales ~ ₹ 155 K.
- Among the major sellers, Reliance Digital offers this product at a minimum price of ~ ₹ 140 K and a maximum price of ~ ₹155 K.
- When we look at the manufacturer's own online portal, Samsung sells this model at the price with lower and upper range same as Reliance Digital. This is the first time we have found the manufacturer's online portal displaying some competitive pricing with a major retailer.
- We also observe one of the highest variances among this group excluding Etoren is displayed by Mahajan Electronics. This store offers this product at a minimum price of ~ ₹ 119 K and ~ ₹ 153 K.
- Although we have collected the data for the brand-new and refurbished variant for the seller named Triveni, it seems the difference in price between both the variants is extremely close. Hence, we are discussing this separately. Triveni sells the brand-new version of the product at minimum and maximum price of ~ ₹ 70 K and ~ ₹ 75 while the refurbished version is sold by the same store at ~ ₹ 55 K.
- The remaining two stores dealing in the refurbished models are selling this product at a price close to their peers selling the brand-new variant.

Figure 4.38

Samsung Galaxy Z Fold 4 5G Beige (256 GB/12 GB/New) Store vs Price chart

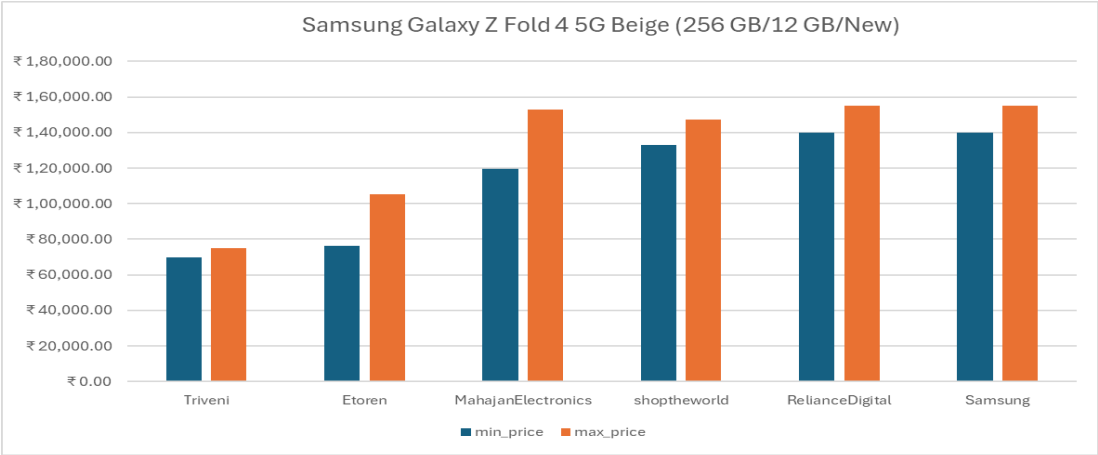
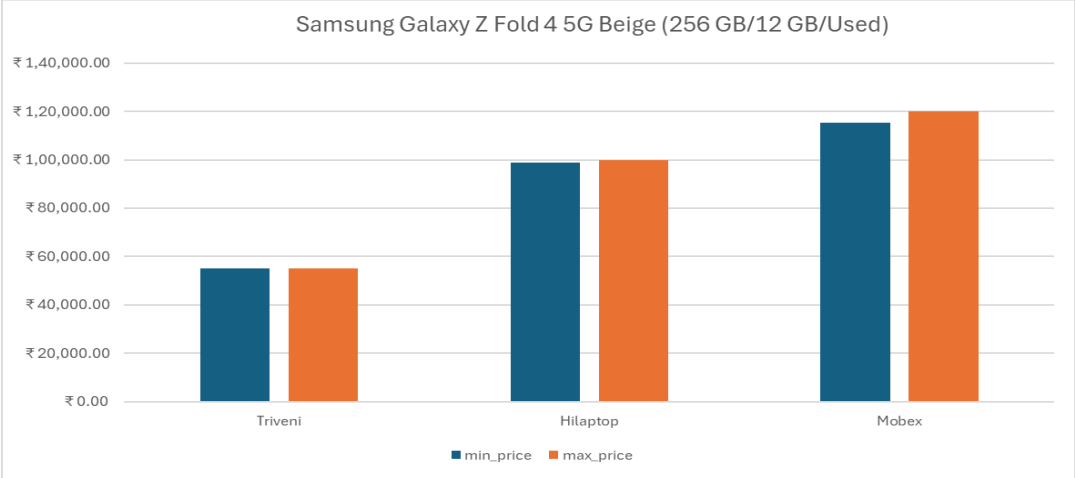


Figure 4.39

Samsung Galaxy Z Fold 4 5G Beige (256 GB/12 GB/Used) Store vs Price chart



Samsung Galaxy Z Fold 4 5G Beige (256 GB/12 GB/New) - Linear Model for Reliance Digital and Samsung Pricing

We tried to predict the minimum price for the stores that showed significant variance in the product price during the period of study, in this case Flipkart and Mi While the coefficients are described as below (for detailed predictions refer Appendix 2 – Figure 1.18 & 1.19).

Below are the results for general linear model created using R software -

Coefficients -

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
Reliance Digital	46891.61	4089.759	11.47	2E-16
Samsung	49457.07	3375.838	14.65	2E-16

Residual standard error: 5470 on 277 degrees of freedom

Multiple R-squared: 0.974, **Adjusted R-squared**: 0.973

F-statistic: 619 on 17 and 277 DF, **p-value**: <0.0000000000000002

Xiaomi 12 Pro–

- Xiaomi 12 Pro – was launched in December 2021 and is one of the mid-range flagship models of Xiaomi. In India, this product is available both online and offline stores. Although this product has multiple variants based on the storage, colour and memory features, for this study we have considered the below variants –
    - Storage Size – 128 GB/256 GB/1 TB
    - RAM – 8/12 GB
    - Colour – Gray, Blue, Purple, Green
- We extracted data for 52 sellers selling this variant online during the period of study
- Out of these sellers, 11 sellers sell the refurbished versions of the product.
- We compare the minimum, average and maximum price for this product for each seller during the period of the study and based on this we calculate the % variance between the minimum and maximum selling price of the product when compared with the average selling price.
- We will be discussing only one variant of this model.

Xiaomi 12 Pro Blue (256 GB/12 GB)

- Xiaomi 12 Pro Blue (256 GB/12 GB) models are sold by 26 online sellers of which there are 3 sellers dealing in refurbished products (Figure 4.40 & 4.41 and Appendix 2 - Table 1.40 & 1.41).
- 10 sellers among this group display price variance for this product.

- This product shows one of the most peculiar price trends among the group. JioMart sells this product at the lowest price of ~ ₹ 23.5 K while it sells this at the highest price of ~ ₹ 24 K.
- Sellers like Etoren, Sathya mobiles, Dikazo sells this product with a range of ~ ₹ 27.5 K and ~ ₹ 36 K.
- Flipkart displays a huge variance in price. It sells this product at maximum listing price of ~ ₹ 80 K while it offers this product for a lowest price of ~ ₹ 42 K, which is close to 50% reduction. The highest price on Flipkart is only next to the seller Dimprice (which sells it at ~ ₹ 83 K).
- Reliance Digital offers this product at a price range of ~ ₹ 40 K and ~ ₹ 45 K.
- The Xiaomi store (Mi) sells this product at a price range of ~ ₹ 42 K and ~ ₹ 49 K.
- We see a constant price being offered by Amazon, ~ ₹ 45 K during the period of study.
- The stores dealing in the refurbished models are selling this product at a price close to their peers selling the brand-new variant. The stores Cashify and Budli are selling the refurbished product way more than the brand-new product sold by JioMart.

Figure 4.40

Xiaomi 12 Pro Blue (256 GB/12 GB /New) Store vs Price chart

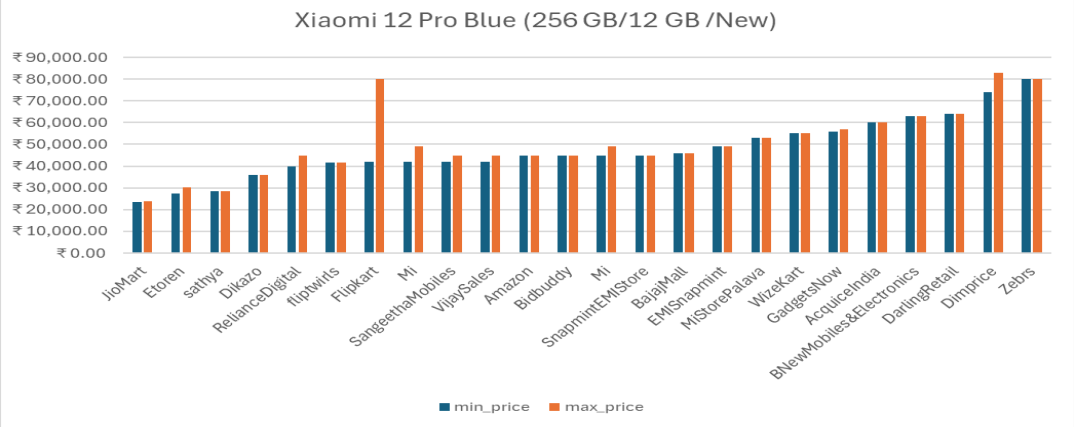
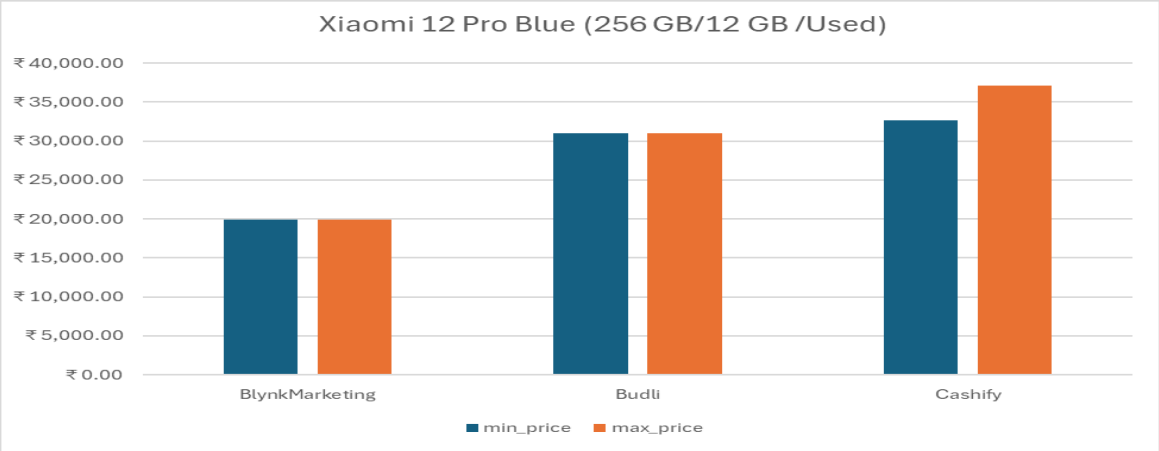


Figure 4.41

Xiaomi 12 Pro Blue (256 GB/12 GB /Used) Store vs Price chart



Xiaomi 12 Pro Blue (256 GB/12 GB /New) - Linear Model for Flipkart and Mi

We tried to predict the minimum price for the stores that showed significant variance in the product price during the period of study, in this case Flipkart and Mi (for detailed predictions refer Appendix 2 – Figure 1.20 & 1.21).

Below are the results for general linear model created using R software -

Coefficients -

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
Flipkart	2009.597	2953.477	0.68	0.49672
Mi	-3447.614	2990.837	-1.15	0.24985

Residual standard error: 4940 on 331 degrees of freedom

Multiple R-squared: 0.879, Adjusted R-squared: 0.871

F-statistic: 114 on 21 and 331 DF, **p-value**: <0.0000000000000002

vivo Y16–

- vivo Y16– was launched in September 2022 and is one of the low-range flagship models of vivo. In India, this product is available both online and offline stores. Although this product has multiple variants based on the storage, colour and memory features, for this study we have considered the below variants –
    - Storage Size – 32 GB/64 GB/128 GB

- RAM – 2/3/4 GB
- Colour – Drizzling Gold, Stellar Black

- We extracted data for 54 sellers selling this variant online during the period of study
- Out of these sellers, 7 sellers sell refurbished versions of the product.
- We compare the minimum, average and maximum price for this product for each seller during the period of the study and based on this we calculate the % variance between the minimum and maximum selling price of the product when compared with the average selling price.
- We will be discussing only one variant of this model.

vivo Y16 Gold (128 GB/4 GB)

- vivo Y16 Gold (128 GB/4 GB) models are sold by 19 online sellers of which there is 1 seller dealing in refurbished products (Figure 4.42 & 4.43 and Appendix 2 - Table 1.42 & 1.43).
- 7 sellers display price variance during the period of study.
- From the available data from the sellers under this group the minimum and maximum price for this product is ~ ₹ 10 K (Reliance Digital/Teel) and ~ ₹ 20.2 K (Scurtech, which comes out as an outlier for this low range phone). Most sellers sold this at price of ~ ₹ 13 K.
- Flipkart shows the major price change with the minimum and maximum price as ~ ₹ 10.2 K and ~ ₹ 12 K respectively.
- Among the rest of the major sellers, Croma sells this product at a minimum price of ~ ₹ 12.5 K and a maximum price of ~ ₹ 13 K and while Amazon sells this at constant price of ~ ₹ 13 K.
- We have only 1 seller dealing in the refurbished model and this seller is selling this product within a range of ~ ₹ 10.7 K and ~ ₹ 10.8 K respectively. Which is higher than the lowest price offered by sellers dealing with the brand-new version of the product. This is still consistent with our previous observations.

Figure 4.42

vivo Y16 Gold (128 GB/4 GB/New) Store vs Price chart

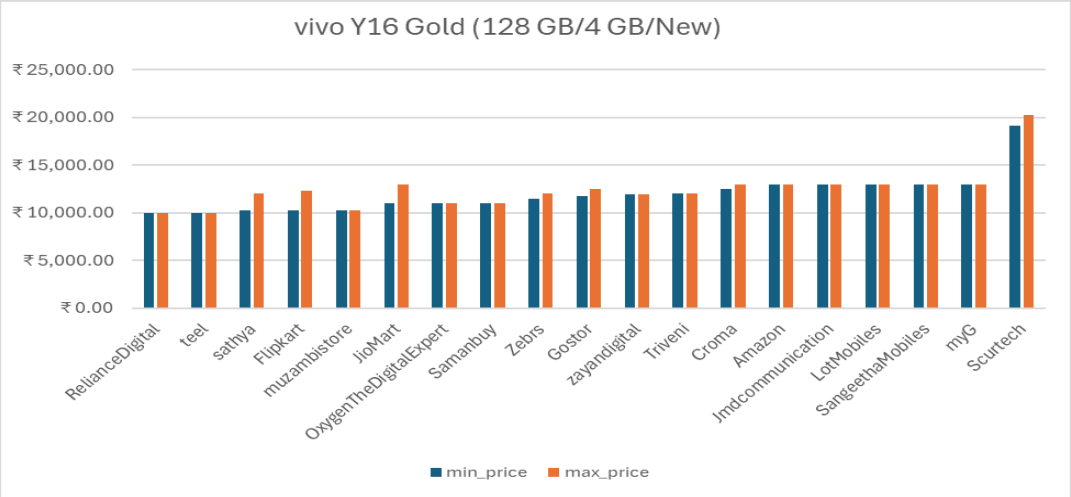
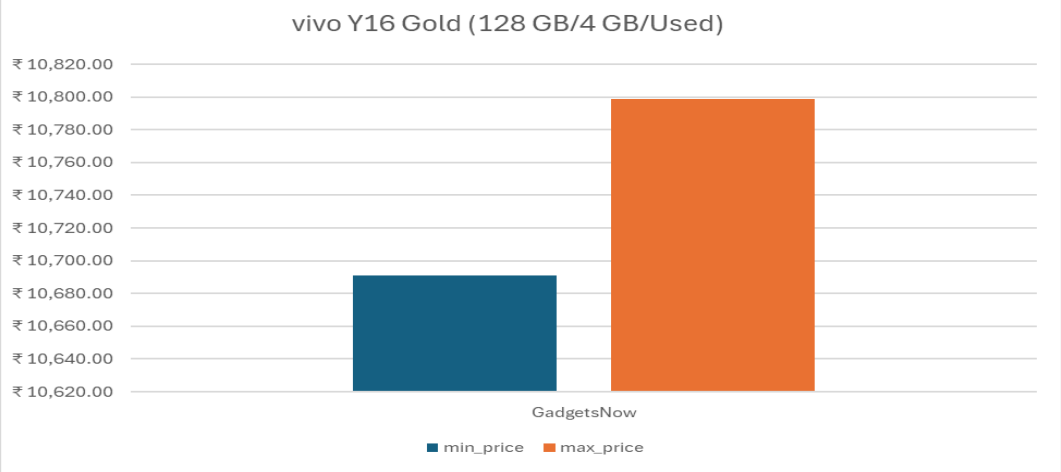


Figure 4.43

vivo Y16 Gold (128 GB/4 GB/Used) Store vs Price chart



vivo Y16 Gold (128 GB/4 GB - Linear Model for Flipkart and JioMart Prices

We tried to predict the minimum price for the stores that showed significant variance in the product price during the period of study, in this case Flipkart and JioMart (for detailed predictions refer Appendix 2 – Figure 1.22 & 1.23).

Below are the results for general linear model created using R software -

Coefficients -

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
Flipkart	60.5107	164.867	0.37	0.71363
JioMart	-400.2568	230.9809	-1.73	0.08323

Residual standard error: 1490 on 2807 degrees of freedom

Multiple R-squared: 0.73, Adjusted R-squared: 0.728

F-statistic: 361 on 21 and 2807 DF, p-value: <0.0000000000000002

Groceries

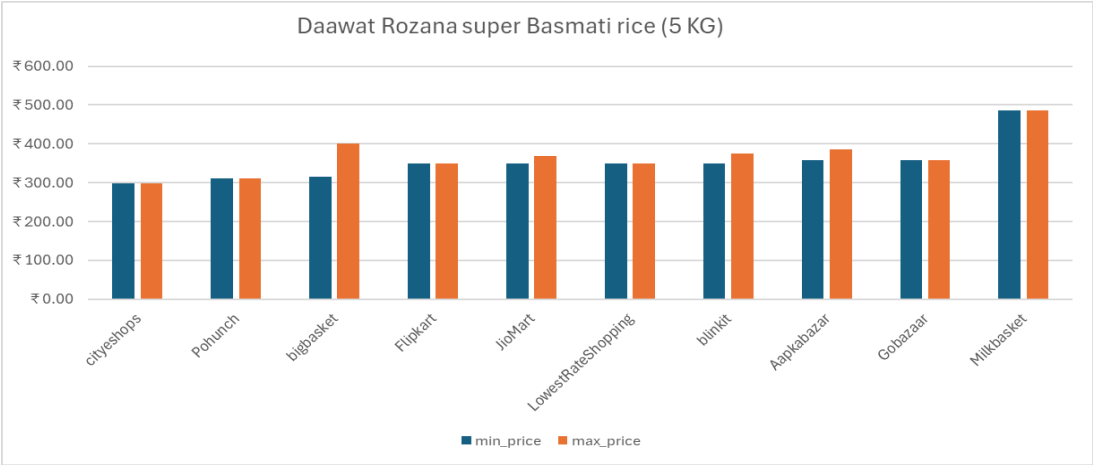
Basmati Rice 5 Kg (Brand – Daawat Rozana Super) –

Daawat Rozana super Basmati rice is one of the most popular rice brands in the in the Indian middle class. We extracted the price for this product from 10 sellers. It is worth mentioning that usually groceries will not have refurbished or used products and we prefer to ignore the sellers who deal in this for this study.

- Four stores display a variance in price for this product (Figure 4.44 and Appendix 2 - Table 1.44).
- City-e-shop sells at the lowest price among the group ~ ₹ 299.00
- Big Basket shows the most price variance during the period of study with its minimum selling price ~ ₹ 315.00 and highest selling price ~ ₹ 400.00
- Blinkit which is one of the fast commerce, delivering in less than 30 minutes, sells this product at a minimum selling price ~ ₹ 349.00 and highest selling price ~ ₹ 375.00

Figure 4.44

Daawat Rozana super Basmati rice (5 KG) Store vs Price chart



Daawat Rozana super Basmati rice (5 KG) - Linear Model for Big Basket

We take an attempt to predict the minimum price for the stores and that showed significant variance in the product price during the period of study, in this case Big Basket (for detailed predictions refer Appendix 2 – Figure 1.24).

Below are the results for general linear model created using R software -

Coefficients -

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
Big basket	352.1893	3.980491	88.48	<2e-16

Residual standard error: 11 on 130 degrees of freedom

Multiple R-squared: 0.999, Adjusted R-squared: 0.999

F-statistic: 1.3e+04 on 12 and 130 DF, **p-value**: <2e-16

Basmati Rice 5 Kg (Brand – Fortune Biryani Special Basmati Rice) –

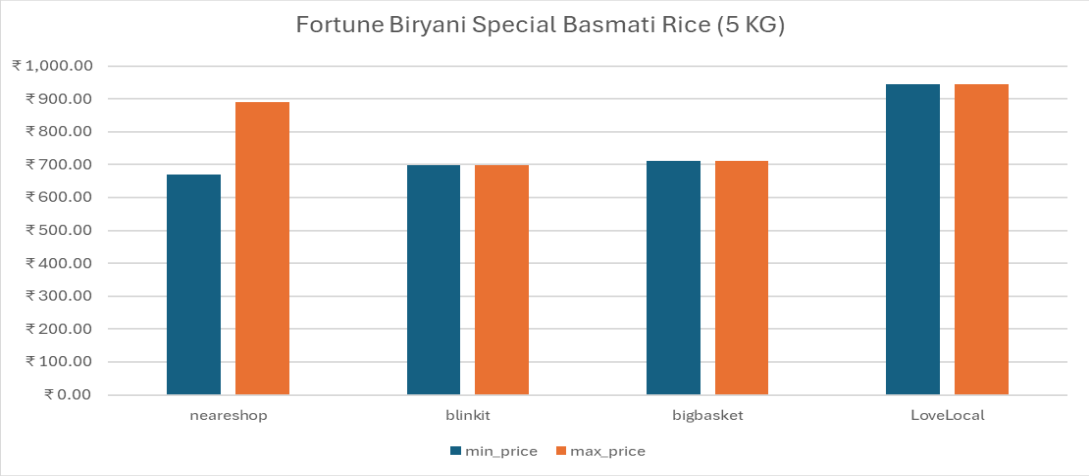
Fortune Biryani Special Basmati Rice is one of the most popular rice brands in the in the Indian middle class. We extracted the price of this product from 4 sellers.

- Among these sellers, only one seller displayed the variance in price (Figure 4.45 and Appendix 2 - Table 1.45)
- Near e shop is one of the sellers listed which showed huge price variance during the period of study. It sold at a minimum price of ~ ₹ 670.00 and a maximum price of ~ ₹ 890.00 showing a price difference of 33%

- The rest of the stores sell this product within a range of ~ ₹ 699.00 and ~ ₹ 945.00
- The maximum price of ~ ₹ 945.00 by Love Local store is an outlier among this group considering the prices by rest of the stores.

Figure 4.45

Fortune Biryani Special Basmati Rice (5 KG) Store vs Price chart



Daawat Rozana super Basmati rice (5 KG) - Linear Model for Near-e-shop

We tried to predict the minimum price for the stores that showed significant variance in the product price during the period of study, in this case Near-e-shop (for detailed predictions refer Appendix 2 – Figure 1.25).

Below are the results for general linear model created using R software -

Coefficients -

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
Near-e-shop	308.05	330.72	0.93	0.42000

Residual standard error: 104 on 3 degrees of freedom

Multiple R-squared: 0.994, Adjusted R-squared: 0.982

F-statistics: 81.1 on 6 and 3 DF, **p-value**: 0.00208

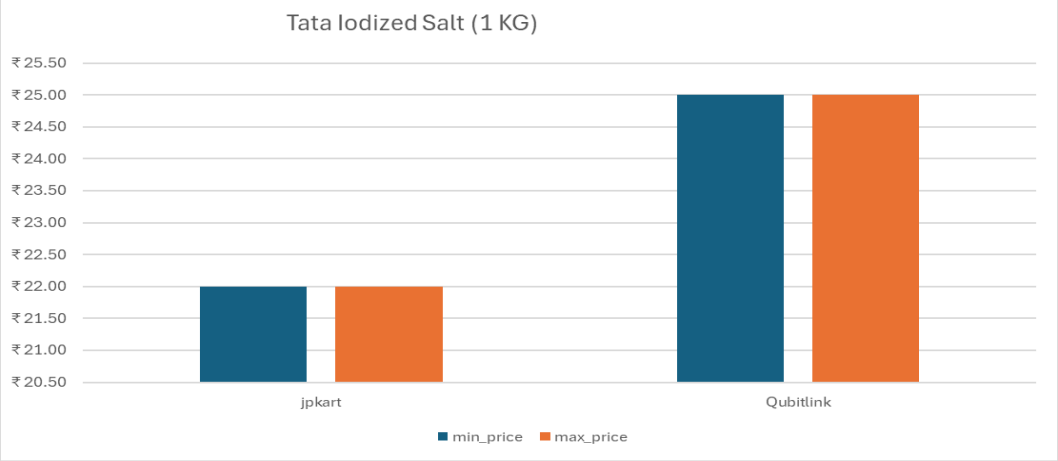
Table Salt (Brand – Tata Iodized Salt 1 KG) –

Tata Iodized Salt (1 KG) is one of the most popular Salt brands in the in the Indian household. We extracted the price of this product from 2 sellers. None of the stores display variance in price for this product.

- None of the stores showed any variance in the price (Figure 4.46 and Appendix 2 - Table 1.46)
- The JP Kart store sells this product at a minimum price of ~ ₹ 22.00 while Qubit Link sells this product at ~ ₹ 25.00

Figure 4.46

Tata Iodized Salt (1 KG) Store vs Price chart



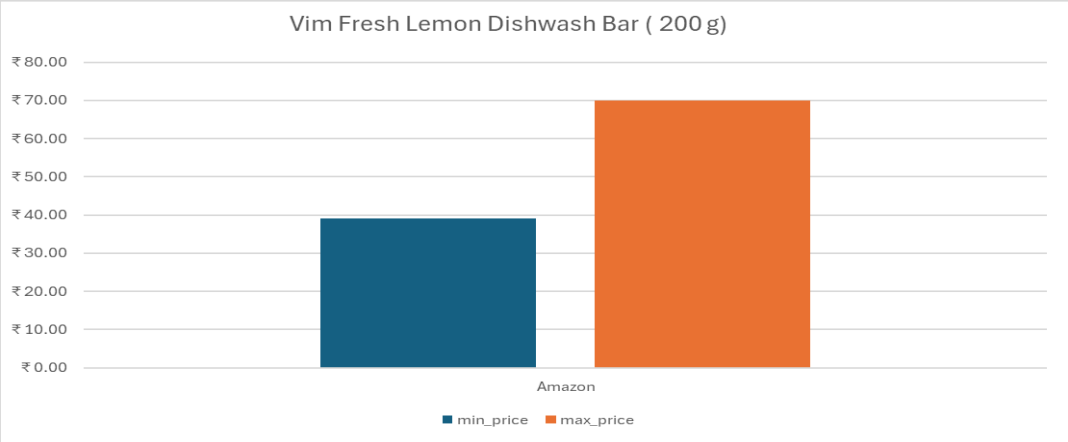
Dishwash Bar (Brand – Vim Fresh Lemon Dishwash Bar 200 g) –

Vim Fresh Lemon Dishwash Bar 200 g is one of the most popular dishwash soap brands in the in the Indian household. We extracted the price for this product for 1 seller.

- Amazon displays huge price variances even for low budget products. It sells this product for a minimum price of ~ ₹ 39.00 and a maximum price of ~ ₹ 70.00.

Figure 4.47

Vim Fresh Lemon Dishwash Bar (200 g) Store vs Price chart



Vim Fresh Lemon Dishwash Bar (200 g) - Linear Model for Amazon

We take an attempt to predict the minimum price for the stores that showed significant variance in the product price during the period of study, in this case Amazon (for detailed predictions refer Appendix 2 – Figure 1.26).

Below are the results for general linear model created using R software -

Coefficients -

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
Amazon	123.15	40.533	3.04	0.038

Residual standard error: 11 on 4 degrees of freedom

Multiple R-squared: 0.501, Adjusted R-squared: 0.251

F-statistic: 2.01 on 2 and 4 DF, **p-value**: 0.249

Butter (100 gm) (Brand – Milky Mist Salted Butter 100 g) –

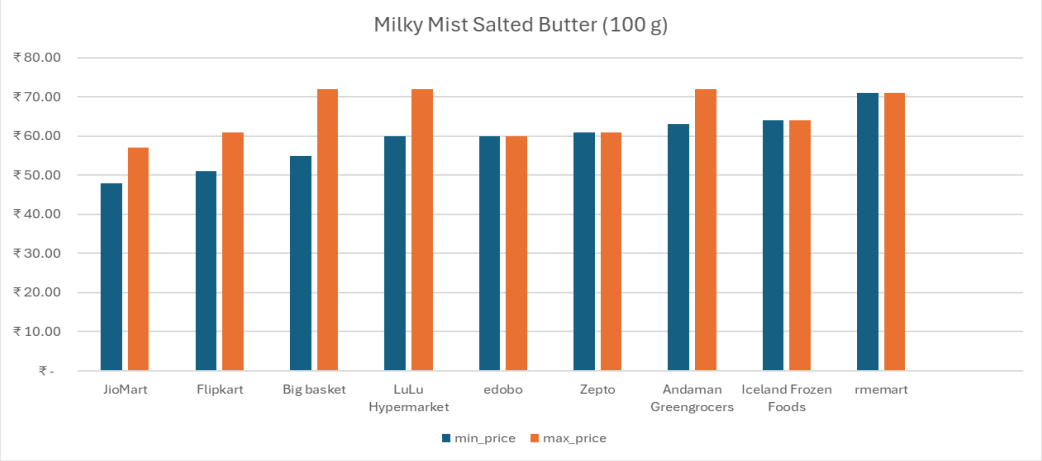
Milky Mist Salted Butter 100 g is one of the fastest growing brands in the in the Indian household.

- We extracted the price for this product for 9 sellers (Figure 4.48 and Appendix 2 - Table 1.48).
- This product is available on JioMart at a minimum price of ~ ₹ 48.00 and a maximum price of ~ ₹ 57.00, which is the lowest among the group during the period of study.

- Flipkart sells this product within a price range of ~ ₹ 51.00 - ₹ 61.00, the % of variance is comparable to JioMart.
- Although Big Basket and Zepto are specifically online grocery stores, their prices are higher than the other online retailers. Big Basket shows the highest variance among the group and sells this product within a price range of ~ ₹ 55.00 - ₹ 72.00, on the other hand Zepto sells this product at a uniform price of ~ ₹ 61.00

Figure 4.48

Milky Mist Salted Butter (100 g) Store vs Price chart



Milky Mist Salted Butter (100 g) - Linear Model for JioMart, Flipkart and Big Basket

We tried to predict the minimum price for the stores that showed significant variance in the product price during the period of study, in this case JioMart, Flipkart and Big Basket (for detailed predictions refer Appendix 2 – Figure 1.27-1.29).

Below are the results for general linear model created using R software -

Coefficients -

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
JioMart	17.8431	2.8833	6.19	3.30E-09
Flipkart	17.9058	2.9555	6.06	6.60E-09

Big Basket	20.9082	3.4397	6.08	5.90E-09

Residual standard error: 2.1 on 203 degrees of freedom

Multiple R-squared: 0.999, Adjusted R-squared: 0.999

F-statistic: 1.62e+04 on 12 and 203 DF, **p-value**: <2e-16

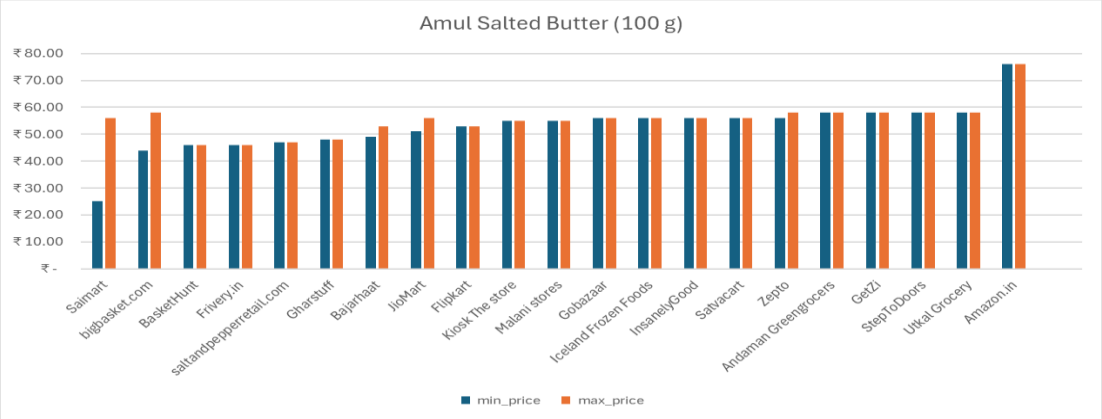
Butter (100 gm) (Brand – Amul Salted Butter 100 g) –

Amul Salted Butter 100 g is one of the major milk product brands in the in the Indian household. We extracted the price for this product from 21 sellers.

- Only 5 sellers display a price variance for this product of which only two sellers display major price variance (Figure 4.49 and Appendix 2 - Table 1.49).
- This product is available on Sai mart at a price range of ~ ₹ 25.00 - ₹ 56.00 which is the highest price variance among this group during the period of study. The lowest price by Sai mart is extremely low considering the MRP of the product.
- The price range for this product on Big Basket is within ~ ₹ 44.00 - ₹ 58.00. While the lowest price on Big Basket is lower than most of the stores, the highest available price is higher than most of the stores.
- JioMart sells this product within a price range of ~ ₹ 51.00 - ₹ 56.00. The upper range of the price is still less than Big Basket.

Figure 4.49

Amul Salted Butter (100 g) Store vs Price chart



Amul Salted Butter (100 g) - Linear Model for Big Basket and JioMart

We tried to predict the minimum price for the stores that showed significant variance in the product price during the period of study, in this case JioMart and Big Basket (for detailed predictions refer Appendix 2 – Figure 1.30 & 1.31).

Below are the results for general linear model created using R software -

Coefficients -

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
Jio Mart	36.4544	2.5942	14.05	<2e-16
Big Basket	38.1261	2.7112	14.06	<2e-16

Residual standard error: 1.6 on 200 degrees of freedom

Multiple R-squared: 0.999, Adjusted R-squared: 0.999

F-statistics: 4.99e+04 on 5 and 200 DF, **p-value**: <2e-16

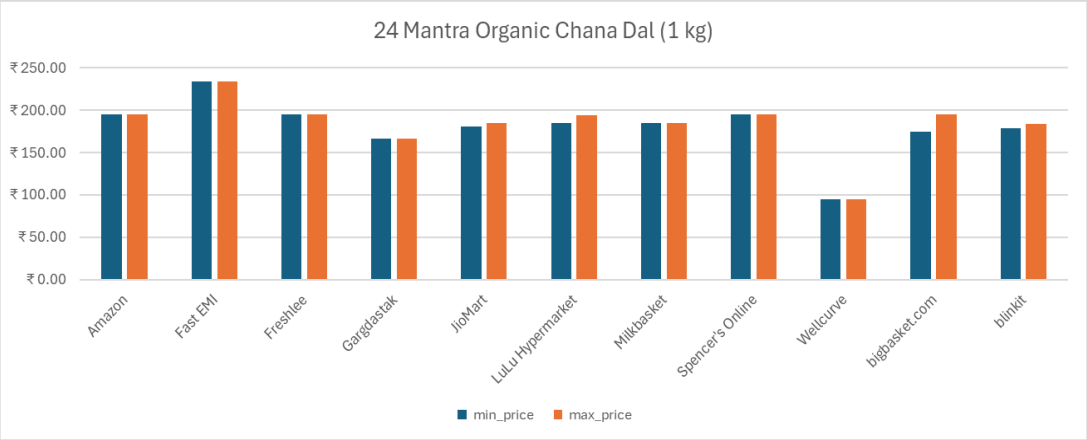
Dal (1 KG) (Brand –24 Mantra Organic Chana Dal 1 kg) –

24 Mantra Organic Chana Dal 1 KG is one of the prominent pulses sold online in India. We extracted the price for this product from 11 sellers.

- Only 4 sellers display a price variance for this product of which only two sellers display major price variance (Figure 4.50 and Appendix 2 - Table 1.50).
- Well curve sells this product at an extremely low price of ~ ₹ 95.00, which is extremely odd considering the rest of the group.
- Big Basket shows the highest price variance for this product among the group. It sells this product at a price range of ~ ₹ 175.00 and ~ ₹ 195.00.
- While JioMart and Blinkit display lower price variance but the maximum price on these sellers is ~ ₹ 185.00 and ~ ₹ 184.00 respectively.
- Lulu Hypermarket sells this product within the price range of ~ ₹ 185.00 and ~ ₹ 194.00
- The highest price for this product is ~ ₹ 234.00 from Fast EMI.

Figure 4.50

24 Mantra Organic Chana Dal (1 KG) Store vs Price chart



24 Mantra Organic Chana Dal (1 KG) - Linear Model for Big Basket and Lulu Hypermarket

We try to predict the minimum price for the stores that showed significant variance in the product price during the period of study, in this case JioMart and Big Basket (for detailed predictions refer Appendix 2 – Figure 1.32 & 1.33).

Below are the results for general linear model created using R software -

Coefficients -

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
Big Basket	174.358	19.908	8.76	0.0000027
Lulu Hypermarket	170.813	19.487	8.77	0.0000027

Residual standard error: 2.1 on 11 degrees of freedom

Multiple R-squared: 1, Adjusted R-squared: 1

F-statistic: 3.92e+04 on 3 and 11 DF, **p-value**: <2e-16

Television –

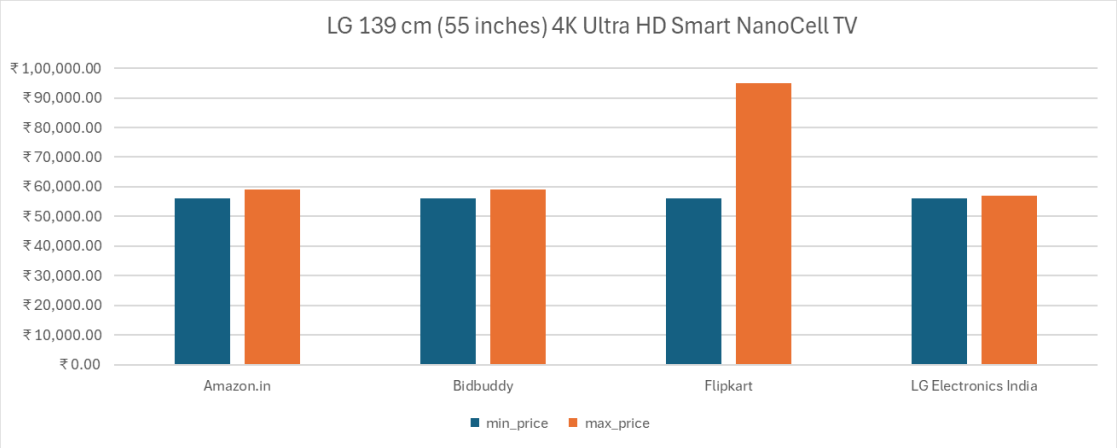
LG 139 cm (55 inches) 4K Ultra HD Smart NanoCell TV –

LG 139 cm (55 inches) 4K Ultra HD Smart NanoCell TV is one of the popular television brands purchased by Indian middle class (mid and upper) and upper-class consumers.

- We collected data for 4 sellers for this product. All 4 of which display price variance for this product (Figure 4.51 and Appendix 2 - Table 1.51).
- All sellers sell this product for a minimum price of ~ ₹ 56 K although the maximum price each of the sellers differs slightly except for Flipkart
- Flipkart sold this product at a maximum price of ₹ 95 K, which is clearly an outlier and almost twice the highest price by sellers.
- The online store by LG, who is the manufacturer itself, also closely follows the retailers on the pricing

Figure 4.51

LG 139 cm (55 inches) 4K Ultra HD Smart NanoCell TV Store vs Price chart



LG 139 cm (55 inches) 4K Ultra HD Smart NanoCell TV - Linear Model for Amazon

We take an attempt to predict the minimum price for the stores that showed significant variance in the product price during the period of study, in this case Amazon (for detailed predictions refer Appendix 2 – Figure 1.33).

Below are the results for general linear model created using R software -

Coefficients -

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
Amazon	82952.232	6936.298	11.96	<2e-16

Residual standard error: 3540 on 63 degrees of freedom

Multiple R-squared: 0.997, Adjusted R-squared: 0.996

F-statistic: 3.01e+03 on 6 and 63 DF, **p-value**: <2e-16

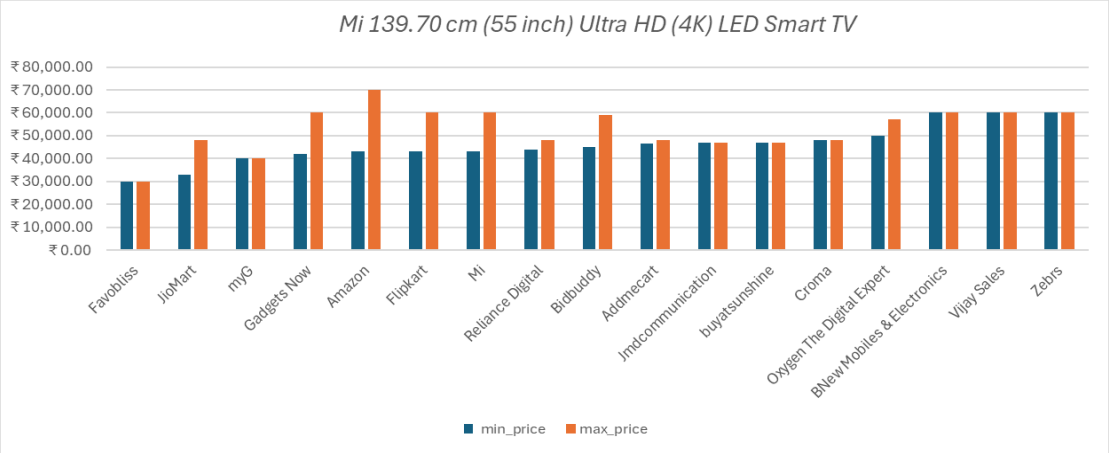
Mi 139.70 cm (55 inch) Ultra HD (4K) LED Smart TV –

Mi 139.70 cm (55 inch) Ultra HD (4K) LED Smart TV is one of the new entrants in the Indian marketplace as compared to LG, Samsung and Sony.

- We collected data for 17 sellers for this product, of which 9 sellers display price variance (Figure 4.52 and Appendix 2 - Table 1.52).
- Amazon shows the highest price variance of 63% between its minimum and maximum price (~ ₹ 43 K and ~ ₹ 70 K)
- JioMart also displays high price variance although it sells this product at it lowest price of ~ ₹ 33 K which is 2nd only to Favobliss which sells this product at lowest price of ~ ₹ 29 K (a less known online retailer). JioMart highest selling price also remains lower than most of the major e-commerce stores (of ~ ₹ 48 K)
- Flipkart on the other hand, sells this product at its minimum price of ~ ₹ 43 K and a maximum price of ~ ₹ 60 K
- The Manufacturer store Mi, also sells this product within a range of ~ ₹ 43 K and of ~ ₹ 60 K
- Croma sells this product at a constant price of ~ ₹ 48 K
- This product shows major variance in price (at least among the 55-inch TV segment)

Figure 4.52

Mi 139.70 cm (55 inch) Ultra HD (4K) LED Smart TV Store vs Price chart



Mi 139.70 cm (55 inch) Ultra HD (4K) LED Smart TV - Linear Model for JioMart, Amazon and Flipkart

We tried to predict the minimum price for the stores that showed significant variance in the product price during the period of study, in this case JioMart, Amazon and Flipkart (for detailed predictions refer Appendix 2 – Figure 1.34-1.36).

Below are the results for general linear model created using R software -

Coefficients -

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
JioMart	25442.8931	3221.8377	7.9	4.10E-13
Amazon	26137.2463	3302.6317	7.91	3.70E-13
Flipkart	30197.5193	3793.7563	7.96	2.80E-13

Residual standard error: 3300 on 162 degrees of freedom

Multiple R-squared: 0.995, Adjusted R-squared: 0.995

F-statistic: 8.51e+03 on 4 and 162 DF, **p-value**: <2e-16

Samsung 7 138 Cm 55 Inch Ultra HD 4k Led Smart Tizen TV –

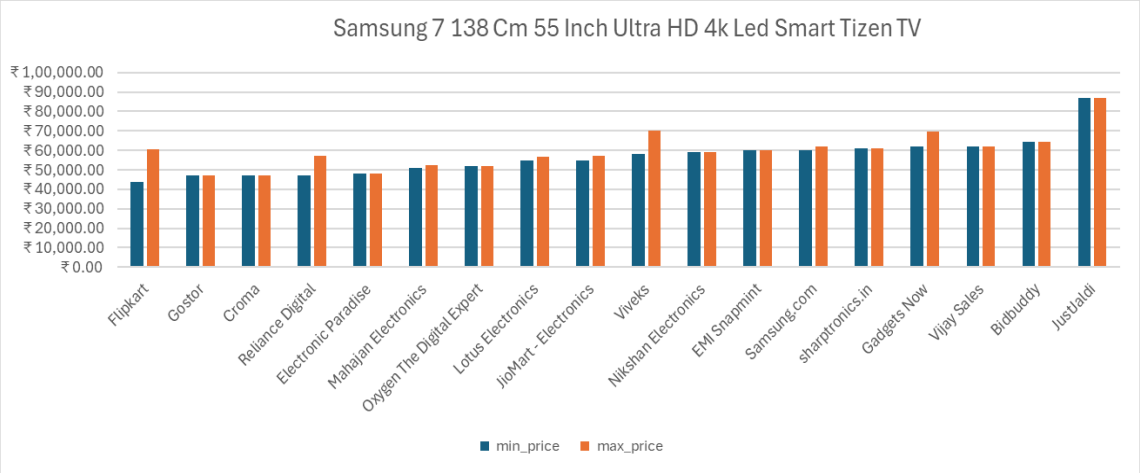
Samsung 7 138 Cm 55 Inch Ultra Hd 4k Led Smart Tizen TV is one of the popular and established television brands in the Indian marketplace.

- We collected data for 18 sellers for this product, of which 8 sellers display price variance (Figure 4.53 and Appendix 2 - Table 1.53).

- Of the major stores, Flipkart shows high price variance, its minimum and maximum price listing is ~ ₹ 44 K and ~ ₹ 60.7 K respectively. Its minimum price is the lowest among the group. Although its highest price is higher than the maximum price of multiple stores.
- Gostor sells this at a uniform price of ~ ₹ 47 K while among the major stores Croma sells at a uniform price of is ~ ₹ 47.3 K
- Reliance Digital sells this product at its lowest price of is ~ ₹ 47.3 K while its maximum price is ~ ₹ 57 K, which is still lower than the maximum price listed by Flipkart.
- JioMart and the manufacturer Samsung sold this product at a lower price range.

Figure 4.53

Samsung 7 138 Cm 55 Inch Ultra HD 4k Led Smart Tizen TV Store vs Price chart



Samsung 7 138 Cm 55 Inch Ultra HD 4k Led Smart Tizen TV - Linear Model for Flipkart and Reliance Digital

We tried to predict the minimum price for the stores that showed significant variance in the product price during the period of study, in this case Flipkart and Reliance Digital (for detailed predictions refer Appendix 2 – Figure 1.37 & 1.38).

Below are the results for general linear model created using R software -

Coefficients -

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
Flipkart	34322.509	6152.859	5.58	0.0000017
Reliance Digital	35267.798	6563.372	5.37	0.0000034

Residual standard error: 1590 on 41 degrees of freedom

Multiple R-squared: 0.999, **Adjusted R-squared**: 0.999

F-statistic: 3.82e+03 on 18 and 41 DF, **p-value**: <2e-16

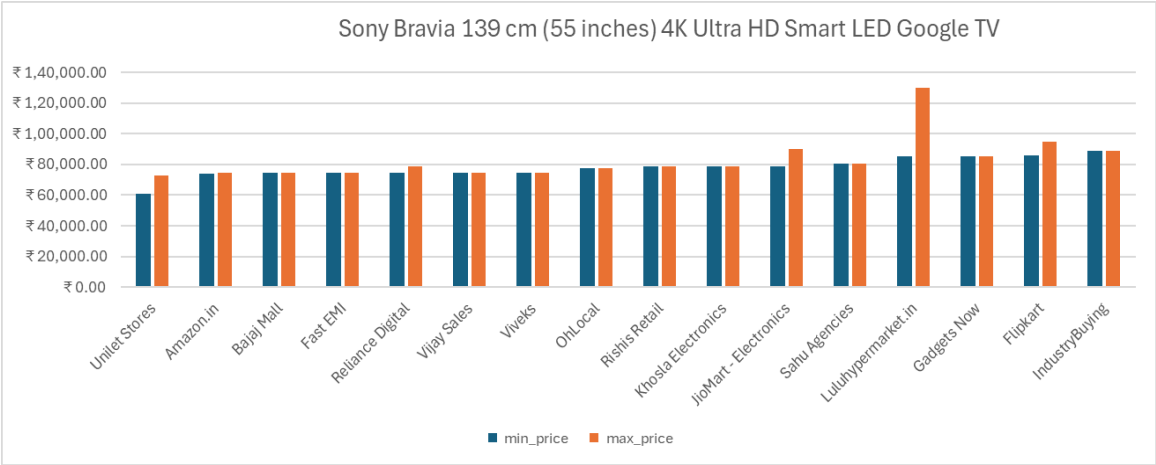
Sony Bravia 139 cm (55 inches) 4K Ultra HD Smart LED Google TV –

Sony Bravia 139 cm (55 inches) 4K Ultra HD Smart LED Google TV is one of the most popular and established television brands in the Indian marketplace.

- We collected data for 16 sellers for this product, of which 6 sellers display price variance (Figure 4.54 and Appendix 2 - Table 1.54).
- Unilet stores sells this product within its minimum and maximum price of ~ ₹ 61 K and ~ ₹ 73 K respectively.
- Among the major online stores, Amazon displays very small price variance. It sells this product within a minimum and maximum price of ~ ₹ 74 K and ~ ₹ 76.7 K, which is just ~ ₹ 700 and one of the lowest price variances for high-cost products.
- Reliance Digital projects its minimum and maximum price as ~ ₹ 74.7 K and ~ ₹ 78.0 K respectively.
- Lulu Hypermarket and Flipkart both sell at their minimum listing prices of ~ ₹ 85 K although the maximum listing price by Lulu hypermarket is among the highest within this group at ~ ₹ 130 K.
- JioMart sells this product within the range of ~ ₹ 78.8 K and ~ ₹ 90 K respectively.

Figure 4.54

Sony Bravia 139 cm (55 inches) 4K Ultra HD Smart LED Google TV Store vs Price chart



Sony Bravia 139 cm (55 inches) 4K Ultra HD Smart LED Google TV - Linear Model for JioMart and Lulu Hypermarket

We take an attempt to predict the minimum price for the stores that showed significant variance in the product price during the period of study, in this case JioMart and Lulu Hypermarket (for detailed predictions refer Appendix 2 – Figure 1.39 & 1.40).

Below are the results for general linear model created using R software -

Coefficients -

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
JioMart	22139.53	6477.4618	3.42	1.00E-03
Lulu Hypermarket	34540.9173	9887.174	3.49	8.00E-04

Residual standard error: 7060 on 76 degrees of freedom

Multiple R-squared: 0.996, **Adjusted R-squared**: 0.996

F-statistic: 5.95e+03 on 3 and 76 DF, **p-value**: <2e-16

Electronics (Laptops) –

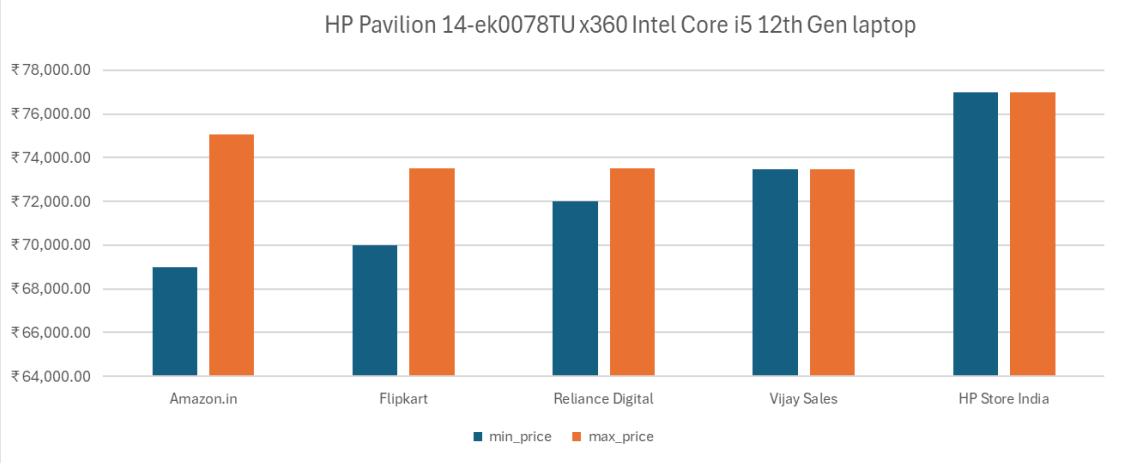
HP Pavilion 14-ek0078TU x360 Intel Core i5 12th Gen / 16GB RAM / 512GB SSD with Iris Xe Graphics Convertible Laptop - MS Windows 11 & Office 21 –

HP Pavilion 14-ek0078TU x360 Intel Core i5 12th Gen / 16GB RAM / 512GB SSD with Iris Xe Graphics Convertible Laptop - MS Windows 11 & Office 21 laptop is a high-performance mid-budget range. We collected data for 5 sellers for this product, of which 3 sellers display price variance.

- Price variance is shown only by 3 major online marketplaces (Figure 4.55 and Appendix 2 - Table 1.55).
- The product is available at the lowest price on Amazon, which sells within the price range ~ ₹ 69 K and ~ ₹ 75 K. Although its minimum listing price is the lowest in this group, the maximum listing price is 2nd highest just after Manufacturer HP.
- Flipkart sells this product at its minimum price of ~ ₹ 70 K and while the maximum price is ~ ₹ 73.5 K which is less than the maximum price available at Amazon
- Reliance Digital shows a very less price variance and sells this product at minimum and maximum price of ~ ₹ 72 K and ~ ₹ 73.5 K respectively.
- The manufacturer store, HP, sells this product at a uniform price of ~ ₹ 77 K

Figure 4.55

HP Pavilion 14-ek0078TU x360 Intel Core i5 12th Gen laptop Store vs Price chart



HP Pavilion 14-ek0078TU x360 Intel Core i5 12th Gen laptop - Linear Model for Amazon and Flipkart

We tried to predict the minimum price for the stores that showed significant variance in the product price during the period of study, in this case Flipkart and Amazon (for detailed predictions refer Appendix 2 – Figure 1.41 & 1.42).

Below are the results for general linear model created using R software -

Coefficients -

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
Amazon	29204.418	7461.648	3.91	2.60E-04
Flipkart	28620.85	7351.474	3.89	2.70E-04

Residual standard error: 1060 on 54 degrees of freedom

Multiple R-squared: 1, **Adjusted R-squared**: 1

F-statistic: 5.69e+04 on 5 and 54 DF, **p-value**: <2e-16

Lenovo IdeaPad Flex 5 Intel Core I3 12th Gen Laptop –

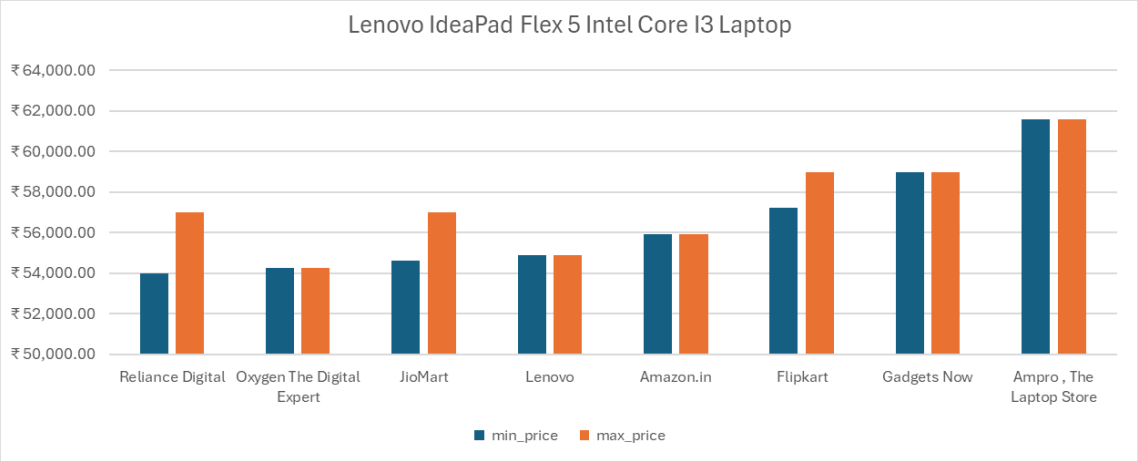
Lenovo IdeaPad Flex 5 Intel Core I3 12th Gen - 8 Gb/512 Gb SSD/Windows 11 Home 14iau7 Thin and Light Laptop is available at a mid-budget range. We collected data for 8 sellers for this product, of which 3 sellers display price variance.

- Price variance is shown only by 3 major online marketplaces (Figure 4.56 and Appendix 2 - Table 1.56).
- The product is available at the lowest price on Reliance Digital, which sells within the price range ~ ₹ 54 K and ~ ₹ 57 K. Although its minimum listing price is the lowest in this group, the maximum listing price is higher than Oxygen stores, Lenovo and Amazon.
- JioMart sells this product with a significantly lower price variance with the price range between ~ ₹ 54.6 K and ~ ₹ 57 K
- Oxygen store sells this product at constant price of ~ ₹ 54 K
- The manufacturer store Lenovo does not display any price variance and sells this product at a constant price of ~ ₹ 55 K
- Amazon also sells this product at a constant price of ~ ₹ 56 K.

- Although Flipkart displays a price variance between its listing price but it's higher than its competitor stores.

Figure 4.56

Lenovo IdeaPad Flex 5 Intel Core I3 Laptop Store vs Price chart



Lenovo IdeaPad Flex 5 Intel Core I3 Laptop - Linear Model for Reliance Digital

We tried to predict the minimum price for the stores that showed significant variance in the product price during the study period, in this case Reliance Digital (for detailed predictions refer Appendix 2 – Figure 1.43).

Below are the results for general linear model created using R software -

Coefficients -

Intercepts	Estimate	Std. Error	t-value	Pr(>|t|)
Reliance Digital	8.09E+04	1.97E+04	4.1	4.60E-03

Residual standard error: 772 on 7 degrees of freedom

Multiple R-squared: 1, **Adjusted R-squared**: 1

F-statistic: 8.46e+03 on 13 and 7 DF, p-**value**: 2.23e-13

4.2 Summary of Findings

Based on the collected data, we found significant variance in the price for multiple sellers. During this study we saw not only prominent sellers displaying price variance but

also some less known online sellers display higher price variance. We also found the manufacturer stores display some price variance but this was lower than their retailer stores. The price variance among the sellers is common across smartphones, laptop, TV and even grocery. We had some success with the linear model for predicting the next day price for few product with less errors or variance.

We provide a quick summary of the results in an aggregate format. This tabular representation provides a detail on the number of different products sold by seller for this study and the average price variance displayed by the seller (we have excluded the sellers not displaying any significant price variance in this aggregate result). During our study we found Flipkart listing the maximum number of products considered for this study (a total of 30 products) with an average price variance of 16% , this was followed by Amazon (selling 23 products) with an average price variance of 11%, Jiomart and Reliance both displaying 10% of average price variance.

Table 4.1

# of products sold by the seller and Avg. Price variance displayed

Store	# of products	Avg. Price Variance
Flipkart	30	16%
Amazon	23	11%
JioMart	22	10%
RelianceDigital	21	10%
GadgetsNow	13	5%
Bidbuddy	12	5%
Croma	12	2%
VijaySales	12	1%
Triveni	10	1%
Etoren	7	14%
SangeethaMobiles	7	3%
Zebrs	7	1%

BajajMall	6	111%
eBay	6	40%
FastEMI	6	1%
myG	6	4%
OxygenTheDigitalExpert	6	2%
Poorvika	6	2%
RefitGlobal	6	10%
Samsung	6	7%
Sathya	6	3%
Bigbasket	5	20%
BigCMobiles	4	13%
DarlingRetail	4	4%
Elcytec	4	5%
Gostor	4	2%
SupremeMobiles	4	24%
Luluhypermarket	4	25%
Blinkit	3	3%
Cashify	3	9%
Mi	3	22%
Mobex	3	4%
Shoptheworld	3	14%
Vlebazaar	3	3%
Addmecart	2	2%
BlynkMarketing	2	4%
Dikazo	2	7%
Dimprice	2	6%
EasternLogica	2	6%
Hilaptop	2	1%
LoveTechHateWaste	2	3%

MahajanElectronics	2	16%
Mall2Mart	2	6%
MapleStore	2	1%
PrivacyPortal	2	1%
Viveks	2	11%
Zepto	2	2%
ImagineOnline	2	125%
UniletStores	2	10%
AndamanGreengrocers	2	7%
Aapkabazar	1	8%
Apple	1	17%
Bajarhaat	1	8%
Canadianbestseller	1	1%
Near-e-shop	1	33%
PoojaraTelecom	1	15%
Saimart	1	124%
Scurtech	1	6%
LGElectronicsIndia	1	2%
LotusElectronics	1	4%

A Similar summary of the price prediction is also provided. Here we have only provided the details of the product whose predicted price was very close to the actual price.

Table 4.2

Product models whose predicted price was close to the actual price

Product Model
Apple iPhone 13 Blue (128 GB/New) Actual vs Predicted price for Reliance Digital
Apple iPhone 13 Blue (128 GB/New) Actual vs Predicted price for Apple store

Apple iPhone 13 Pro Max Graphite (512 GB/New) Actual vs Predicted price for Flipkart

Nokia C32 Breezy Mint (4 GB/128 GB /New) Actual vs Predicted price for Reliance Digital

Nokia C32 Breezy Mint (4 GB/128 GB /New) Actual vs Predicted price for JioMart

Samsung Galaxy F12 Celestial Black (128 GB/4 GB/New) Actual vs Predicted price for Flipkart

OnePlus 10 Pro Volcanic Black (128 GB/8 GB /New) Actual vs Predicted price for Flipkart

Samsung Galaxy Z Fold 4 5G Beige (256 GB/12 GB/New) Actual vs Predicted price for Samsung

Xiaomi 12 Pro Blue (256 GB/12 GB/New) Daily Actual vs Predicted price for Mi

Xiaomi 12 Pro Blue (256 GB/12 GB/New) Daily Actual vs Predicted price for Flipkart

Fortune Biryani Special Basmati Rice (5 KG) Daily Actual vs Predicted price for Near-e-shop.

Vim Fresh Lemon Dishwash Bar (200 g) Actual vs Predicted price for Near-e-shop.

Milky Mist Salted Butter (100 g) Actual vs Predicted price for JioMart

Milky Mist Salted Butter (100 g) Actual vs Predicted price for Flipkart

Milky Mist Salted Butter (100 g) Actual vs Predicted price for Big Basket

Amul Salted Butter (100 g) Actual vs Predicted price for JioMart

Amul Salted Butter (100 g) Actual vs Predicted price for Big Basket

24 Mantra Organic Chana Dal (1 KG) Actual vs Predicted price for Big Basket

LG 139 cm (55 inches) 4K Ultra HD Smart NanoCell TV Actual vs Predicted price for Amazon

Mi 139.70 cm (55 inch) Ultra HD (4K) LED Smart TV Actual vs Predicted price for Amazon

Mi 139.70 cm (55 inch) Ultra HD (4K) LED Smart TV Actual vs Predicted price for JioMart

Samsung 7 138 Cm 55 Inch Ultra HD 4k Led Smart Tizen TV Actual vs Predicted price for Reliance Digital
Sony Bravia 139 cm (55 inches) 4K Ultra HD Smart LED Google TV Actual vs Predicted price for Lulu Hypermarket
Sony Bravia 139 cm (55 inches) 4K Ultra HD Smart LED Google TV Actual vs Predicted price for JioMart
Lenovo IdeaPad Flex 5 Intel Core I3 Laptop Actual vs Predicted price for Reliance Digital
Samsung Galaxy S23 Ultra 5G Green (256 GB/12GB/New) Actual vs Predicted price for Amazon

4.3 Conclusion

We conclude our results with multiple observations where the listing price by multiple sellers did vary during the period of study. For each product, there was atleast one seller where the price would vary slightly and in some instances significantly. We also found that the refurbished smartphones are closer to their new variants in the price model. Estimating the next day price for any product by a seller is tricky, different studies have demonstrated multiple forecasting and prediction models. In our study we have relied on a basic general linear regression model to retrain or reinforce the model to learn the new pricing based on the last day pricing combined with the user feedback for the product.

CHAPTER V:
DISCUSSION

5.1 Discussion of Results

We discuss the questions we wanted to answer while conducting this study using the results obtained in Chapter IV. This study although not very exhaustive yet is one of the very early attempt to study the price variance among the Indian e-commerce sellers for multiple products. We try to interpret our results to seek the answers for the questions we proposed in Chapter I, II and III.

5.2 Discussion of research questions –

1. **Is the same product sold by different e-commerce sellers during the same period of study?**

Ans. We found multiple e-commerce sellers selling the same products during the study period. As per the results, 157 sellers are involved in selling 55 unique products, *i.e.*, every seller is involved in selling 3 unique products during the period of study

2. **Does the price vary for different e-commerce sellers for the same product during the same period?**

Ans. On average, 47% of stores show a price variance for the same product during the same period (Appendix 2 - Table 1.57).

3. **Does the same e-commerce seller update the price for different products during this period?**

Ans. Out 157 sellers, 32 sellers updated their price for different products during the study period, which is roughly ~ 20.1% of the total sellers.

4. **Is the price update for different products a constant trend by the e-commerce sellers?**

Ans. Out of the 157 sellers under this study, 67 sellers displayed a constant price variance for different products *i.e.,* 42.04% of the total sellers update their price for different products constantly but this result is inconclusive as it cannot be extrapolated for the rest of the sellers.

5. Are any of the products sold by the manufacturer on its e-commerce portal?

Ans. Out of 157 sellers, we found 8 of these were from the direct e-commerce retail from the manufacturer. We would like this opportunity to name this phenomenon as "Direct e-commerce or direct e-tail". In this study we observed majority of these Direct e-tailers were Smartphone, TV and laptop manufacturers, we arrive to a conclusion that –

- The probability of direct e-tailing is higher for electronic gadget manufacturers.
- Certain e-commerce platforms are promoting their own sponsored brands for e.g., Solimo by Amazon, MarQ by Flipkart, BB Royal range of products by BigBasket which is a newly introduced strategy in Indian e-commerce. We refer to this event as a native competition. Although we are unsure how this impacts the sales of already established and non-native brands.

6. Is product sold directly by the manufacturer on its e-commerce portal has more competitive pricing than other retailers and dealers?

Ans. We found the average price variance by the direct e-tailers is ~ 6% while the average price variance for retailers/dealers on the e-commerce platform is ~ 8% (Table 71). This suggests that the manufacturers do not display more competitive pricing than their retailers/dealers, this demands further analysis and study to develop the right understanding for this behavior.

Table 5.1

Comparison of price variance between direct e-tailer and retailer/dealer.

Store	# of products	Avg. Price Variance	Type
Flipkart	30	16%	Retailer

Amazon	23	11%	Retailer
JioMart	22	10%	Retailer
Croma	12	2%	Retailer
VijaySales	12	1%	Retailer
SangeethaMobiles	7	3%	Retailer
Samsung	6	7%	Manufacturer
Bigbasket	5	20%	Retailer
Luluhypermarket	4	25%	Retailer
blinkit	3	3%	Retailer
Cashify	3	9%	Retailer
Mi	3	22%	Manufacturer
OPPO	3	0%	Manufacturer
NokiaPhonesIndia	2	0%	Manufacturer
Zepto	2	2%	Retailer
Apple	1	17%	Manufacturer
Lenovo	1	0%	Manufacturer
ShopClues	1	0%	Retailer
LGElectronicsIndia	1	2%	Manufacturer
HPStoreIndia	1	0%	Manufacturer

7. Is it possible to predict the next pricing decision by the e-commerce sellers?

Ans. We found this as a rather tricky question. In our study we found that there should be a balance between the features that can influence the linear behavior of the price. The current model has a limitation where it considers only few attributes that can influence the price of a product for any seller viz. Previous Day price (or Last price of the product), store and ratings . We tried to generalize this model for all the sellers and product as an attempt to test the validity of our hypothesis for a generalized linear regression model. In this study we found that smaller price variance are better suited for this model while those product with higher price variance in the next day may not be an ideal candidate.

This presents an oppurtunity to add newer features to the model like competitor price etc. and leveraging advanced Machine Learning algorithms like Deep learning etc. for bettter results.

CHAPTER VI:
SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

6.1 Summary

We did an exhaustive study with the product under consideration and presented our finding in Chapter 4 and 5. This is the first detailed study on product price variance by e-commerce sellers in an Indian market place. We found that at least one-third of the sellers are involved in selling more than one product and almost half of the sellers would reduce or increase the price for a product. This study revealed that the same product was sold by multiple sellers during the period of study, this behavior offers choice for buyers to chose the best available offer for any product. We also found the manufacturer operated online stores showing some degree of price variance but not higher than an online retailer or dealer. The next day price prediction algorithm doesn't generalize for all products and sellers equally but can be treated as a e-commerce version of stock price prediction.

6.2 Implications

Based on the data collected during the period of study and its analysis, we found significant information on seller-product-price relationship in the Indian e-commerce landscape. With this information we can infer the below -

- The product price data collection can be simplified and be leveraged in an automated way using the architecture proposed and used by us during our study.
- The price updates for all categories of products is a common trend for e-commerce sellers
- There is a tough competition among e-commerce sellers for almost every product under the study
- The online shoppers have multiple options to choose from for almost every product
- There is no specific pattern for product pricing that can fit a single or multiple pricing model although attempts can be made to develop stock-price predictions like pricing models for e-commerce price predictions too.

- The manufacturer online stores are more common for electronic products and there doesn't seem to be any cannibalistic behavior displayed by the offering of the manufacturer.
- There are direct-etailers emerging in the Indian e-commerce where the brands native to the e-commerce partner is coming into existence.
- The refurbished or used product market is significant in the smartphones although our study indicates the pricing for such products seems very close to their new and unboxed variants.
- We did find the quick-commerce entrants like Zepto, Blinkit, BigBasket etc. under the grocery product-lines. Quick commerce coupled with slight price variance can be a major e-commerce distruptor.

6.3 Recommendations for Future Research

We believe that our work is just a beginning for a much needed research and study on the e-commerce price behavior. There are a lot more products and e-commerce sellers that can be studied for their pricing behavior. The diirect comparison with bricks and mortar stores can be a significant approach towards understanding the exact pricing behavior. India as an e-commerce destination is highly promising, with a population of 250 million e-commerce shoppers during 2023, it is expected to reach 425 million e-commerce shoppers by 2027, which is 30% of the total population (Minhas, Statista website, 2024). The emerging quick commerce penetration in categories apart from groceries needs to studied. The silent branding by e-commerce marketplaces as a part of direct-etailing is a new trend in Indian e-commerce and its impact or consumer base is still not well understood. We only touched the surface of different categories of products and we would like to study other categories of e-commerce products including B2B e-commerce as well.

6.4 Conclusion

We have made an attempt to study the product pricing behavior by different e-commerce sellers in the Indian e-commerce industry. This study helped us understand the pricing beahvior for different products by different e-commerce sellers. We took an attempt to predict the product pricing for different sellers which helped with some understanding on pricing strategy. There is huge scope for studying other categories of product sold over e-commerce.

REFERENCES

Abdelrhim, Mansour and Elsayed, Abdalla. (2020) 'The Effect of COVID-19 Spread on the E-Commerce Market: The Case of the 5 Largest E-Commerce Companies in the World'. Available at SSRN: https://ssrn.com/abstract=3621166 or http://dx.doi.org/10.2139/ssrn.3621166 (Accessed: 14th February 2024)

Abdollahi, Golrou and Leimstoll, Uwe. (2011) 'A Classification for Business Model Types in E-commerce', AMCIS 2011 Proceedings - All Submissions. 88. Available at: https://aisel.aisnet.org/amcis2011_submissions/88 (Accessed: 15 July 2024)

Akther, F. (2023) 'E-commerce in India: Trends, Hurdles, and Growth Opportunities', Formosa Journal of Science and Technology, 2(10), p2871-2880.

Almeida, F., Santos, J. D., & Monteiro, J. A. (2014) 'e-commerce business models in the context of web3. 0 paradigm', ArXiv Preprint ArXiv:1401.6102.

Amazon Business. (2023) Most Demanded Products in India. Available at: https://business.amazon.in/en/discover-more/blog/most-demanded-products-in-india (Accessed: 04 August 2024)

Ancarani, F. (2002) 'Pricing and the internet: Frictionless commerce or pricer's paradise?', European Management Journal, 20(6), p680–687.

Apache Parquet. (2024) Apache Parquet: Columnar storage for Hadoop. Available at: https://parquet.apache.org/ (Accessed: 10 October 2024)

Apache Spark. (2024) Apache Spark: Lightning-fast unified analytics engine. Available at: https://spark.apache.org/ (Accessed: 10 October 2024).

Argabioso, N.M. and Orencia, A.J.B. (2023) 'Rising Amidst Turbulence: A Phenomenological Exploration of Online Sellers' Lived Experiences During the COVID-19 Pandemic', International Journal of Multidisciplinary: Applied Business and Education Research, 4(7), p2382-2390.

Bakos, Y. (1998) 'The emerging role of electronic marketplaces on the Internet', Communications of the ACM, 41(8), p35–42.

Bashir, U. (2004) Most Popular Categories for Online Purchases in India. Available at: https://www.statista.com/forecasts/823376/most-popular-categories-for-online-purchases-in-india (Accessed: 04 August 2024)

Battase, D.S.T and Shankar, S.S. (2020) 'E-commerce in India – An overview', International Research Journal of Marketing & Economics ISSN (2348-9766), 7(2), p302-310.

Bauer, J. and Jannach, D. (2018) 'Optimal pricing in e-commerce based on sparse and noisy data', Decision support systems, 106, p53-63.

Bichler, M., Kalagnanam, J., Katircioglu, K., King, A.J., Lawrence, R.D., Lee, H.S., Lin, G.Y. and Lu, Y. (2002) 'Applications of flexible pricing in business-to-business electronic commerce', IBM Systems Journal, 41(2), p287-302.

Bryson, P.J. (2005) 'Pricing in the New Economy: lessons from the period of the E-Commerce bubble', International Journal of Business, Volume 1, No. 1, 25, p1-14

BuiltWith. (2023) eCommerce technologies Web Usage Distribution in United States. Available at: https://trends.builtwith.com/shop/country/United-States (Accessed: 29 December 2023).

Cabral, L. and Xu, L. (2021) 'Seller reputation and price gouging: Evidence from the COVID-19 pandemic', Economic Inquiry, 59(3), p 867-879

Cakra, Y.E. and Trisedya, B.D. (2015) 'Stock price prediction using linear regression based on sentiment analysis', International conference on advanced computer science and information systems (ICACSIS,IEEE), p147-154

Capital One Shopping. (2024) Retail Statistics (2024): Sales Volume & Industry Trends by Year. Available at: https://capitaloneshopping.com/research/retail-statistics/ (Accessed: 01 March 2024).

Chen, L., Mislove, A. and Wilson, C. (2016) 'An empirical analysis of algorithmic pricing on amazon marketplace', Proceedings of the 25th international conference on World Wide Web, p1339-1349

Chopra, L., Verma, R.S. and Mandal, P.C. (2021) 'Pricing strategies for companies during the Covid-19 pandemic', International journal of business strategy and automation (IJBSA), 2(4), p1-19.

Chornous, G., & Horbunova, Y. (2020) 'Modeling and Forecasting Dynamic Factors of Pricing in E-commerce', IT&I, p71–82.

Counter point Research. (2024) India Smartphone Market Share: Quarterly. Available at: https://www.counterpointresearch.com/insights/india-smartphone-share/ (Accessed: 17 July 2024)

Dasgupta, P.R. and Hashimoto, Y. (2004) 'Multi-attribute dynamic pricing for online markets using intelligent agents', Autonomous Agents and Multiagent Systems, International Joint Conference, IEEE Computer Society,Vol. 2, p277-284

Dash, B., Sharma, P., Ansari, M. F., & Swayamsiddha, S. (2022) 'A review of ONDC's digital warfare in India taking on the e-commerce giants' , International Journal of Engineering and Technology, 11(2), 96-99. Available at: https://doi.org/10.14419/ijet.v11i2.32128 (Accessed: 15 April 2024)

De, T. S., Singh, P., & Patel, A. (2024) 'A Machine learning and Empirical Bayesian Approach for Predictive Buying in B2B E-commerce', Proceedings of the 2024 8th International Conference on Machine Learning and Soft Computing, p17–24.

Enache, M.C. (2021) 'Machine Learning for Dynamic Pricing in e-Commerce', Economics and Applied Informatics, (3), p114-119.

Fairlie, M. (2024) The Largest E-Commerce Markets in the World. Available at: https://www.business.com/articles/10-of-the-largest-ecommerce-markets-in-the-world-b/ (Accessed: 10 June 2024)

Federal Reserve Bank of St. Louis. (2023) E-Commerce Retail Sales. Available at: https://fred.stlouisfed.org/series/ECOMPCTSA#0 (Accessed: 29 December 2023).

Wikipedia contributors. (2024) Filpkart. Available at: https://en.wikipedia.org/wiki/Flipkart (Accessed: 25 February 2024).

Flipkart seller blogs. (2023) How to Find a Profitable Product to Sell Online. Available at: https://seller.flipkart.com/seller-blog/how-to-find-a-profitable-product-to-sell-online (Accessed: 04 August 2024)

Friberg, R., Ganslandt, M., & Sandström, M. (2001) 'pricing Strategies in E-commerce: Bricks vs. Clicks', IUI Working Paper No. 559

Gadgets 360 Staff. (2023) Best Mobile Phones. Available at: https://www.gadgets360.com/mobiles/best-phones (Accessed: 19 October 2024)

"Gedmontaitė, P. (2024) 'Impact of country's and store's image on a selection of an online store in cross-border shopping', Master Thesis, Vilniaus universitetas. Available at: https://epublications.vu.lt/object/elaba:191573676/191573676.pdf (Accessed: 28 Sept 2024)."

Gheorghe, M., Mihai, F.C. and Dârdală, M. (2018) 'Modern techniques of web scraping for data scientists', International Journal of User-System Interaction, 11(1), p63-75.

Anindya Ghose & Arun Sundararajan, 2006. "Evaluating Pricing Strategy Using e-Commerce Data: Evidence and Estimation Challenges',

Ghose, A., & Sundararajan, A. (2006) 'Evaluating Pricing Strategy Using e-Commerce Data: Evidence and Estimation Challenge', Papers math/0609170, arXiv.org.

Gojiya, J. H. (2023) 'E-commerce in India and its Business Models', Productivity, 39(2).

Google Shopping. (2023) Google Shopping. Available at: https://shopping.google.com/ (Accessed: 15 August 2024)

Hadasik, B. (2024) 'Reduction of Information Asymmetry in E-commerce: The Web Scraping Approach' , Publishing House of the University of Economics in Katowice.

Han, R., Su, W., & Xiao, R. (2021) 'A Study on the Profitability of China's E-commerce Platforms in the Post-epidemic Era', International Conference on Financial Management and Economic Transition (FMET 2021), Atlantis Press, p44–49.

Hannak, A., Soeller, G., Lazer, D., Mislove, A. and Wilson, C., 2014, November. Measuring price discrimination and steering on e-commerce web sites. In Proceedings of the 2014 conference on internet measurement conference (pp. 305-318).

Hannak, A., Soeller, G., Lazer, D., Mislove, A., & Wilson, C. (2014). Measuring price discrimination and steering on e-commerce web sites. Proceedings of the 2014 Conference on Internet Measurement Conference, 305–318.

Hanspach, P., Sapi, G., & Wieting, M. (2024) 'Algorithms in the marketplace: An empirical analysis of automated pricing in E-commerce'. Information Economics and Policy, 69, 101111. Available at SSRN: https://ssrn.com/abstract=3945137 or http://dx.doi.org/10.2139/ssrn.3945137

Hartveld, A.R. (2017) 'The Influence of Competitor Prices on Price Sensitivity: A Bayesian Pricing Strategy in E-Commerce', Econometrie. Available at: http://hdl.handle.net/2105/36851

Hoang, T. (2022) 'E-commerce managers' perceptions of pricing strategies'. Available at: https://urn.fi/URN:NBN:fi:jyu-202212085494

Hwang, S. B., & Kim, S. (2006) 'Dynamic pricing algorithm for E-Commerce'. Advances in Systems, Computing Sciences and Software Engineering: Proceedings of SCSS05, p149–155.

IBEF. (2024) India's E-commerce Boom: Growth, Trends & Future Prospects. Available at: https://www.ibef.org/industry/ecommerce (Accessed: 08 August 2024).

Joo, J. (2015) 'Roles of the buyer’s trust in seller in posted-price model of consumer to consumer e-commerce', Journal of Theoretical and Applied Electronic Commerce Research, 10(3), p30–44.

Kauffman, R., & Wood, C. (2000) 'Follow the leader? Strategic pricing in e-commerce, Carlson School of Management Discussion Paper (University of Minnesota).

Kedia, S., Jain, S. and Sharma, A., 2020. Price optimization in fashion e-commerce. arXiv preprint arXiv:2007.05216.

Kedia, S., Jain, S., & Sharma, A. (2020) 'Price optimization in fashion e-commerce', CoRR,abs/2007.05216. Available at: https://arxiv.org/abs/2007.05216

Khder, M. A. (2021) 'Web scraping or web crawling: State of art, techniques, approaches and application'. International Journal of Advances in Soft Computing & Its Applications, 13(3).

Kin, M. (2023) How Many eCommerce Sites Are There in 2023? Available at: https://www.markinblog.com/how-many-ecommerce-sites/ (Accessed: 29 December 2023)

Klatt, T. (2013) 'E-Commerce Business Models and Search Engine Dependency'. IBusiness, 05(03), 205–208. Available at: https://doi.org/10.4236/ib.2013.53b041/ (Accessed: 29 December 2023)

Krishna, S. (2023). 10 most popular phones in India in 2023: 91mobiles insights. Available at: https://www.91mobiles.com/hub/10-popular-phones-in-india-2023/ (Accessed: 04 May 2024)

Lacuesta, A., Roldán Blanco, P., & Serrano-Puente, D. (2020) 'Effects of e-commerce on prices and business competition'. Economic Bulletin/Banco de España, Issue 4/2020.

Leung, K. H., Luk, C. C., Choy, K. L., Lam, H. Y., & Lee, C. K. M. (2019) 'A B2B flexible pricing decision support system for managing the request for quotation process

under e-commerce business environment'. International Journal of Production Research, 57(20), p6528–6551.

Liu, J., Zhang, Y., Wang, X., Deng, Y., & Wu, X. (2019) 'Dynamic pricing on e-commerce platform with deep reinforcement learning: A field experiment'. ArXiv Preprint ArXiv:1912.02572.

Mahadevan, B. (2000) 'Business models for Internet-based e-commerce: An anatomy'. California Management Review, 42(4), p55–69.

MariaDB Corporation. (2024) MariaDB: The open source relational database. Available at: https://mariadb.org/ (Accessed: 10 November 2024)

Marshall, M. (2001) 'Dynamic pricing for e-commerce, an integrated solution'. Proceedings Third International Workshop on Advanced Issues of E-Commerce and Web-Based Information Systems. WECWIS 2001, p192–194.

Minga, L. M., Feng, Y.-Q., & Li, Y.-J. (2003) 'Dynamic pricing: ecommerce-oriented price setting algorithm'. Proceedings of the 2003 International Conference on Machine Learning and Cybernetics (IEEE Cat. No. 03EX693), 2, p893–898.

Minhas. (2024) Number of annual online shoppers in India from 2019 to 2021, with an estimate until 2027. Available at: https://www.statista.com/statistics/1191958/india-number-of-annual-online-shoppers/ (Accessed: 5th October 2024).

Minhas, A. (2024). E-commerce in India. Available at: https://www.statista.com/topics/2454/e-commerce-in-india/#topicOverview (Accessed: 28 July 2024)

Morina, V. and Sejdiu, S., 2022. Evaluating and comparing web scraping tools and techniques for data collection. UBT Knowl. Cent.

Nagle, T.T. and Müller, G., 2018. The strategy and tactics of pricing: A guide to growing more profitably.6th edn. Routledge Publishings. Availabe at: http://www.pmm.edu.my/zxc/2022/lib/ebok/The%20Strategy%20And%20Tactics%20Of

%20Pricing%20A%20Guide%20To%20Growing%20More%20Profitably%20By%20M%FCller,%20Georg%20Nagle,%20Thomas%20T.pdf (Accessed: 28 July 2024)

Nandi, S., & Mary Posonia, A. (2020) 'e-Commerce Site Pricing and Review Analysis', International Conference on Emerging Trends and Advances in Electrical Engineering and Renewable Energy, p595–602.

Nougarahiya, S., Shetty, G., & Mandloi, D. (2021) 'A review of e–commerce in india: The past, present, and the future', Research Review International Journal of Multidisciplinary, 6(03), p12–22.

Pang, Z., Xiao, W., & Zhao, X. (2021) 'Preorder price guarantee in e-commerce', Manufacturing & Service Operations Management, 23(1), p123–138.

Plotly Technologies Inc. (2024) Plotly: The front end for ML and data science models. Available at: https://plotly.com/ (Accessed: 10 October 2024)

Pradhan, D. (2024) India's E-commerce Sector: Growth and Future Projections. Available at: https://www.forbes.com/advisor/in/business/ecommerce-statistics/#:~:text=India's%20e%2Dcommerce%20sector%20is,expected%20to%20reach%20501.6%20million.(Accessed: 12 June 2024)

Prajosh vm. (2024) Most Sold Product Categories from Indian E-commerce Websites. Available at: https://www.seamedia.in/blog/most-sold-product-categories-from-indian-e-commerce-websites/ (Accessed: 04 August 2024)

Python Software Foundation. (2024) Python: A programming language. Available at: https://www.python.org/ (Accessed: 10 October 2024)

R Core Team. (2024) R: A language and environment for statistical computing. Available at: https://www.r-project.org/ (Accessed: 10 October 2024)

Rasheed, H. S. (2009) 'Contrasting e-commerce business models: Performance implications for small enterprises', Journal of Developmental Entrepreneurship, 14(01), p89–101.

Razi, M. A., Tarn, J. M., & Siddiqui, F. A. (2004) 'Exploring the failure and success of DotComs', Information Management & Computer Security, 12(3), p228–244.

Rindita, F. S., Majlaton, E. G. I., Singh, A., Namazov, I., & Tick, A. (2021) 'The impact of coronavirus (COVID-19) pandemic on e-commerce', Management, Enterprise and Benchmarking in the 21st Century, p105–124.

Sabanoglu, T. (2023) United States: total retail sales 2020-2026. Available at: https://www.statista.com/statistics/443495/total-us-retail-sales/ (Accessed: 25 September 2023).

Schlosser, R., Boissier, M., Schober, A., & Uflacker, M. (2016) 'How to Survive Dynamic Pricing Competition in E-commerce', RecSys Posters.

Selvy, P. T., Anitha, M. M., Varthan, L. R. V., Sethupathi, P., & Adharsh, S. P. (2022) 'Intelligent web data extraction system for E-commerce'. Journal of Algebraic Statistics, 13(3), p63–68.

Shin, N. (2001) 'Strategies for competitive advantage in electronic commerce', J. Electron. Commer. Res., 2(4), p164–171.

Smartprix. (2023) Best online comparison shopping. Available at: https://www.smartprix.com/ (Accessed: 30 September 2024)

Smith, C. (2024). Flipkart Statistics and User Count for 2023. Available at: https://expandedramblings.com/index.php/flipkart-statistics/?expand_article=1 (Accessed: 25 February 2024)

Srividhya, V. and Megala, P., 2019. Scraping and Visualization of Product Data from E-commerce Websites. Int. J. Comput. Sci. Eng, 7(5), pp.1403-1407.

Srividhya, V., & Megala, P. (2019) 'Scraping and Visualization of Product Data from E-commerce Websites', International Journal of Computer Sciences and Engineering, 7(5), p1403–1407.

Stahl, D. O. (2000) 'Strategic advertising and pricing in e-commerce', In Industrial organization, Emerald Group Publishing Limited, p69–100.

Statista Research Department. (2024) Revenue of the e-commerce industry in the U.S. 2019-2029. Available at: https://www.statista.com/statistics/272391/us-retail-e-commerce-sales-forecast/ (Accessed: 30 August 2024)

Steelman, Z. R., Hammer, B. I., & Limayem, M. (2014). 'Data collection in the digital age', MIS Quarterly, 38(2), p355–378.

Sun, S. (2023) Share of leading smartphone models sold across India in July 2023, by model. Available at: https://www.statista.com/statistics/755685/india-smartphone-market-share-by-model/ (Accessed: 30 December 2023)

Tian, Y. and Stewart, C. (2006) 'History of e-commerce' In Encyclopedia of e-commerce, e-government, and mobile commerce, IGI Global, p559-564

Tugba Sabanoglu. (2023) United States: total retail sales 2020-2026. Available at: https://www.statista.com/statistics/443495/total-us-retail-sales/ (Accessed: 29 December 2023)

Vakhutinsky, A., Mihic, K., & Wu, S.-M. (2019) 'A prescriptive analytics approach to markdown pricing for an e-commerce retailer', Journal of Pattern Recognition Research, 14(1), p1–20.

Weerahandi, S. (2013) 'Exact Statistical Methods for Data Analysis', United States: Springer.

Wikipedia contributors. (2024) Research. Available at: https://en.wikipedia.org/wiki/Research (Accessed: 08 August 2024).

Wikipedia contributors. (2023) Timeline of e-commerce. Available at: https://en.wikipedia.org/wiki/Timeline_of_e-commerce (Accessed: 20 June 2023).

Wikipedia contributors. (2024) Flipkart. Available at: https://en.wikipedia.org/wiki/Flipkart (Accessed: 25 February 2024).

Wikipedia contributors. (2024) Indiaplaza. Available at: https://en.wikipedia.org/wiki/Indiaplaza#:~:text=In%20June%201999%2C%20K%20Vaitheeswaran,only%20music%20CDs%20for%20sale (Accessed: 1212 February 2024).

Xerve. (2023) All categories. Available at: https://www.xerve.in/prices (Accessed: 30 September 2024)

Xie, H., Ma, R. T. B., & Lui, J. C. S. (2018) 'Enhancing reputation via price discounts in e-commerce systems: A data-driven approach'. ACM Transactions on Knowledge Discovery from Data (TKDD), 12(3), p1–29.

Yalçn, Y., & Öztürk, S. (2024) 'The Use of Machine Learning Techniques and Distance Measures in Capturing Collusive Pricing: A Case Study for Algorithmic Pricing in E-Commerce Industry', Research Square, DOI: 10.21203/rs.3.rs-4019758/v1

Yin, C., & Han, J. (2021) 'Dynamic pricing model of e-commerce platforms based on deep reinforcement learning', Computer Modeling in Engineering & Sciences, 127(1), p291–307.

Zineb, E. L. F., Najat, R., & Jaafar, A. (2021) 'An intelligent approach for data analysis and decision making in big data: a case study on e-commerce industry', International Journal of Advanced Computer Science and Applications, 12(7).

APPENDIX A: TABLES FROM METHODOLOGY

Table 1

List of collected samples for Laptops

Product	Model
Laptop	ASUS VivoBook 15 Intel Core i5-12500H 8GB 512GB SSD Windows 11 Home
Laptop	HP Pavilion x360 14 Intel Core i5-1135G7 8GB 512GB SSD Windows 11 Home
Laptop	Acer Aspire 5 Intel Core i5-1135G7 8GB 512GB SSD Windows 11 Home
Laptop	Lenovo IdeaPad Slim 3 Intel Core i5-1135G7 8GB 512GB SSD Windows 11 Home
Laptop	Dell Inspiron 3501 Intel Core i5-1135G7 8GB 256GB SSD Windows 11 Home
Laptop	ASUS VivoBook 14 Intel Core i5-12500H 8GB 512GB SSD Windows 11 Home
Laptop	HP 15s 1115G4 Intel Core i5-1135G7 8GB 256GB SSD Windows 11 Home
Laptop	Acer Aspire 3 Intel Core i5-1135G7 8GB 256GB SSD Windows 11 Home
Laptop	Lenovo IdeaPad Slim 5 Intel Core i5-1135G7 8GB 512GB SSD Windows 11 Home
Laptop	Dell Vostro 15 5510 Intel Core i5-1135G7 8GB 512GB SSD Windows 11 Home
Laptop	MSI Modern 14 B11MOU Intel Core i5-11500H 8GB 512GB SSD Windows 11 Home
Laptop	Lenovo IdeaPad Slim 5 Pro Intel Core i5-1135G7 16GB 512GB SSD Windows 11 Home
Laptop	HP Pavilion Aero 13 AMD Ryzen 5 5500U 8GB 512GB SSD Windows 11 Home
Laptop	Dell XPS 13 Intel Core i5-1135G7 8GB 512GB SSD Windows 11 Home
Laptop	Apple MacBook Air M1 M1 8GB 256GB SSD macOS Monterey
Laptop	ASUS ZenBook 14 Intel Core i5-1135G7 16GB 512GB SSD Windows 11 Home
Laptop	Lenovo ThinkPad X1 Carbon Intel Core i5-1135G7 16GB 512GB SSD Windows 11 Pro
Laptop	Microsoft Surface Laptop 4 Intel Core i5-1135G7 8GB 512GB SSD Windows 11 Home
Laptop	Dell XPS 15 Intel Core i5-1135G7 16GB 512GB SSD Windows 11 Home
Laptop	Apple MacBook Pro M1 Pro M1 Pro 16GB 512GB SSD macOS Monterey
Laptop	ASUS ZenBook 13 Intel Core i7-1165G7 16GB 512GB SSD Windows 11 Home

Laptop	HP Spectre x360 14 Intel Core i7-1165G7 16GB 512GB SSD Windows 11 Home
Laptop	Lenovo ThinkPad X1 Yoga Intel Core i7-1165G7 16GB 512GB SSD Windows 11 Pro
Laptop	Microsoft Surface Laptop Studio Intel Core i7-11370H 32GB 1TB SSD Windows 11 Pro
Laptop	Apple MacBook Pro M1 Max M1 Max 32GB 1TB SSD macOS Monterey
Laptop	ASUS ROG Strix G15 AMD Ryzen 9 5900HX 16GB 512GB SSD Windows 11 Home
Laptop	Acer Predator Helios 300 Intel Core i7-11800H 16GB 512GB SSD Windows 11 Home
Laptop	Lenovo Legion 5 AMD Ryzen 7 5800H 16GB 512GB SSD Windows 11 Home
Laptop	Dell G15 Intel Core i5-11400H 8GB 512GB SSD Windows 11 Home
Laptop	HP Omen 15 Intel Core i7-11800H 16GB 512GB SSD Windows 11 Home
Laptop	ASUS ROG Zephyrus G15 AMD Ryzen 9 5900HS 16GB 1TB SSD Windows 11 Home
Laptop	MSI GE66 Raider Intel Core i7-11800H 16GB 1TB SSD Windows 11 Home
Laptop	Lenovo Legion 5 Pro AMD Ryzen 7 5800H 16GB 512GB SSD Windows 11 Home
Laptop	Acer Nitro 5 Intel Core i5-11400H 8GB 512GB SSD Windows 11 Home
Laptop	HP Pavilion Gaming 15 AMD Ryzen 5 5600H 8GB 512GB SSD Windows 11 Home
Laptop	Dell G5 15 Intel Core i5-11400H 8GB 512GB SSD Windows 11 Home
Laptop	ASUS TUF Gaming A15 AMD Ryzen 5 5600H 8GB 512GB SSD Windows 11 Home
Laptop	Acer Nitro 5 AN515-57 Intel Core i7-11800H 16GB 512GB SSD Windows 11 Home
Laptop	HP Omen 15-en0002ax Intel Core i7-11800H 16GB 1TB SSD Windows 11 Home
Laptop	Lenovo Legion 5i Pro Intel Core i7-11800H 16GB 1TB SSD Windows 11 Home
Laptop	ASUS ROG Strix G17 AMD Ryzen 9 5900HX 16GB 1TB SSD Windows 11 Home
Laptop	MSI GE76 Raider Intel Core i7-11800H 16GB 1TB SSD Windows 11 Home
Laptop	Lenovo Legion 7 AMD Ryzen 9 5900HX 16GB 1TB SSD Windows 11 Home
Laptop	Acer Predator Triton 500 Intel Core i7-11800H 16GB 1TB SSD Windows 11 Home
Laptop	HP Omen 17 Intel Core i7-11800H 16GB 1TB SSD Windows 11 Home

Laptop	Dell Alienware M15 R7 Intel Core i7-12700H 16GB 1TB SSD Windows 11 Home
Laptop	ASUS ROG Strix Scar 15 AMD Ryzen 9 5900HX 32GB 1TB SSD Windows 11 Home
Laptop	MSI GE76 Raider Dragon Edition Tiamat Intel Core i9-12900H 32GB 2TB SSD Windows 11 Home
Laptop	Lenovo Legion 7i Intel Core i9-12900H 32GB 2TB SSD Windows 11 Pro
Laptop	Acer Predator Triton 500 SE Intel Core i9-12900H 32GB 2TB SSD Windows 11 Home
Laptop	ASUS ROG Zephyrus Duo 15 SE AMD Ryzen 9 5900HX 32GB 2TB SSD Windows 11 Home
Laptop	MSI GS77 Stealth Intel Core i9-12900H 32GB 2TB SSD Windows 11 Home
Laptop	Lenovo Legion 7 Slim Intel Core i9-12900H 32GB 2TB SSD Windows 11 Pro
Laptop	Acer Predator Helios 700 Intel Core i9-12900H 32GB 2TB SSD Windows 11 Home
Laptop	HP Omen 17-an1007ax Intel Core i9-12900H 32GB 2TB SSD Windows 11 Home
Laptop	Dell Alienware X17 R2 Intel Core i9-12900H 32GB 2TB SSD Windows 11 Home
Laptop	ASUS ROG Strix Scar 17 AMD Ryzen 9 5900HX 32GB 2TB SSD Windows 11 Home
Laptop	MSI GE77 Raider Dragon Edition Tiamat Intel Core i9-12900H 64GB 4TB SSD Windows 11 Home
Laptop	Lenovo Legion 7i Intel Core i9-12900HK 64GB 4TB SSD Windows 11 Pro
Laptop	Acer Predator Triton 500 SE Intel Core i9-12900HK 64GB 4TB SSD Windows 11 Home

Table 2

List of collected samples for Smartphones

Product	Model
Smartphone	Samsung Galaxy S23 Ultra 5G
Smartphone	Apple iPhone 14 Pro Max
Smartphone	vivo X90 Pro
Smartphone	Xiaomi 13 Pro
Smartphone	Google Pixel 7 Pro 5G
Smartphone	OPPO Find N2 Flip
Smartphone	Samsung Galaxy S23 Plus 5G
Smartphone	Samsung Galaxy S23 5G
Smartphone	Apple iPhone 13 Pro Max
Smartphone	Samsung Galaxy Z Fold 4 5G
Smartphone	Samsung Galaxy S22 Ultra
Smartphone	vivo X80 Pro 5G
Smartphone	OnePlus 11
Smartphone	realme 11 Pro Plus
Smartphone	Samsung Galaxy Z Flip 4 5G
Smartphone	iQOO 11 5G
Smartphone	OnePlus 11R
Smartphone	Xiaomi 12 Pro 5G
Smartphone	OnePlus 10 Pro
Smartphone	Samsung Galaxy S22 Plus
Smartphone	vivo X80 5G
Smartphone	Samsung Galaxy Z Fold 3
Smartphone	Samsung Galaxy Z Flip 3
Smartphone	iQOO 9 Pro 5G
Smartphone	vivo X70 Pro Plus
Smartphone	iQOO 9T 5G
Smartphone	realme GT 2 Pro 5G
Smartphone	Apple iPhone 13
Smartphone	realme GT Neo 3 5G 150W
Smartphone	OnePlus 10R 5G
Smartphone	POCO F4 5G
Smartphone	OPPO Reno8 Pro 5G
Smartphone	Asus ROG Phone 5
Smartphone	iQOO 7 Legend
Smartphone	realme GT 5G
Smartphone	realme 9 Pro Plus

Smartphone	realme GT Neo 2 5G
Smartphone	realme X7 Max
Smartphone	OnePlus Nord 2 8GB RAM
Smartphone	iQOO Z6 Pro
Smartphone	Xiaomi Redmi Note 11 Pro Plus 5G
Smartphone	realme 9 5G SE
Smartphone	Xiaomi Redmi 9 Prime
Smartphone	realme C3
Smartphone	Xiaomi Redmi 9A
Smartphone	POCO X5 Pro
Smartphone	realme 11 Pro
Smartphone	realme 10 Pro Plus 5G
Smartphone	iQOO Z6 Pro
Smartphone	realme Narzo 50 Pro 5G
Smartphone	Moto G82
Smartphone	OnePlus Nord CE 2 5G
Smartphone	Samsung Galaxy F62
Smartphone	iQOO Z5 5G
Smartphone	vivo V21e 5G
Smartphone	Xiaomi Mi 11 Lite
Smartphone	Xiaomi Redmi Note 10 Pro Max 8GB RAM
Smartphone	Lava Agni 2 5G
Smartphone	Xiaomi Redmi Note 12 Pro 5G
Smartphone	iQOO Neo 6 5G
Smartphone	realme GT Neo 3T 5G
Smartphone	OPPO F23
Smartphone	OnePlus Nord CE 3 Lite 5G 256GB
Smartphone	vivo Y100
Smartphone	Xiaomi Redmi K50i
Smartphone	Xiaomi Redmi 9 Prime
Smartphone	POCO C55
Smartphone	realme C55
Smartphone	realme C33
Smartphone	Infinix Hot 30i
Smartphone	POCO M2 4GB RAM
Smartphone	realme Narzo 30A
Smartphone	Infinix Hot 10S
Smartphone	realme C15
Smartphone	Xiaomi Redmi 9
Smartphone	Tecno Spark 7T

Smartphone	Samsung Galaxy F12
Smartphone	realme Narzo N53
Smartphone	Xiaomi Redmi 12C
Smartphone	Xiaomi Redmi A2 2023
Smartphone	Samsung Galaxy F13
Smartphone	Xiaomi Redmi 10
Smartphone	POCO M5
Smartphone	Nokia C32
Smartphone	vivo Y16

Table 3

List of collected samples for Televisions

Product	Model
TV	Sony Bravia 139 cm (55 inches) 4K Ultra HD Smart LED Google TV
TV	OnePlus 108 cm (43 inches) Y Series 4K Ultra HD Smart Android LED TV
TV	Redmi 80 cm (32 inches) Android 11 Series HD Ready Smart LED TV
TV	OnePlus 125.7 cm (50 inches) U Series 4K LED Smart Android TV 50U1S
TV	Samsung Crystal UHD 4K Smart TV 50AU8000
TV	LG 65NANO81TPA
TV	Samsung Crystal UHD 4K Smart TV 55AU8000
TV	Sony Bravia 125.7 cm (50 inches) 4K Ultra HD Smart LED Google TV
TV	OnePlus 86 cm (34 inches) Y Series 4K Ultra HD Smart Android LED TV
TV	Samsung Crystal UHD 4K Smart TV 43AU8000
TV	Xiaomi Mi LED Smart TV 4A Pro 55
TV	Samsung Crystal UHD 4K Smart TV 55AU9000
TV	OnePlus 65U1S
TV	Realme 32 inches Smart Android TV Full HD 32A15K
TV	LG 43NANO75TPZ
TV	Sony Bravia 55X75K
TV	Samsung Crystal UHD 4K Smart TV 50AU7000
TV	OnePlus 43Y1
TV	Redmi 86 cm (34 inches) Android 11 Series HD Ready Smart LED TV
TV	Samsung Crystal UHD 4K Smart TV 43AU7000
TV	LG 43NANO75UPA
TV	OnePlus 32Y1
TV	Samsung Crystal UHD 4K Smart TV 32AU7000

TV	Redmi 108 cm (43 inches) Android 11 Series HD Ready Smart LED TV
TV	Samsung Crystal UHD 4K Smart TV 32AU8000
TV	Realme 32 inches Smart Android TV Full HD
TV	LG 32NANO75UPA
TV	OnePlus Y Series 4K Ultra HD Smart Android LED TV 32Y1S
TV	Samsung Crystal UHD 4K Smart TV 43AU8000
TV	Sony Bravia 43X75K
TV	Xiaomi Mi LED Smart TV 4A Pro 43
TV	Samsung Crystal UHD 4K Smart TV 32AU7200
TV	OnePlus Y Series 4K Ultra HD Smart Android LED TV 43Y1
TV	LG 50 NANO75 UPA
TV	Samsung Crystal UHD 4K Smart TV 43AU7200
TV	OnePlus 50Y1S
TV	Redmi 32 inches Android 11 Series Full HD Smart LED TV
TV	Realme 32 inches Smart Android TV Full HD
TV	Sony Bravia 43X75
TV	OnePlus 50U1
TV	Samsung Crystal UHD 4K Smart TV 55AU7200
TV	OnePlus U Series 4K LED Smart Android TV 50U1
TV	Samsung Crystal UHD 4K Smart TV 50AU7100
TV	Redmi 108 cm (43 inches) Android 11 Series Full HD Smart LED TV
TV	Realme 32 inches Smart Android TV Full HD
TV	Samsung Crystal UHD 4K Smart TV 43AU7100
TV	OnePlus Y Series 4K Ultra HD Smart Android LED TV 32Y1
TV	Redmi 32 inches Android 11 Series HD Ready Smart LED TV
TV	OnePlus Y Series 4K Ultra HD Smart Android LED TV 43Y1S

Table 4

List of collected samples for Groceries

product	Model
Grocery	Basmati Rice 5 Kg
Grocery	Wheat Flour (5 Kg)
Grocery	Tea (500 gm)
Grocery	Sugar (5 kg)
Grocery	Refined Oil (1 Kg)
Grocery	Mustard Oil (1 Kg)
Grocery	Urad Dal (1 Kg)
Grocery	Moong Dal (1 Kg)
Grocery	Toor Dal (1 kg)

Grocery	Chana Dal (1 Kg)
Grocery	Masoor Dal (1 Kg)
Grocery	Salt (1 kg)
Grocery	Rock Salt (1kg)
Grocery	Dishwash Soap
Grocery	Cofee Powder (50 gm)
Grocery	Maida (500 gm)
Grocery	Soybean oil 1kg
Grocery	Groundnut Oil (1 kg)
Grocery	Sunflower oil 1kg
Grocery	Dahi (100 gm)
Grocery	Ghee (500 gm)
Grocery	Potato (5kg)
Grocery	Onion (5 kg)
Grocery	Tomato (1 kg)
Grocery	Milk (1 Ltr)
Grocery	Bread (400 gm)
Grocery	Butter (100 gm)
Grocery	Noodles (100 gm)

Table 5

List of collected samples for Sellers

Store Name	Store Name	Store Name	Store Name
Malanistores	Valuekart18	BajajMall	aonemobile
GoMothers	AmazeDigitals	muzambistore	Getteky
MySupermarketCompare	GreenDigitalHub	PhoneSmart	KannankandyEstore
Flipkart	RebornNxt	Kaeinyonne	buyyzodigital
Amazon	Placezon	Ampro	Phonewale
Spencer'sOnline	Dimprice	thinkgets	ThePhoneX
JainSuperBazar	Zebrs	Lalithatraders	RiesbauKft
SriShasthaProvisionStore	RefurbFone	vaishnavimobilestore	SyndicateMobiles
Gargdastak	MobilegooShop	poojaratele	Mobilelogy
bigbasket	MomentOnlineShopping	Jmdcommunication	Coverswala
AliaBazar	Filpz	PoojaraTelecom	Hirki
GrobasketAps	James&Co	greenokramall	Router-switch
Satvacart	SnapmintEMIStore	Buyreal	iRenewed.Shop
Zepto	PlacewellRetail	NokiaPhonesIndia	vexclusive
mygroceryindia	iTech	ZalaniCollectionNX	xtracover
edobo	Dealsdom	NikshanElectronics	ssense
JioMart	Dikazo	EasternLogica	Samsung
Milkbasket	Ovantica	BigCMobiles	wizekart
blinkit	RefitGlobal	DarlingRetail	storeeight
MahabhojPalace	dealsplant	OnePlusIndia	SouthPort
Frivery	AiInfocom	Xtracover	CometBusters
LoveLocal	Etoren	JustlookOnlineStore	BuyShuy
Freshlee	StockX	Handystore	ShopBLT
Pohunch	iccessories	canadianbestseller	MahajanElectronics
Gobazaar	Sahivalue	IdealTechnology	unboxyourmobile
Gharstuff	easy-buy	MahiEnterprises	KitaliSuppliers
cityeshops	gadgetsnow	Bhatiamobile	reliancedigital
Aapkabazar	Hilaptop	StoreEight	elcytec
LowestRateShopping	JustJaldi	Xfurbish	BackSpace
Luluhypermarket	DolphinsKart	ctinfotech	Rarewaves
FastEMI	fliptwirls	citizeninfotech	nexhour
neareshop	UnboxYourMobile	ElectronicParadise	RishisRetail
FreshClub	JaiDurgaEnterprises	HiTechLand	Moglix
NeelamFoodland	iTradeit	Bigbacchat	AnkurElectricals
Craftsvilla	BestbuyMobiles	HappiMobiles	AgoanElectronics
FetchNBuy	bestbuymobiles	AndroidCrunch	VasanthandCo
LeMarcheRetail	Cellbuddy	CapesIndia	darasmobiles

SouqAlBuhair	Shopdealclue	buy2handmobile	GetUSCart
AgamyaStore	Adibuja	itradeit	Buythevalue
QuickPantry	Top10Mobiles	Gbalaji	SovietExpress
EasydayClub	Gostor	expressionmobile	Skymartbw
Zaamoon	Vixtan	placewellretail	2ndTechGadgets
Qubitlink	Mobilex	GlobalTradingcompany	Jenrica
BGStores	cliktodeal	snapmint	bulkli
IKShop	iRefurbish	DesignInfo	Tamilshop
MyMakBuddy	HotspotSmartphoneStore	AngroosGiftsBoutique	mobspares
Mall2Mart	MobiBay	happimobiles	safezonemobiles
CityMall	ShopClues	Taqumart	UnitedArtsSportingGoods
SriSriTattva	TechPoint	designinfo	sunsky-online
GarudaPrakashan	ParagonSupplyCompany	TheWorldMall	tamilshop
jpkart	LoveTechHateWaste	shagunbanaras	hitech-land
AcerStore	Microless	ManikMobileShopee	agstores.online
Ubuy	Mobiwix	PixelTNT	AslamMobileStore
Elcytec	FoneZone.me	Microplus	CellPoint
Shop4Deal	WizeKart	skyscom.org	Sakshicommunication
GameLoot	DeviceRepairGuy	Mobuyls	vivopune
Bidbuddy	TechsDeck	KohinoorElectronics	zayandigital
sathya	BlynkMarketing	easternlogica	WeFix.NET
vlebazaar	MillionCases	supremememobiles	Mi
Triveni	aprozone	MyNishTech	AcquiceIndia
Mobex	CellFAther	NationalMobile	Eldairouty
BNewMobiles&Electronics	SecondZone	sangeethamobiles	Digify
KhoslaElectronics	CasecartIndia	xphonesmobiles	thedigify
Maliks	HousekeepingEnterprises	KishanElectronics	Smartranchi
Tradeindia	LotusElectronics	GiftstoIndia24x7	Howzzthat
Scurtech	TechnoSystems	EasyStoreOnline	sharptronics
eBay	LotMobiles	AartiMobile&Electronics	Aajjo
SangeethaMobiles	Favobliss	Datamation	buyatsunshine
OhLocal	NuevoGadgets	OPPO	HariomElectronics
Koreanbro	itportal	Gadxy	vplak
AJIO	SupremeMobiles	bansaltelecom	PeedeeElectronics

gudlaptop	CasesVilla	LotusMobiles	SMS
Nexus	CaseCue	SunskyWholesale	MarutiMobile
GudLaptop	BestofIndianProducts	Sunsky	Ononya
GingerPc	BrootCompusoftLLP	Levsto	IndustryBuying
triveniworld	Myntra	ManojMobileRetailstore	SahuAgencies
addmecart	Radiant	Samanbuy	alluniversehardware
Emiraroad	Bulkli	AihomeMalaysia	AkshayaPaathramMiniMart
Tryitfirst	MobileCafe	ChargingCable	EcartSe
OxygenTheDigitalExpert	DHgateonlinestore	4mee	ShopatSC
Fonebook	ConradElectronicInternational	PMCJewellery	NeverownedIndia
iFutureAppleStore	Vivo	iNfinityPhone	Frikly
Zoneofdeals	PrivacyPortal	BURGA	Viveks
Croma	RingkeIndia	GizmoTech	Newmarketkart
ImagineOnline	Bestomart	CouturierDesign	
Apple	Budli	Seasonsway	
RelianceDigital	Yoho	Glazeimpex	
UnicornStore	EasySkinz	mymec	
VijaySales	SmartWearTech	SRVTechnologies	
Cashify	PetVideoVerifySupplies	MychoiceMywish	
93mobiles	GOTIT	NSKDigitalWorld	
MapleStore	UniletStores	OnlyMyDeal	
myG	MobilesBazaar	UVFolderKing	
iNvent	detec	Arnavtelecom	
GadgetsNow	Daimagestore	TopTenElectronics	
shoptheworld	EMISnapmint	mobileworldwashim.org	
apple	teel	Meesho	
Poorvika	gostreet	WhatnotIndia	
controlZ	TheYoungIndians	BigBacchat	
iCrescent	ValuePlusIndia		

APPENDIX B: TABLES AND FIGURE FROM RESULTS

Table 1.1

Apple iPhone 13 128 GB Blue (New) store-wise price variance

Store	#_user_feedback	min_price	max_price	price_variance
Imagine Online	20778	₹ 20,000.00	₹ 69,900.00	250%
Triveni	15510	₹ 34,999.00	₹ 34,999.00	0%
Amazon	39735	₹ 48,499.00	₹ 52,999.00	9%
Placezon	12581	₹ 49,990.00	₹ 49,990.00	0%
Reliance Digital	16907	₹ 53,900.00	₹ 69,900.00	30%
Moment Online Shopping	35971	₹ 53,999.00	₹ 53,999.00	0%
JioMart	20778	₹ 54,900.00	₹ 54,900.00	0%
Croma	20778	₹ 57,990.00	₹ 62,990.00	9%
Apple	40627	₹ 59,900.00	₹ 69,900.00	17%
Vijay Sales	16454	₹ 60,490.00	₹ 61,990.00	2%
Flipkart	17987	₹ 60,999.00	₹ 61,999.00	2%
Unicorn Store	11747	₹ 62,910.00	₹ 62,910.00	0%
Etoren	4654	₹ 80,192.00	₹ 80,939.00	1%

Table 1.2

Apple iPhone 13 Blue (128 GB/Used) store-wise price variance

Store	#_user_feedback	min_price	max_price	price_variance
eBay	40964	₹ 19,913.00	₹ 37,962.00	91%
Blink Marketing	35971	₹ 38,099.00	₹ 38,099.00	0%
controlZ	38849	₹ 38,499.00	₹ 38,499.00	0%
Refit Global	11390	₹ 41,999.00	₹ 51,900.00	24%
Cashify	16454	₹ 45,499.00	₹ 45,499.00	0%
Elcytec	8142	₹ 54,990.00	₹ 54,990.00	0%
Shop Clues	11217	₹ 60,499.00	₹ 60,499.00	0%

Figure 1.1

Apple iPhone 13 Blue (128 GB/New) Actual vs Predicted price for Reliance Digital

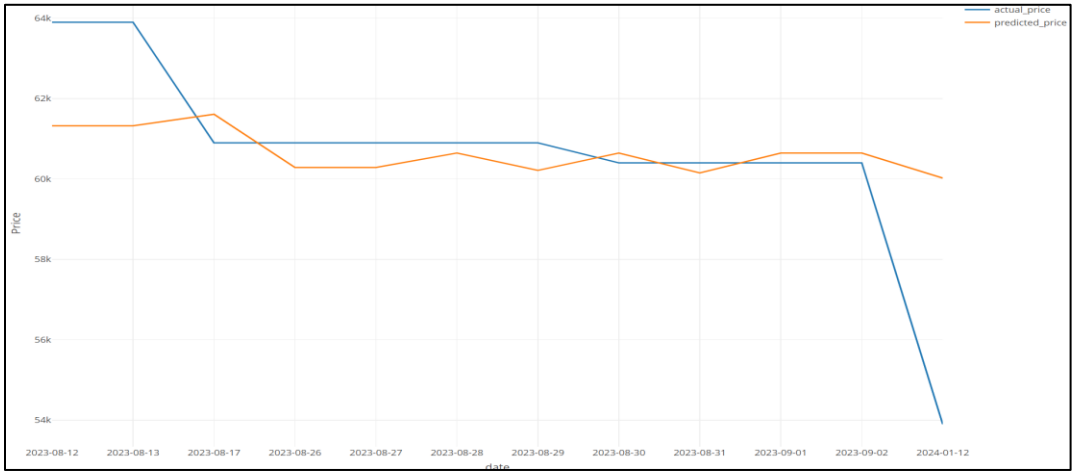


Figure 1.2

Apple iPhone 13 Blue (128 GB/New) Actual vs Predicted price for Apple store

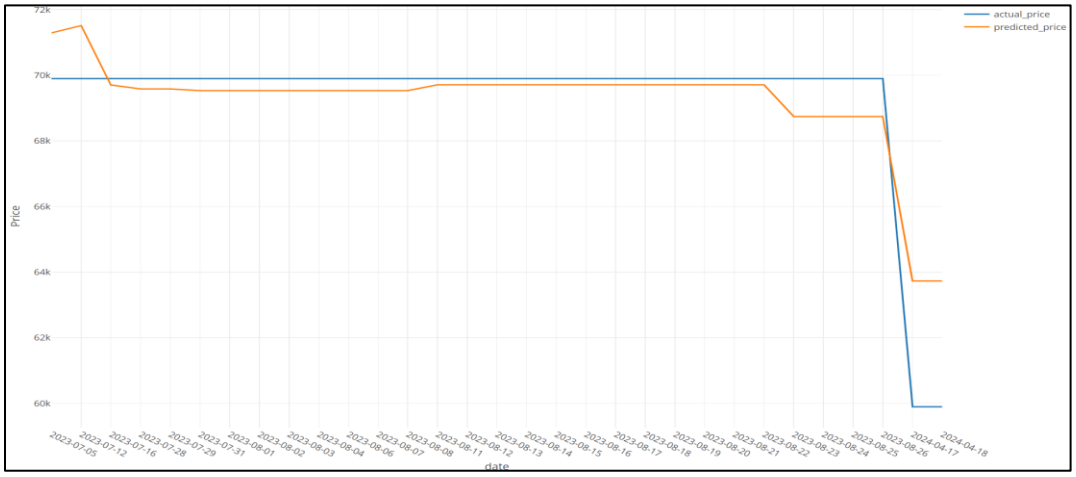


Table 1.3

Apple iPhone 13 128 GB Pink (New) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
93mobiles	40627	₹ 45,499.00	₹ 45,499.00	0%
Reliance Digital	15510	₹ 51,200.00	₹ 53,900.00	5%

Amazon	14293	₹ 51,499.00	₹ 54,900.00	7%
Flipkart	15510	₹ 52,999.00	₹ 59,999.00	13%
Croma	13269	₹ 55,990.00	₹ 55,990.00	0%
Maple Store	8104	₹ 61,399.00	₹ 61,399.00	0%
Imagine Online	8867	₹ 62,205.00	₹ 62,205.00	0%
James&Co	8867	₹ 64,900.00	₹ 64,900.00	0%

Table 1.4

Apple iPhone 13 128 GB Pink (Used/Refurbished) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Triveni	40964	₹ 32,999.00	₹ 32,999.00	0%
Valuekart18	40529	₹ 36,990.00	₹ 36,990.00	0%
RefitGlobal	5403	₹ 42,999.00	₹ 42,999.00	0%
RefurbFone	11623	₹ 51,599.00	₹ 51,599.00	0%

Table 1.5

Apple iPhone 13 256 GB Blue (New) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
myG	6972	₹ 68,900.00	₹ 74,900.00	9%
RelianceDigital	6972	₹ 69,900.00	₹ 74,900.00	7%
Flipkart	9091	₹ 69,999.00	₹ 71,999.00	3%
SangeethaMobiles	6962	₹ 69,999.00	₹ 69,999.00	0%
JioMart	6962	₹ 70,900.00	₹ 70,900.00	0%
MapleStore	9091	₹ 70,999.00	₹ 71,910.00	1%
Croma	6972	₹ 72,990.00	₹ 72,990.00	0%
Dimprice	14966	₹ 81,909.00	₹ 81,909.00	0%

Table 1.6

Apple iPhone 13 Pro 512 GB Graphite (New) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Bid buddy	16395	₹ 1,34,999.00	₹ 1,34,999.00	0%
Flipkart	16395	₹ 1,34,999.00	₹ 1,59,900.00	18%
Shop deal clue	15915	₹ 1,42,000.00	₹ 1,42,000.00	0%
Gadgets Now	16395	₹ 1,49,000.00	₹ 1,59,900.00	7%

Vijay Sales	15593	₹ 1,50,300.00	₹ 1,50,300.00	0%

Table 1.7

Apple iPhone 13 Pro 512 GB Graphite (Used/Refurbished) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Hilaptop	16395	₹ 99,000.00	₹ 99,000.00	0%

Figure 1.3

Apple iPhone 13 Pro Max Graphite (512 GB/New) Actual vs Predicted price for Flipkart

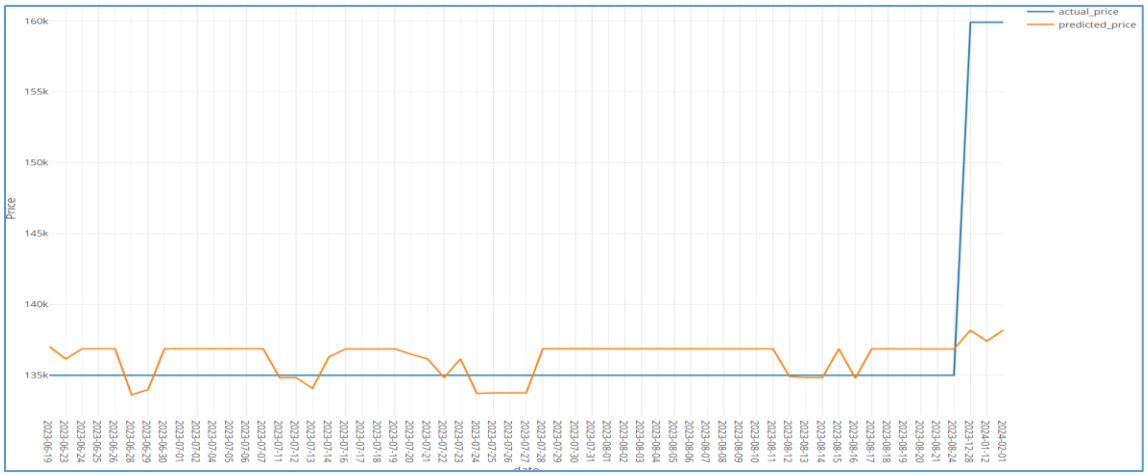


Table 1.8

Samsung Galaxy S23 Ultra 5G Black (512 GB/12GB/New) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Ubuy	45298	₹ 1,09,567.00	₹ 1,09,749.00	0%
Etoren	42283	₹ 1,12,698.00	₹ 1,12,698.00	0%
Amazon	52000	₹ 1,19,799.00	₹ 1,19,799.00	0%
Poorvika	54543	₹ 1,19,999.00	₹ 1,19,999.00	0%
Samsung	14606	₹ 1,19,999.00	₹ 1,19,999.00	0%
BuyShuy	24939	₹ 1,29,999.00	₹ 1,29,999.00	0%
JustJaldi	32393	₹ 1,34,499.00	₹ 1,34,499.00	0%
Bidbuddy	20534	₹ 1,34,999.00	₹ 1,34,999.00	0%
DarlingRetail	54950	₹ 1,34,999.00	₹ 1,34,999.00	0%
Fonebook	18345	₹ 1,34,999.00	₹ 1,34,999.00	0%

Table 1.9

Samsung Galaxy S23 Ultra 5G Green (512 GB/12GB/New) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Etoren	56321	₹ 85,965.00	₹ 1,08,272.00	26%
SangeethaMobiles	54543	₹ 1,07,999.00	₹ 1,07,999.00	0%
Amazon	54543	₹ 1,19,999.00	₹ 1,34,999.00	13%
OxygenTheDigitalExpert	54543	₹ 1,19,999.00	₹ 1,19,999.00	0%
RelianceDigital	54543	₹ 1,19,999.00	₹ 1,19,999.00	0%
Samsung	43153	₹ 1,19,999.00	₹ 1,19,999.00	0%
Croma	15012	₹ 1,34,999.00	₹ 1,34,999.00	0%
Flipkart	20023	₹ 1,34,999.00	₹ 1,34,999.00	0%
JioMart	31604	₹ 1,34,999.00	₹ 1,34,999.00	0%
Jmdcommunication	45298	₹ 1,34,999.00	₹ 1,34,999.00	0%
SouthPort	45298	₹ 1,34,999.00	₹ 1,34,999.00	0%
Zebrs	55470	₹ 1,34,999.00	₹ 1,34,999.00	0%
buyyzodigital	42283	₹ 1,34,999.00	₹ 1,34,999.00	0%

Table 1.10

Samsung Galaxy S23 Ultra 5G Green (512 GB/12GB/Used) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
eBay	80503	₹ 9,941.00	₹ 24,046.00	142%

Table 1.11

Samsung Galaxy S23 Ultra 5G Black (256 GB/12GB/New) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Triveni	52000	₹ 84,999.00	₹ 84,999.00	0%
FastEMI	53078	₹ 87,999.00	₹ 92,999.00	6%
Zebrs	54543	₹ 87,999.00	₹ 87,999.00	0%
Amazon	58881	₹ 92,170.00	₹ 1,07,990.00	17%
sathya	45538	₹ 99,900.00	₹ 99,900.00	0%
Mall2Mart	58881	₹ 99,998.00	₹ 1,04,999.00	5%
Darling Retail	59590	₹ 1,09,999.00	₹ 1,24,999.00	14%
Samsung	54543	₹ 1,09,999.00	₹ 1,24,999.00	14%
Supreme Mobiles	57580	₹ 1,09,999.00	₹ 1,09,999.00	0%
myG	57664	₹ 1,09,999.00	₹ 1,24,999.00	14%
Flipkart	20534	₹ 1,12,999.00	₹ 1,24,999.00	11%
Gostor	54950	₹ 1,20,099.00	₹ 1,20,099.00	0%

Unilet Stores	58881	₹ 1,21,249.00	₹ 1,21,249.00	0%
Croma	20534	₹ 1,24,999.00	₹ 1,24,999.00	0%
James&Co	24720	₹ 1,24,999.00	₹ 1,24,999.00	0%
Reliance Digital	20534	₹ 1,24,999.00	₹ 1,24,999.00	0%

Table 1.12

Samsung Galaxy S23 Ultra 5G Black (256 GB/12GB/Used) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
RefitGlobal	45911	₹ 87,900.00	₹ 87,900.00	0%
Elcytec	45298	₹ 96,990.00	₹ 1,06,990.00	10%
Mobex	42283	₹ 1,17,899.00	₹ 1,22,599.00	4%

Table 1.13

Samsung Galaxy S23 Ultra 5G Green (256 GB/12GB/New) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Amazon	59590	₹ 87,499.00	₹ 1,06,000.00	21%
FastEMI	53078	₹ 92,479.00	₹ 92,479.00	0%
Buyreal	57664	₹ 93,651.00	₹ 93,651.00	0%
93mobiles	52214	₹ 94,999.00	₹ 94,999.00	0%
Mall2Mart	58881	₹ 95,640.00	₹ 1,01,399.00	6%
Flipkart	27626	₹ 99,999.00	₹ 99,999.00	0%
JioMart	52214	₹ 99,999.00	₹ 99,999.00	0%
Fonebook	57664	₹ 1,09,999.00	₹ 1,09,999.00	0%
Happi Mobiles	15237	₹ 1,09,999.00	₹ 1,09,999.00	0%
Lot Mobiles	54146	₹ 1,09,999.00	₹ 1,09,999.00	0%
Samsung	56321	₹ 1,09,999.00	₹ 1,24,999.00	14%
BuyShuy	52000	₹ 1,23,999.00	₹ 1,23,999.00	0%
Moment Online Shopping	54950	₹ 1,23,999.00	₹ 1,23,999.00	0%
BigC Mobiles	52000	₹ 1,24,999.00	₹ 1,24,999.00	0%
Darling Retail	57664	₹ 1,24,999.00	₹ 1,24,999.00	0%

Table 1.14

Samsung Galaxy S23 Ultra 5G Green (256 GB/12GB/Used) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
RefitGlobal	49624	₹ 87,900.00	₹ 87,900.00	0%
Elcytec	45298	₹ 96,990.00	₹ 1,06,990.00	10%
Mobex	42283	₹ 1,17,899.00	₹ 1,22,599.00	4%

Figure 1.4

Samsung Galaxy S23 Ultra 5G Green (256 GB/12GB/New) Actual vs Predicted price for Amazon

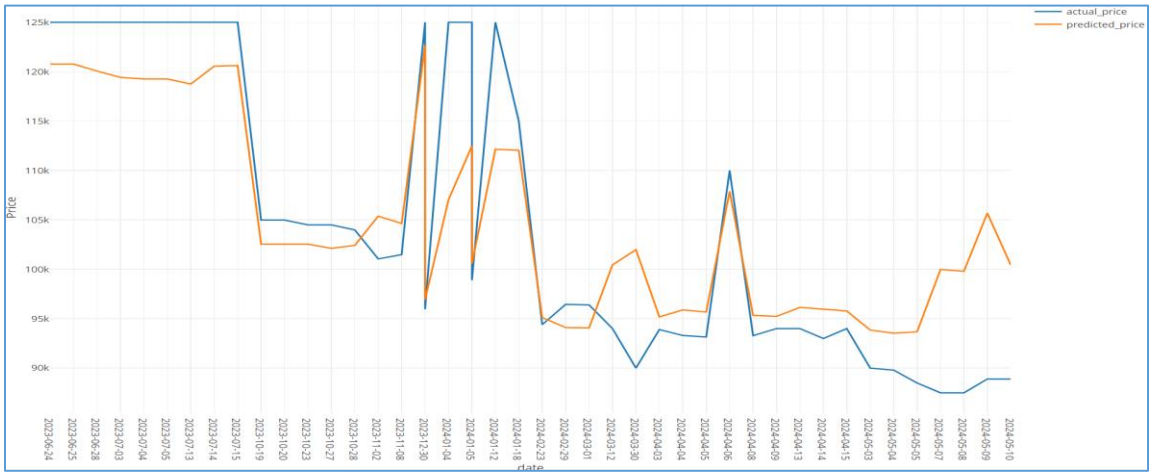


Figure 1.5

Samsung Galaxy S23 Ultra 5G Green (256 GB/12GB/New) Actual vs Predicted price for Samsung

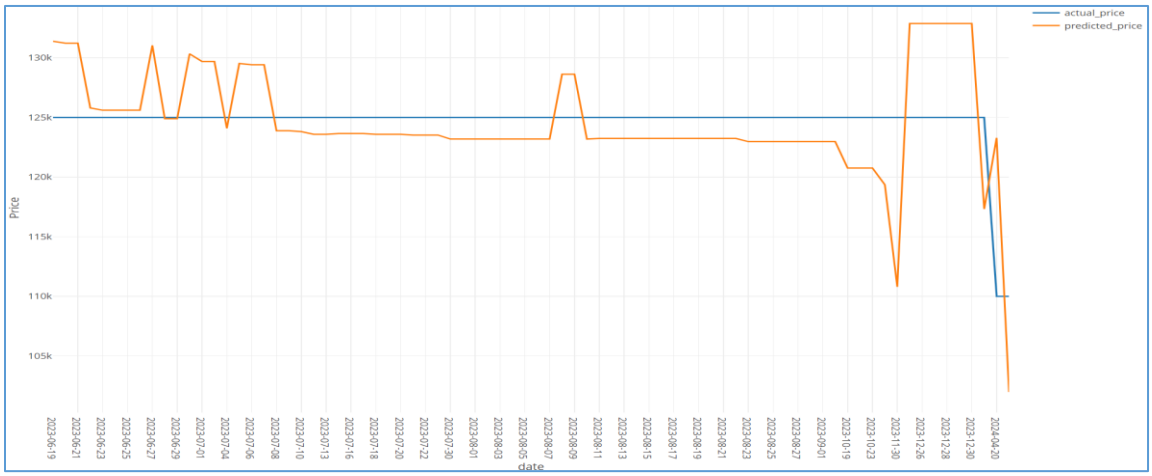


Table 1.15

Infinix Hot 10S Heart of Ocean (4 GB/64 GB/New) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Flipkart	34	₹ 9,309.00	₹ 9,899.00	6%
MobilesBazaar	59	₹ 9,499.00	₹ 9,499.00	0%

GadgetsNow	59	₹ 10,299.00	₹ 10,299.00	0%
JustJaldi	59	₹ 12,999.00	₹ 12,999.00	0%
Bidbuddy	10	₹ 13,999.00	₹ 13,999.00	0%

Table 1.16

Infinix Hot 10S Heart of Ocean (4 GB/64 GB/Used) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
GadgetsNow	33	₹ 12,869.00	₹ 12,999.00	1%
Bidbuddy	10	₹ 12,999.00	₹ 13,999.00	8%

Table 1.17

Infinix Hot 30i Blue (8 GB/128 GB/New) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Flipkart	10559	₹ 8,299.00	₹ 8,999.00	8%
Amazon	109	₹ 8,900.00	₹ 8,900.00	0%
Bidbuddy	114	₹ 8,999.00	₹ 8,999.00	0%
Ovantica	109	₹ 9,214.00	₹ 9,214.00	0%
JioMart	114	₹ 9,690.00	₹ 11,999.00	24%
teel	126	₹ 9,699.00	₹ 9,699.00	0%
GadgetsNow	548	₹ 9,899.00	₹ 9,899.00	0%

Table 1.18

Infinix Hot 30i Blue (8 GB/128 GB/New) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
vlebazaar	974	₹ 5,999.00	₹ 6,499.00	8%

Table 1.19

Infinix Hot 30i Black (8 GB/128 GB/New) store-wise price variance

Store	#_user_feedback	min_price	max_price	price_variance
Fliptwirls	974	₹ 7,999.00	₹ 7,999.00	0%
Flipkart	9100	₹ 8,299.00	₹ 9,499.00	14%
Gostor	974	₹ 8,499.00	₹ 8,499.00	0%
MomentOnlineShopping	5856	₹ 9,399.00	₹ 9,399.00	0%
GadgetsNow	112	₹ 9,999.00	₹ 9,999.00	0%
Gostreet	827	₹ 9,999.00	₹ 9,999.00	0%

Figure 1.6

Infinix Hot 30i Black (8 GB/128 GB/New) Actual vs Predicted price for Flipkart

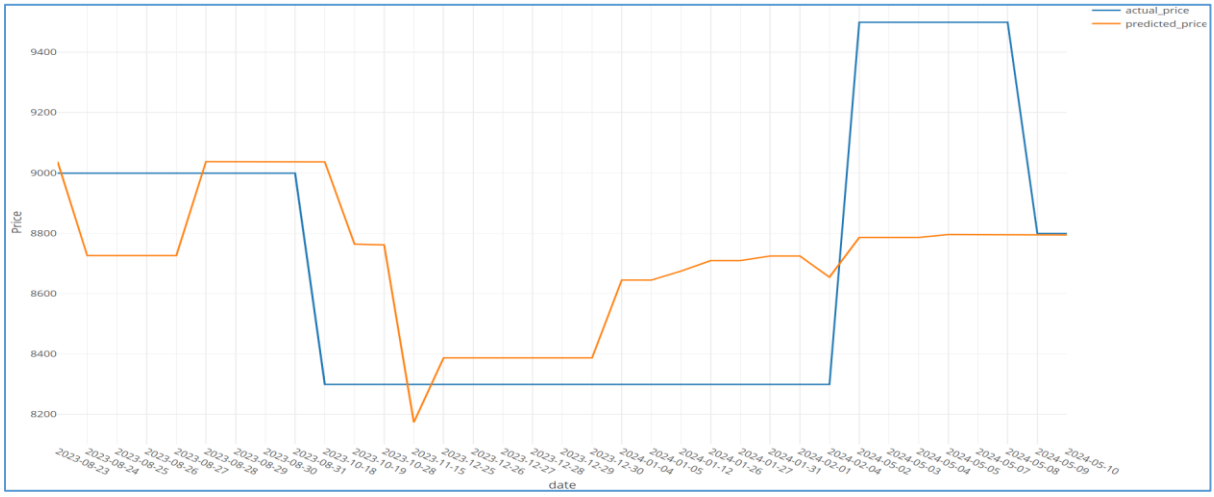


Table 1.20

Motorola Moto G82 White Lily (8 GB/128 GB/New) store-wise price variance

Store	#_user_feedback	min_price	max_price	price_variance
Amazon	3	₹ 16,890.00	₹ 17,349.00	3%
Shoptheworld	38	₹ 17,569.00	₹ 22,804.00	30%
Jmdcommunication	3	₹ 17,999.00	₹ 17,999.00	0%
JioMart	36	₹ 20,499.00	₹ 21,499.00	5%
RelianceDigital	38	₹ 20,499.00	₹ 21,499.00	5%
Flipkart	36	₹ 21,499.00	₹ 21,499.00	0%
Lulu hypermarket	35	₹ 21,499.00	₹ 25,999.00	21%
Poojaratele	36	₹ 21,499.00	₹ 21,499.00	0%
Zebrs	38	₹ 22,199.00	₹ 22,199.00	0%
Craftsvilla	442	₹ 22,499.00	₹ 22,499.00	0%
FastEMI	38	₹ 22,499.00	₹ 22,499.00	0%
DolphinsKart	3	₹ 22,574.00	₹ 22,574.00	0%
Poorvika	36	₹ 22,999.00	₹ 22,999.00	0%

Figure 1.7

Motorola Moto G82 White Lily (8 GB/128 GB/New) Actual vs Predicted price for Amazon

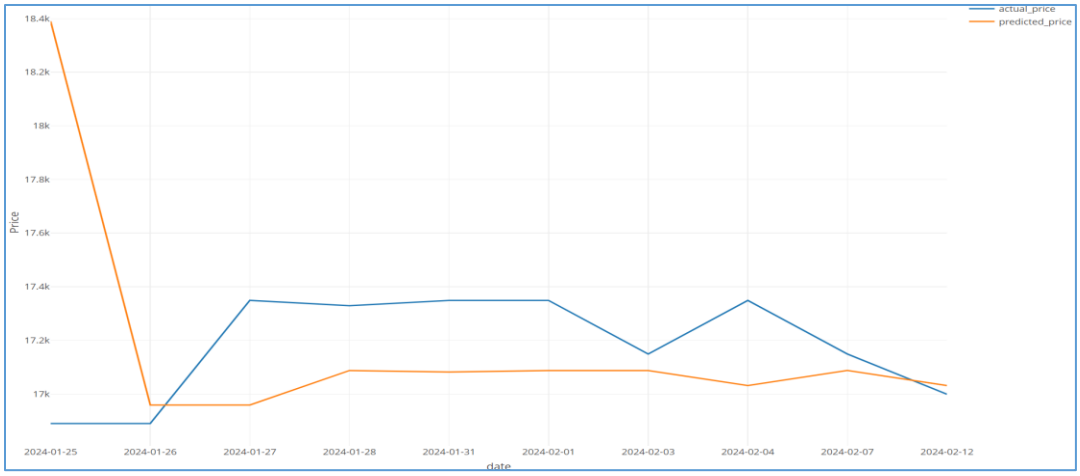


Figure 1.8

Motorola Moto G82 White Lily (8 GB/128 GB/New) Actual vs Predicted price for Shop the world

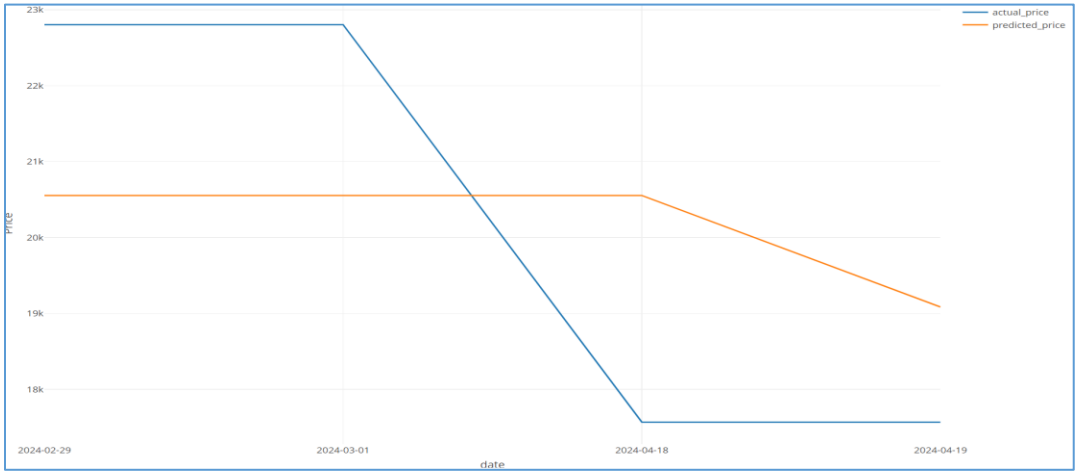


Figure 1.9

Motorola Moto G82 White Lily (8 GB/128 GB/New) Actual vs Predicted price for Reliance Digital

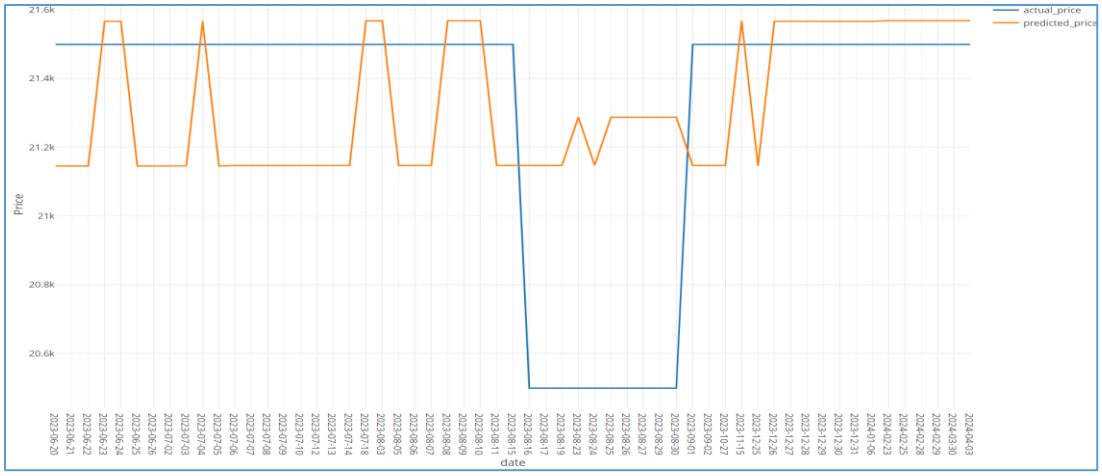


Figure 1.10

Motorola Moto G82 White Lily (8 GB/128 GB/New) Actual vs Predicted price for Lulu Hypermarket

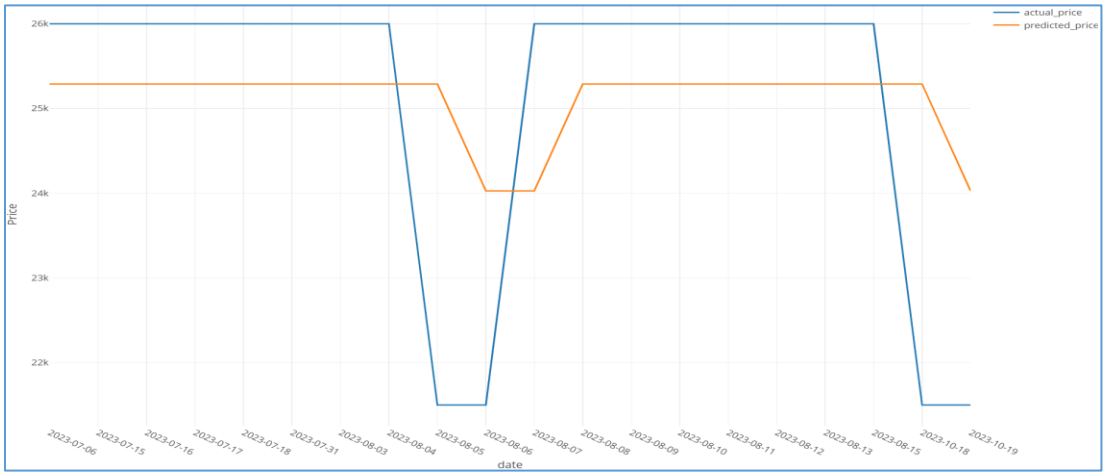


Table 1.21

Motorola Moto G82 Meteorite Gray (6 GB/128 GB/New) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
FastEMI	354	₹ 19,999.00	₹ 19,999.00	0%
JioMart	876	₹ 19,999.00	₹ 19,999.00	0%
Reliance Digital	876	₹ 19,999.00	₹ 19,999.00	0%
eBay	2	₹ 39,538.00	₹ 41,496.00	5%

Table 1.22

Nokia C32 Breezy Mint (4 GB/128 GB /New) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Amazon	846	₹ 7,489.00	₹ 7,999.00	7%
RelianceDigital	756	₹ 7,999.00	₹ 9,499.00	19%
BigCMobiles	409	₹ 8,499.00	₹ 9,499.00	12%
JioMart	429	₹ 8,499.00	₹ 9,499.00	12%
SangeethaMobiles	517	₹ 8,499.00	₹ 9,499.00	12%
EasternLogica	703	₹ 8,999.00	₹ 9,499.00	6%
LotMobiles	389	₹ 9,499.00	₹ 9,499.00	0%
NokiaPhonesIndia	28	₹ 9,499.00	₹ 9,499.00	0%
myG	21	₹ 9,499.00	₹ 9,499.00	0%
Flipkart	28	₹ 9,724.00	₹ 9,924.00	2%
Poorvika	4	₹ 9,999.00	₹ 9,999.00	0%

Table 1.23

Nokia C32 Breezy Mint (4 GB/128 GB /Used) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Triveni	734	₹ 5,499.00	₹ 5,499.00	0%

Figure 1.11

Nokia C32 Breezy Mint (4 GB/128 GB /New) Actual vs Predicted price for Amazon

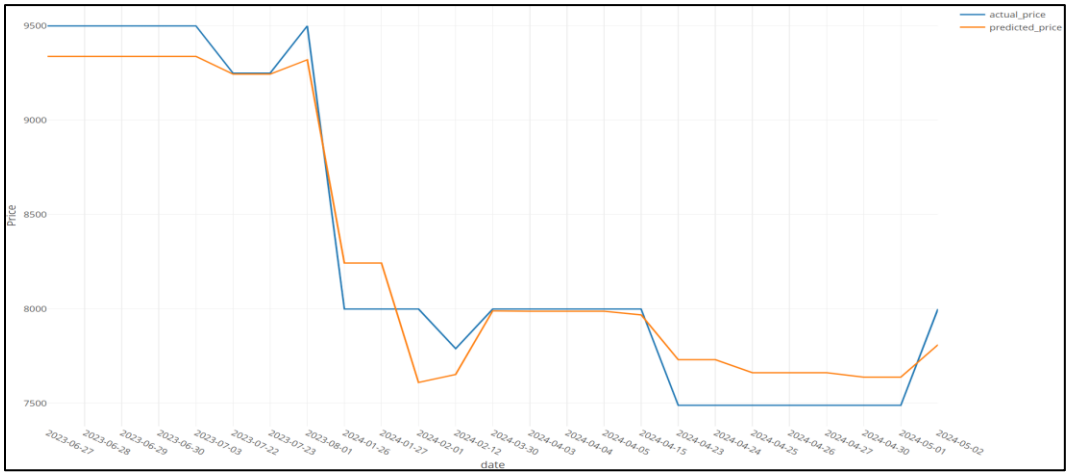


Figure 1.12

Nokia C32 Breezy Mint (4 GB/128 GB /New) Actual vs Predicted price for Reliance Digital

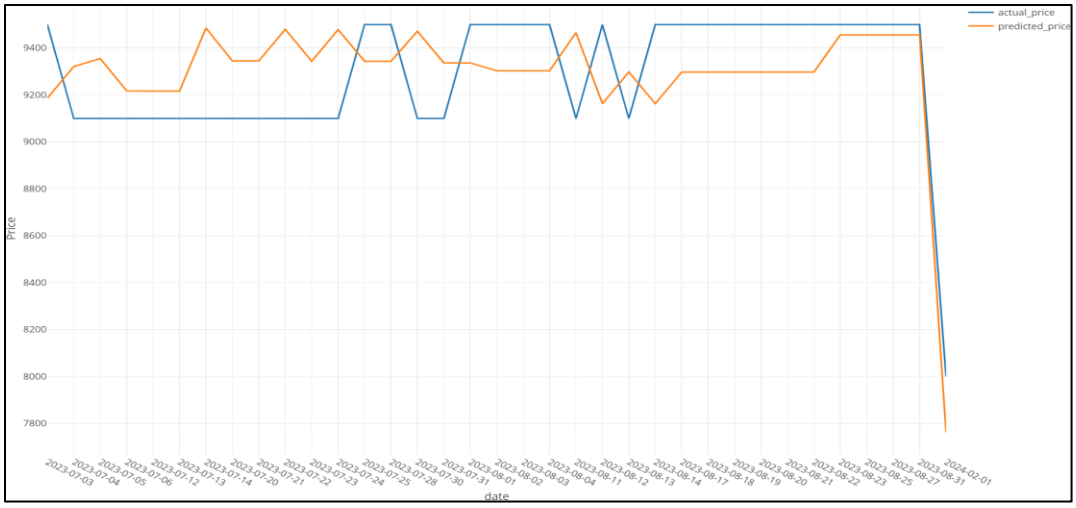


Figure 1.13

Nokia C32 Breezy Mint (4 GB/128 GB /New) Actual vs Predicted price for JioMart

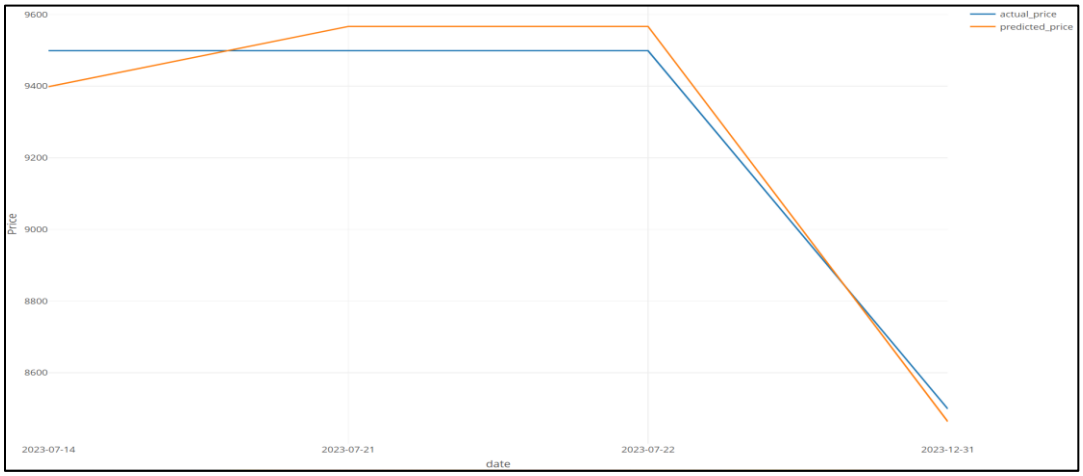


Figure 1.14

Nokia C32 Breezy Mint (4 GB/128 GB /New) Actual vs Predicted price for Flipkart

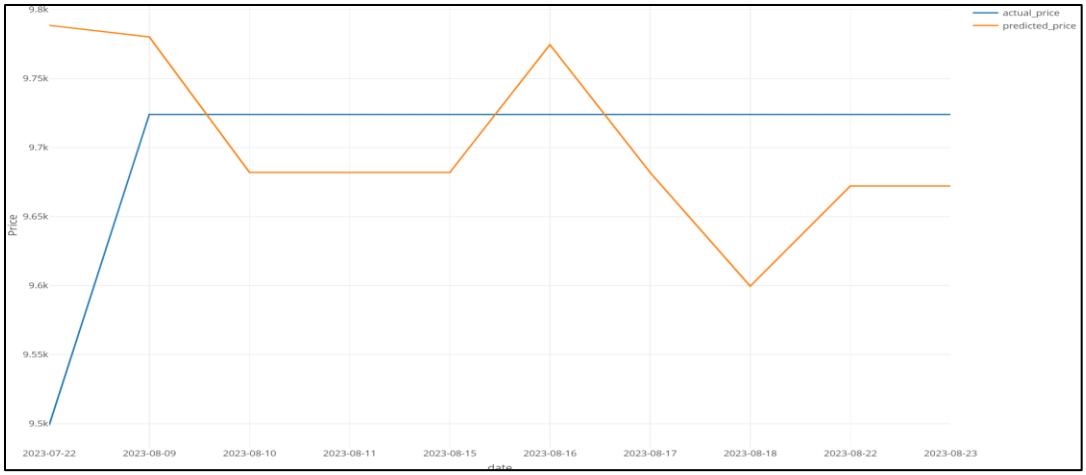


Table 1.24

Nokia C32 Beach Pink (4 GB/128 GB/New) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
BigCMobiles	619	₹ 7,999.00	₹ 7,999.00	0%
Flipkart	734	₹ 7,999.00	₹ 7,999.00	0%
JioMart	668	₹ 7,999.00	₹ 7,999.00	0%
RelianceDigital	825	₹ 7,999.00	₹ 9,499.00	19%
SangeethaMobiles	893	₹ 7,999.00	₹ 7,999.00	0%
myG	703	₹ 7,999.00	₹ 7,999.00	0%
SupremeMobiles	734	₹ 8,199.00	₹ 8,199.00	0%
Amazon	389	₹ 8,999.00	₹ 9,499.00	6%
EasternLogica	703	₹ 8,999.00	₹ 9,499.00	6%
LotMobiles	4	₹ 9,499.00	₹ 9,499.00	0%
LotMobiles	4	₹ 9,499.00	₹ 9,499.00	0%
NokiaPhonesIndia	517	₹ 9,499.00	₹ 9,499.00	0%
ZalaniCollectionNX	6	₹ 9,990.00	₹ 9,990.00	0%
Poorvika	4	₹ 9,999.00	₹ 9,999.00	0%

Table 1.25

OPPO F23 Bold Gold (8 GB/256 GB /New) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
PoojaraTelecom	1	₹ 19,999.00	₹ 22,999.00	15%
Poorvika	1	₹ 21,999.00	₹ 24,999.00	14%
Amazon	304	₹ 22,999.00	₹ 24,999.00	9%
Croma	306	₹ 22,999.00	₹ 24,999.00	9%

Fonebook	1	₹ 22,999.00	₹ 22,999.00	0%
Zebrs	1	₹ 22,999.00	₹ 22,999.00	0%
GadgetsNow	1	₹ 23,759.00	₹ 23,999.00	1%
James&Co	9	₹ 24,999.00	₹ 24,999.00	0%
LotusMobiles	1	₹ 24,999.00	₹ 24,999.00	0%
OPPO	298	₹ 24,999.00	₹ 24,999.00	0%
skyscom.org	1	₹ 24,999.00	₹ 24,999.00	0%
Flipkart	306	₹ 26,399.00	₹ 26,399.00	0%

Table 1.26

OPPO F23 Cool Black (8 GB/256 GB /New) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
BigCMobiles	1	₹ 20,999.00	₹ 28,999.00	38%
Croma	1	₹ 22,999.00	₹ 22,999.00	0%
Reliance Digital	306	₹ 22,999.00	₹ 24,999.00	9%
Jmdcommunication	298	₹ 24,899.00	₹ 24,899.00	0%
Amazon	306	₹ 24,999.00	₹ 24,999.00	0%
BNewMobiles&Electronics	1	₹ 24,999.00	₹ 24,999.00	0%
BajajMall	9	₹ 24,999.00	₹ 24,999.00	0%
James&Co	298	₹ 24,999.00	₹ 24,999.00	0%
GadgetsNow	1	₹ 25,739.00	₹ 25,999.00	1%

Table 1.27

OPPO Find N2 Flip Astral Black (8 GB/256 GB /New) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
BajajMall	140	₹ 12,000.00	₹ 89,999.00	650%
Triveni	336	₹ 39,999.00	₹ 39,999.00	0%
JioMart	151	₹ 59,999.00	₹ 59,999.00	0%
RelianceDigital	444	₹ 59,999.00	₹ 89,999.00	50%
Etoren	444	₹ 66,597.00	₹ 83,232.00	25%
Flipkart	433	₹ 69,999.00	₹ 89,999.00	29%
SupremeMobiles	354	₹ 69,999.00	₹ 89,999.00	29%
sathya	414	₹ 71,990.00	₹ 71,990.00	0%
BNewMobiles&Electronics	184	₹ 89,999.00	₹ 89,999.00	0%
Croma	50	₹ 89,999.00	₹ 89,999.00	0%
MomentOnlineShopping	184	₹ 89,999.00	₹ 89,999.00	0%
OPPO	444	₹ 89,999.00	₹ 89,999.00	0%
OxygenTheDigitalExpert	354	₹ 89,999.00	₹ 89,999.00	0%
Poorvika	379	₹ 89,999.00	₹ 89,999.00	0%

VijaySales	69	₹ 89,999.00	₹ 89,999.00	0%
Ubuy	184	₹ 1,46,794.00	₹ 1,46,794.00	0%

Table 1.28

OPPO Find N2 Flip Astral Black (8 GB/256 GB /Used) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
RefitGlobal	134	₹ 47,999.00	₹ 49,999.00	4%
LoveTechHateWaste	184	₹ 62,043.00	₹ 63,719.00	3%
Sahivalue	379	₹ 62,999.00	₹ 62,999.00	0%

Table 1.29

OPPO Find N2 Flip Moonlit Purple (8 GB/256 GB /New) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
sathya	158	₹ 54,990.00	₹ 54,990.00	0%
JioMart	184	₹ 59,999.00	₹ 89,999.00	50%
Reliance Digital	404	₹ 59,999.00	₹ 59,999.00	0%
fliptwirls	184	₹ 79,499.00	₹ 79,499.00	0%
BajajMall	2099	₹ 89,999.00	₹ 89,999.00	0%
Flipkart	97	₹ 89,999.00	₹ 89,999.00	0%
OPPO	172	₹ 89,999.00	₹ 89,999.00	0%
VijaySales	123	₹ 89,999.00	₹ 89,999.00	0%

Table 1.30

OPPO Find N2 Flip Moonlit Purple (8 GB/256 GB /Used) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Amazon	132	₹ 53,999.00	₹ 53,999.00	0%
sathya	134	₹ 54,990.00	₹ 54,990.00	0%
Triveni	184	₹ 59,999.00	₹ 59,999.00	0%
LoveTechHateWaste	184	₹ 60,499.00	₹ 62,134.00	3%
Housekeeping Enterprises	414	₹ 68,649.00	₹ 68,649.00	0%

Figure 1.15

OPPO Find N2 Flip Moonlit Purple (8 GB/256 GB /New) Actual vs Predicted price for JioMart

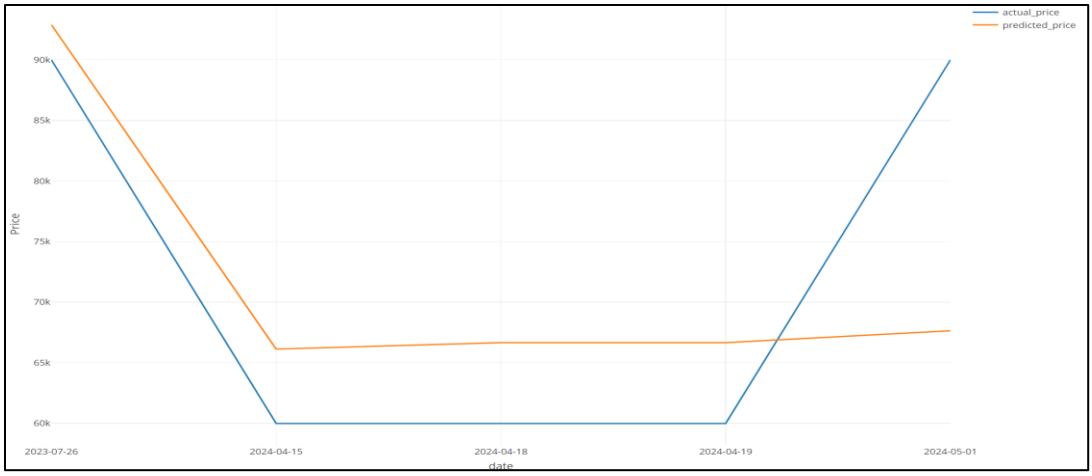


Table 1.31

POCO X5 Pro Astral Black (8 GB/256 GB /New) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Bidbuddy	3044	₹ 20,999.00	₹ 22,999.00	10%
OhLocal	2457	₹ 22,539.00	₹ 22,539.00	0%
BajajMall	5942	₹ 24,999.00	₹ 28,999.00	16%
JioMart	5563	₹ 24,999.00	₹ 24,999.00	0%
Maliks	2477	₹ 26,064.00	₹ 26,131.00	0%
HiTechLand	1708	₹ 29,096.00	₹ 29,170.00	0%
Dikazo	4750	₹ 35,014.00	₹ 39,439.00	13%
eBay	4128	₹ 52,206.00	₹ 52,802.00	1%

Table 1.32

Samsung Galaxy F12 Celestial Black (64 GB/4 GB /New) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Triveni	23	₹ 9,870.00	₹ 10,499.00	0%
vlebazaar	23	₹ 9,870.00	₹ 9,870.00	0%
Tradeindia	23	₹ 9,999.00	₹ 9,999.00	0%
OhLocal	23	₹ 10,289.00	₹ 10,289.00	0%
Flipkart	23	₹ 10,499.00	₹ 11,999.00	14%
vlebazaar	23	₹ 10,499.00	₹ 10,499.00	0%
VijaySales	23	₹ 11,499.00	₹ 11,499.00	0%

Table 1.33

Samsung Galaxy F12 Celestial Black (64 GB/4 GB /Used) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
TheYoungIndians	23	₹ 11,999.00	₹ 11,999.00	0%
Bidbuddy	23	₹ 12,999.00	₹ 12,999.00	0%

Table 1.34

Samsung Galaxy F12 Celestial Black (128 GB/4 GB /New) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
fliptwirls	23	₹ 11,349.00	₹ 11,349.00	0%
addmecart	23	₹ 11,399.00	₹ 11,399.00	0%
Flipkart	36	₹ 11,599.00	₹ 12,999.00	12%
shoptheworld	23	₹ 11,876.00	₹ 11,876.00	0%
Bidbuddy	23	₹ 13,999.00	₹ 13,999.00	0%

Table 1.35

Samsung Galaxy F12 Celestial Black (128 GB/4 GB /Used) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Cashify	23	₹ 7,699.00	₹ 8,699.00	13%

Figure 1.16

Samsung Galaxy F12 Celestial Black (128 GB/4 GB/New) Actual vs Predicted price for Flipkart

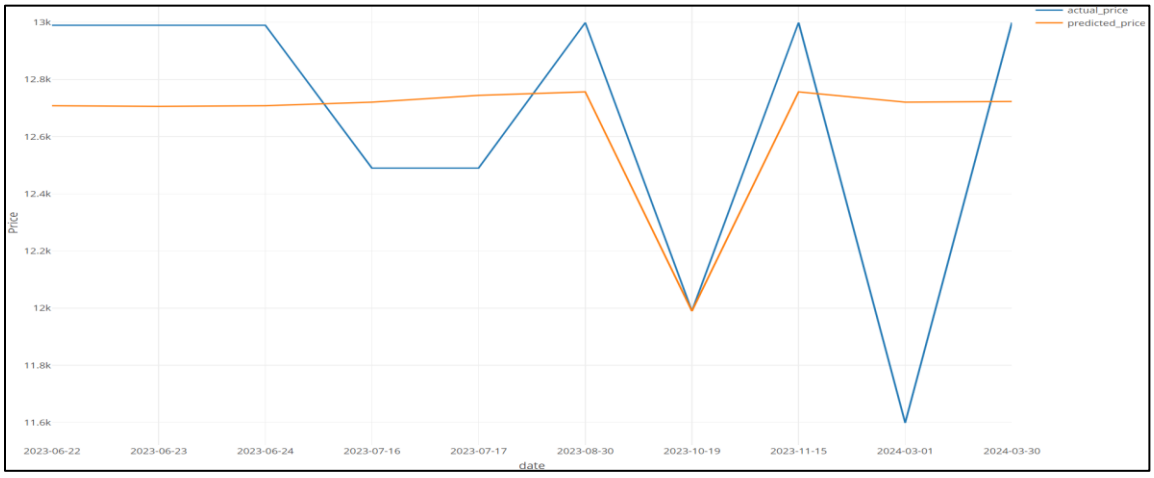


Table 1.36

OnePlus 10 Pro Volcanic Black (128 GB/8 GB /New) store-wise price variance

Store	#_user_feedback	min_price	max_price	price_variance
eBay	598	₹ 35,006.00	₹ 35,091.00	0%
MobilegooShop	81	₹ 38,999.00	₹ 38,999.00	0%
Ubuy	555	₹ 39,880.00	₹ 39,880.00	0%
SupremeMobiles	365	₹ 39,999.00	₹ 66,999.00	68%
Flipkart	555	₹ 41,299.00	₹ 59,999.00	45%
PrivacyPortal	440	₹ 46,117.00	₹ 46,473.00	1%
Etoren	344	₹ 47,353.00	₹ 47,794.00	1%
JustlookOnlineStore	555	₹ 61,490.00	₹ 61,490.00	0%
VijaySales	209	₹ 64,319.00	₹ 64,319.00	0%
RelianceDigital	226	₹ 66,999.00	₹ 66,999.00	0%
Canadianbestseller	823	₹ 77,403.00	₹ 77,915.00	1%

Table 1.37

OnePlus 10 Pro Volcanic Black (128 GB/8 GB/Used) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
RefitGlobal	598	₹ 27,999.00	₹ 35,999.00	29%
Sahivalue	551	₹ 37,299.00	₹ 37,299.00	0%
eBay	598	₹ 37,351.00	₹ 37,598.00	1%
BlynkMarketing	1080	₹ 39,199.00	₹ 41,999.00	7%
Elcytec	439	₹ 41,990.00	₹ 41,990.00	0%
MobiBay	469	₹ 41,999.00	₹ 41,999.00	0%
Xtracover	551	₹ 42,999.00	₹ 42,999.00	0%
PrivacyPortal	555	₹ 52,147.00	₹ 52,631.00	1%

Figure 1.17

OnePlus 10 Pro Volcanic Black (128 GB/8 GB /New) Actual vs Predicted price for Flipkart

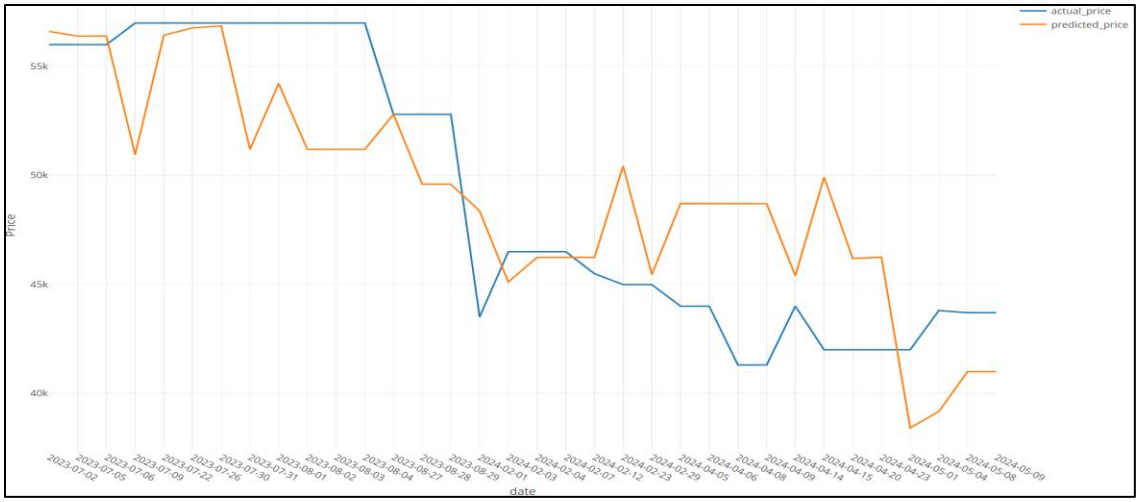


Table 1.38

Samsung Galaxy Z Fold 4 5G Beige (256 GB/12 GB /New) store-wise price variance

Store	#_user_feedback	min_price	max_price	price_variance
Triveni	15625	₹ 69,999.00	₹ 74,999.00	7%
Etoren	39325	₹ 76,293.00	₹ 1,05,417.00	38%
93mobiles	12847	₹ 79,999.00	₹ 79,999.00	0%
SangeethaMobiles	28598	₹ 1,17,999.00	₹ 1,17,999.00	0%
MahajanElectronics	14888	₹ 1,19,399.00	₹ 1,52,999.00	28%
Shoptheworld	10603	₹ 1,33,034.00	₹ 1,47,286.00	11%
easy-buy	5133	₹ 1,35,890.00	₹ 1,35,890.00	0%
RelianceDigital	34710	₹ 1,39,999.00	₹ 1,54,999.00	11%
Samsung	18644	₹ 1,39,999.00	₹ 1,54,999.00	11%
BuyShuy	36424	₹ 1,49,999.00	₹ 1,49,999.00	0%
JustJaldi	3112	₹ 1,51,875.00	₹ 1,51,875.00	0%
Croma	9356	₹ 1,54,999.00	₹ 1,54,999.00	0%
VijaySales	9356	₹ 1,54,999.00	₹ 1,54,999.00	0%

Table 1.39

Samsung Galaxy Z Fold 4 5G Beige (256 GB/12 GB/Used) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Triveni	18782	₹ 54,999.00	₹ 54,999.00	0%
Hilaptop	18275	₹ 99,000.00	₹ 99,999.00	1%
Mobex	5671	₹ 1,15,299.00	₹ 1,19,999.00	4%

Figure 1.18

Samsung Galaxy Z Fold 4 5G Beige (256 GB/12 GB/New) Actual vs Predicted price for Reliance Digital

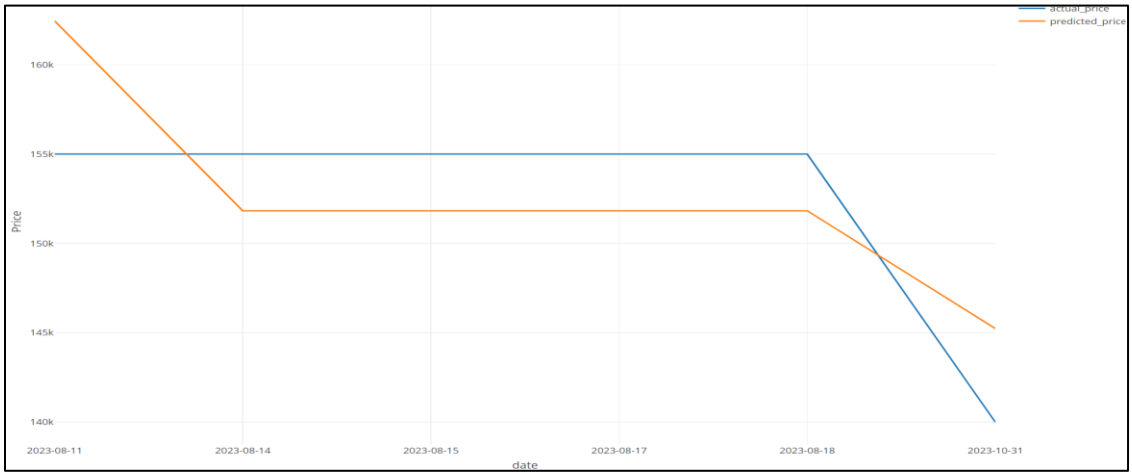


Figure 1.19

Samsung Galaxy Z Fold 4 5G Beige (256 GB/12 GB/New) Actual vs Predicted price for Samsung

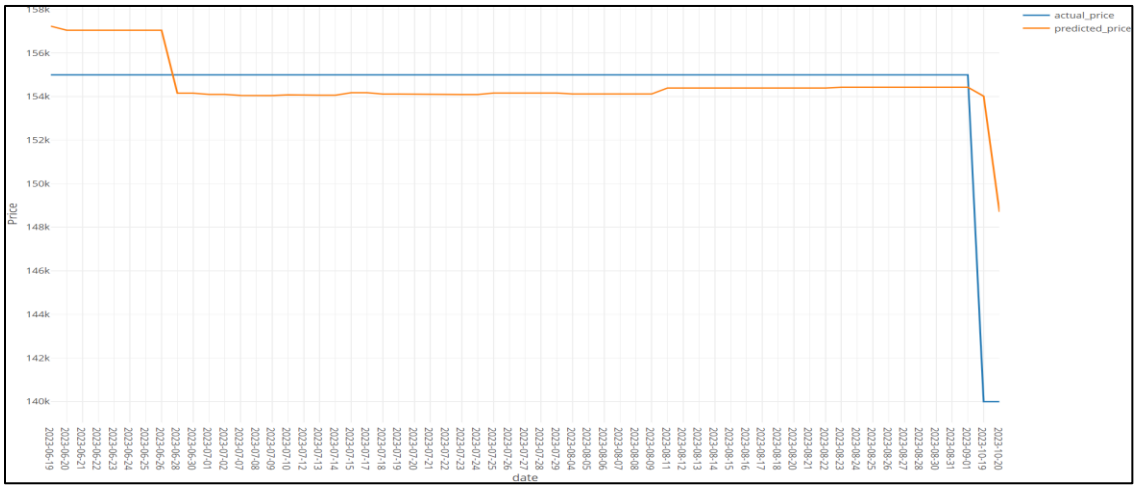


Table 1.40

Xiaomi 12 Pro Blue (256 GB/12 GB /New) store-wise price variance

Store	#_user_feedback	min_price	max_price	price_variance
JioMart	9066	₹ 23,499.00	₹ 23,999.00	2%

Etoren	9338	₹ 27,544.00	₹ 30,351.00	10%
Sathya	9161	₹ 28,499.00	₹ 28,499.00	0%
Dikazo	5541	₹ 35,959.00	₹ 36,012.00	0%
RelianceDigital	1853	₹ 39,999.00	₹ 44,999.00	13%
Fliptwirls	446	₹ 41,799.00	₹ 41,799.00	0%
Flipkart	2662	₹ 41,999.00	₹ 79,999.00	90%
Mi	1020	₹ 41,999.00	₹ 48,999.00	17%
SangeethaMobiles	323	₹ 41,999.00	₹ 44,999.00	7%
VijaySales	404	₹ 41,999.00	₹ 44,999.00	7%
Amazon	303	₹ 44,999.00	₹ 44,999.00	0%
Bidbuddy	1020	₹ 44,999.00	₹ 44,999.00	0%
Mi	1020	₹ 44,999.00	₹ 48,999.00	9%
SnapmintEMIStore	147	₹ 44,999.00	₹ 44,999.00	0%
BajajMall	2007	₹ 45,999.00	₹ 45,999.00	0%
EMISnapmint	373	₹ 48,999.00	₹ 48,999.00	0%
MiStorePalava	2531	₹ 52,999.00	₹ 52,999.00	0%
WizeKart	2662	₹ 54,999.00	₹ 54,999.00	0%
GadgetsNow	483	₹ 55,859.00	₹ 56,999.00	2%
AcquiceIndia	1671	₹ 59,999.00	₹ 59,999.00	0%
BNewMobiles&Electronics	318	₹ 62,999.00	₹ 62,999.00	0%
DarlingRetail	483	₹ 63,999.00	₹ 63,999.00	0%
Dimprice	1020	₹ 74,192.00	₹ 82,969.00	12%

Zebrs	2007	₹ 79,999.00	₹ 79,999.00	0%

Table 1.41

Xiaomi 12 Pro Blue (256 GB/12 GB /Used) store-wise price variance

Store	#_user_feedback	min_price	max_price	price_variance
BlynkMarketing	5288	₹ 19,899.00	₹ 19,899.00	0%
Budli	431	₹ 30,999.00	₹ 30,999.00	0%
Cashify	323	₹ 32,699.00	₹ 37,099.00	13%

Figure 1.20

Xiaomi 12 Pro Blue (256 GB/12 GB/New) Daily Actual vs Predicted price for Flipkart

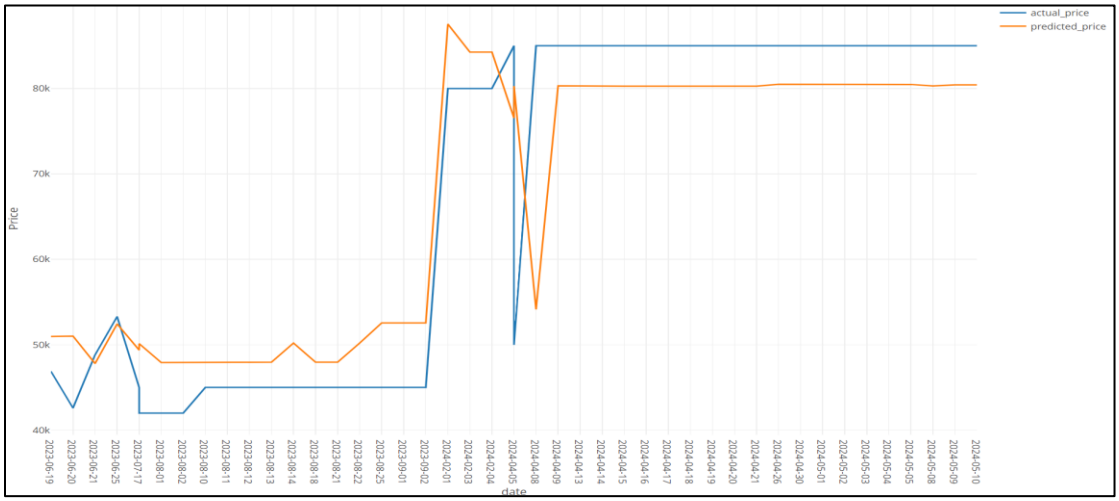


Figure 1.21

Xiaomi 12 Pro Blue (256 GB/12 GB/New) Daily Actual vs Predicted price for Mi

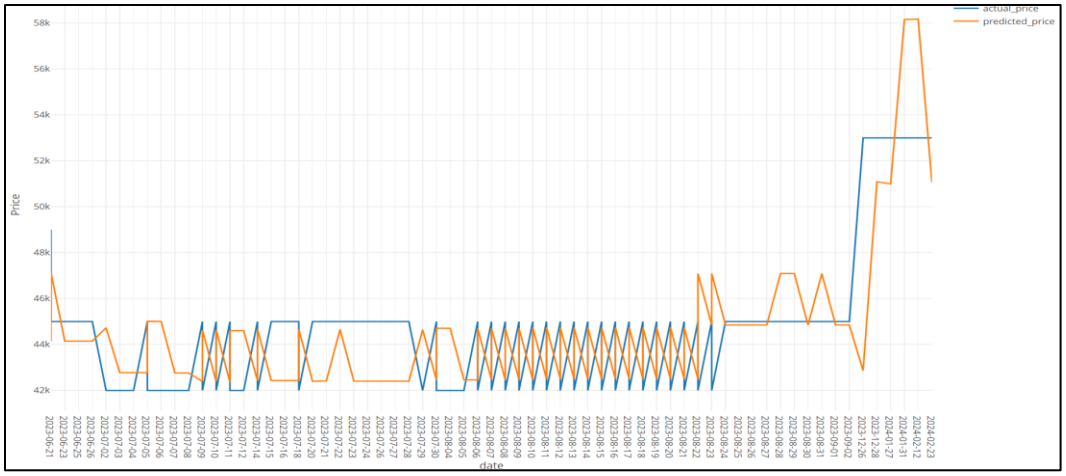


Table 1.42

vivo Y16 Gold (128 GB/4 GB/New) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
RelianceDigital	3101	₹ 9,999.00	₹ 9,999.00	0%
teel	1030	₹ 9,999.00	₹ 9,999.00	0%
sathya	3150	₹ 10,290.00	₹ 11,999.00	17%
Flipkart	5675	₹ 10,299.00	₹ 12,349.00	20%
muzambistore	3101	₹ 10,299.00	₹ 10,299.00	0%
JioMart	1436	₹ 10,999.00	₹ 12,999.00	18%
OxygenTheDigitalExpert	2662	₹ 10,999.00	₹ 10,999.00	0%
Samanbuy	3101	₹ 10,999.00	₹ 10,999.00	0%
Zebrs	3825	₹ 11,499.00	₹ 11,999.00	4%
Gostor	225	₹ 11,790.00	₹ 12,524.00	6%
zayandigital	3101	₹ 11,899.00	₹ 11,899.00	0%
Triveni	2761	₹ 11,999.00	₹ 11,999.00	0%
Croma	225	₹ 12,499.00	₹ 12,999.00	4%
Amazon	66	₹ 12,999.00	₹ 12,999.00	0%
Jmdcommunication	69	₹ 12,999.00	₹ 12,999.00	0%
LotMobiles	133	₹ 12,999.00	₹ 12,999.00	0%
SangeethaMobiles	133	₹ 12,999.00	₹ 12,999.00	0%
myG	38	₹ 12,999.00	₹ 12,999.00	0%
Scurtech	3499	₹ 19,085.00	₹ 20,214.00	6%

Table 1.43

vivo Y16 Gold (128 GB/4 GB/Used) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance

GadgetsNow	3082	₹ 10,691.00	₹ 10,799.00	1%

Figure 1.22

vivo Y16 Gold (128 GB/4 GB/Used) Actual vs Predicted price for Flipkart

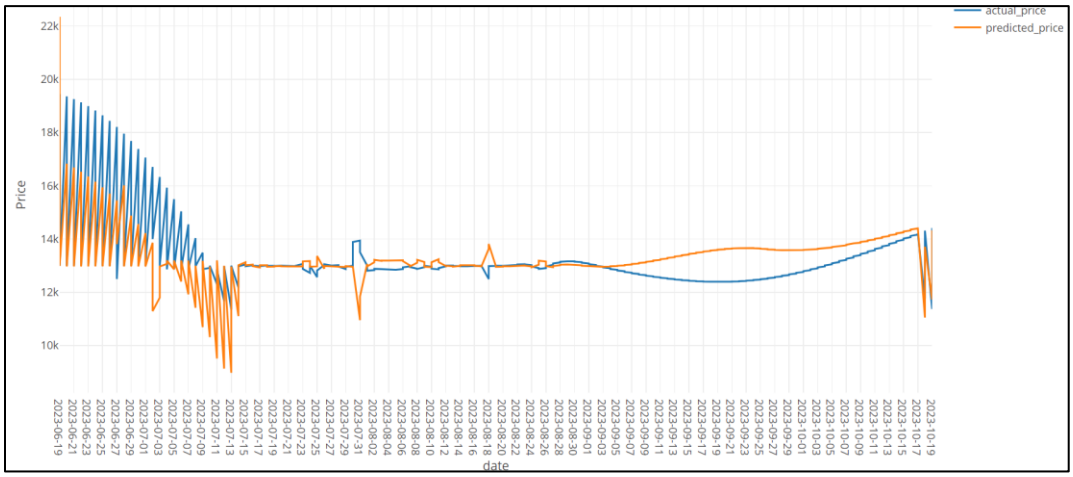


Figure 1.23

vivo Y16 Gold (128 GB/4 GB/Used) Actual vs Predicted price for JioMart

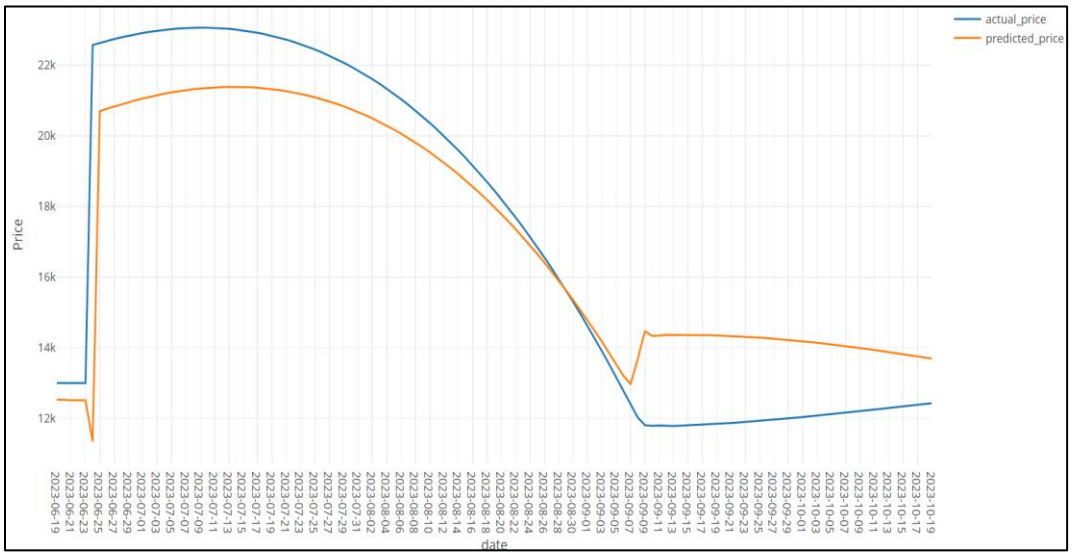


Table 1.44

Daawat Rozana super Basmati rice (5 KG) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
cityeshops	515	₹ 299.00	₹ 299.00	0%
Pohunch	3	₹ 312.00	₹ 312.00	0%
Big basket	515	₹ 315.00	₹ 400.00	27%
Flipkart	3	₹ 349.00	₹ 349.00	0%
JioMart	515	₹ 349.00	₹ 369.00	6%
LowestRateShopping	3	₹ 349.00	₹ 349.00	0%
blinkit	515	₹ 349.00	₹ 375.00	7%
Aapkabazar	3	₹ 358.00	₹ 386.00	8%
Gobazaar	3	₹ 359.00	₹ 359.00	0%
Milkbasket	3	₹ 486.00	₹ 486.00	0%

Figure 1.24

Daawat Rozana super Basmati rice (5 KG) Daily Actual vs Predicted price for Big Basket.

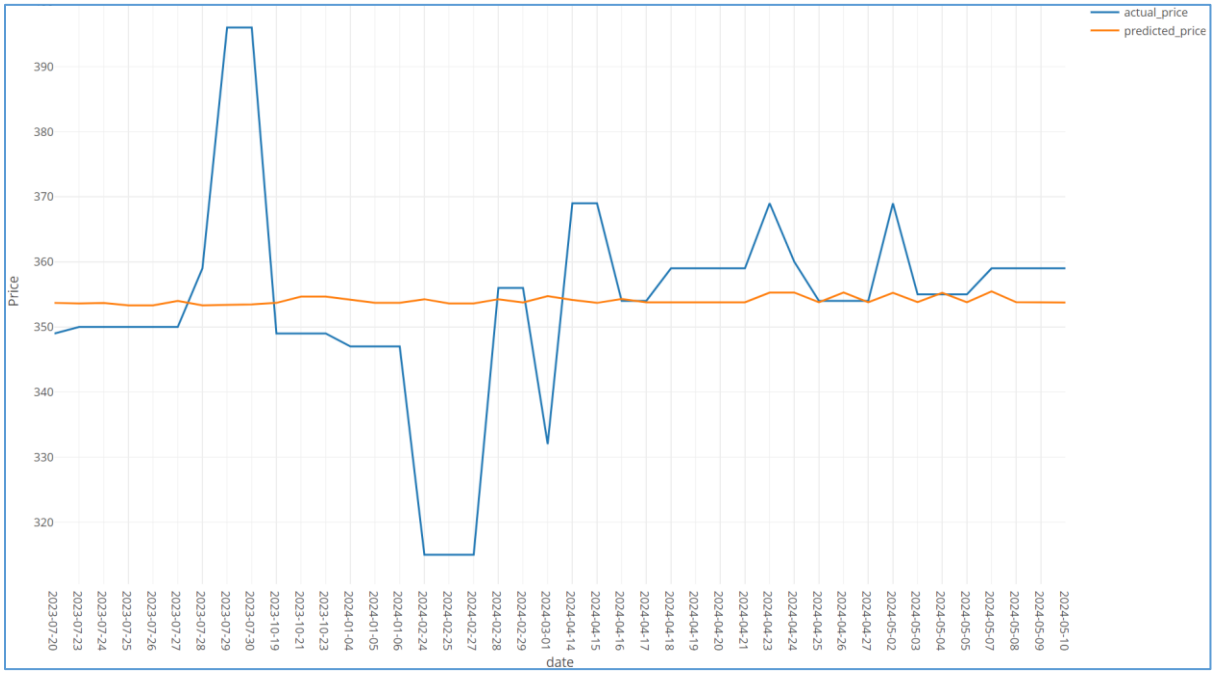


Table 1.45

Fortune Biryani Special Basmati Rice (5 KG) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Near-e-shop	3	₹ 670.00	₹ 890.00	33%

blinkit	3	₹ 699.00	₹ 699.00	0%
Big basket	3	₹ 711.00	₹ 711.00	0%
Love Local	3	₹ 945.00	₹ 945.00	0%

Figure 1.25

Fortune Biryani Special Basmati Rice (5 KG) Daily Actual vs Predicted price for Near-e-shop.

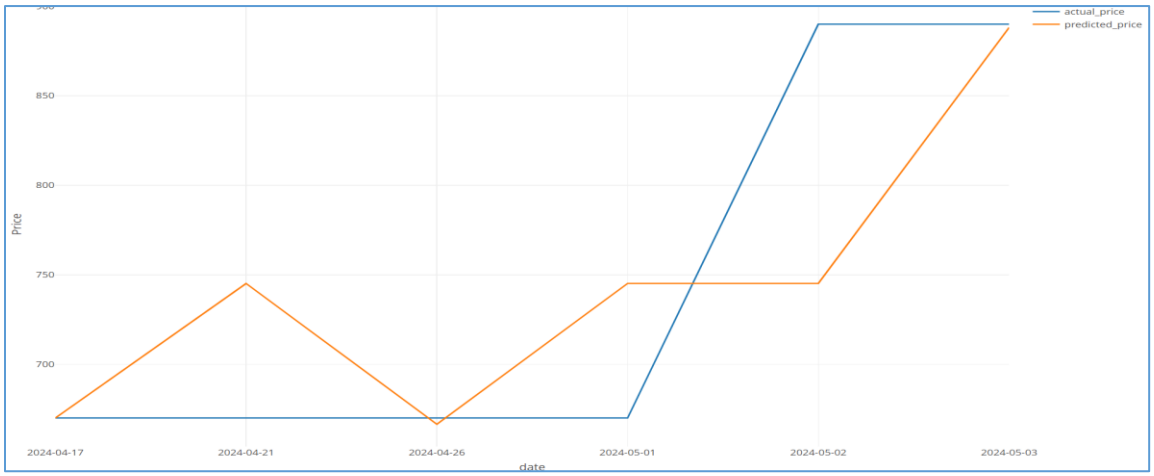


Table 1.46

Tata Iodized Salt (1 KG) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
jpkart	35	₹ 22.00	₹ 22.00	0%
Qubitlink	35	₹ 25.00	₹ 25.00	0%

Table 1.47

Vim Fresh Lemon Dishwash Bar (200 g) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Amazon	3	₹ 39.00	₹ 70.00	79%

Figure 1.26

Vim Fresh Lemon Dishwash Bar (200 g) Actual vs Predicted price for Near-e-shop

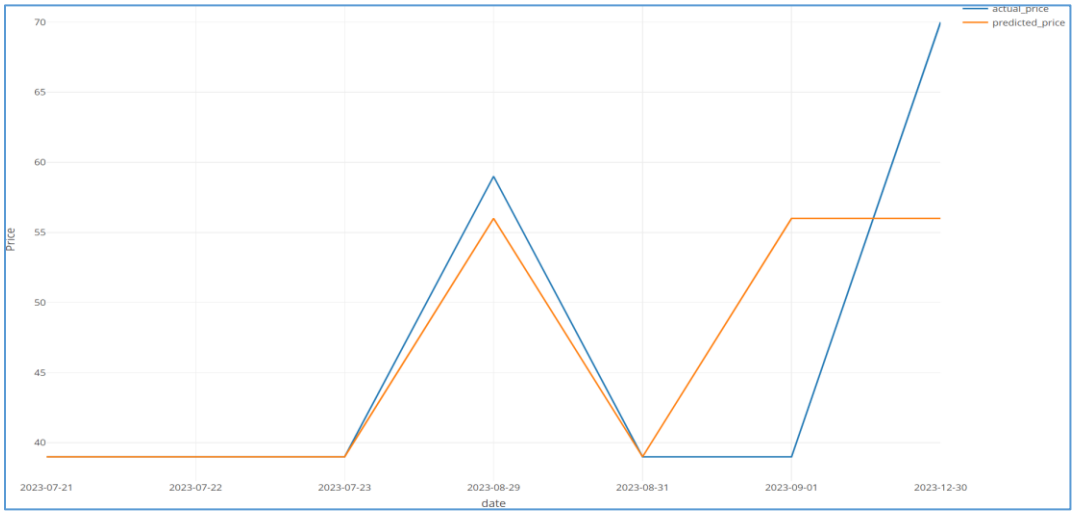


Table 1.48

Milky Mist Salted Butter (100 g) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
JioMart	27	₹ 48.00	₹ 57.00	19%
Flipkart	26	₹ 51.00	₹ 61.00	20%
Big basket	27	₹ 55.00	₹ 72.00	31%
LuLu Hypermarket	27	₹ 60.00	₹ 72.00	20%
edobo	27	₹ 60.00	₹ 60.00	0%
Zepto	2	₹ 61.00	₹ 61.00	0%
Andaman Greengrocers	27	₹ 63.00	₹ 72.00	14%
Iceland Frozen Foods	26	₹ 64.00	₹ 64.00	0%
rmemart	2	₹ 71.00	₹ 71.00	0%

Figure 1.27

Milky Mist Salted Butter (100 g) Actual vs Predicted price for JioMart

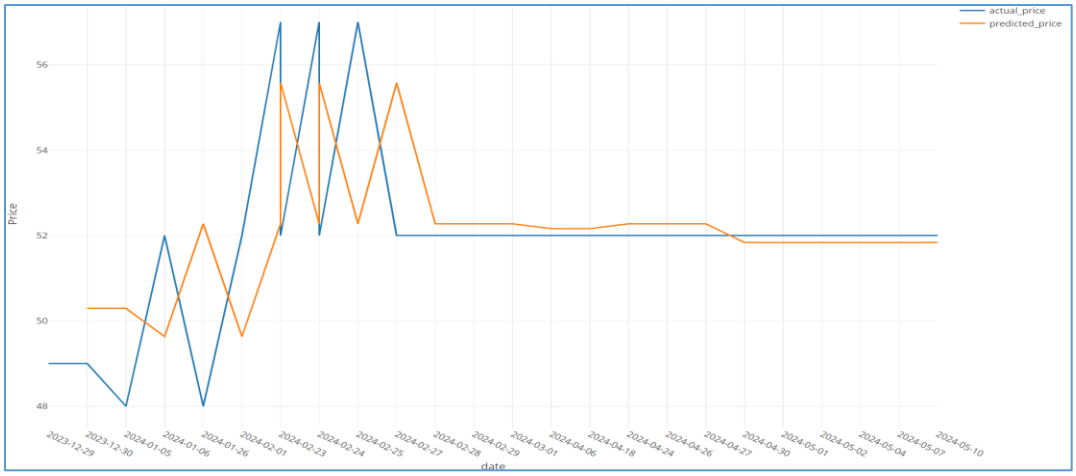


Figure 1.28

Milky Mist Salted Butter (100 g) Actual vs Predicted price for Flipkart

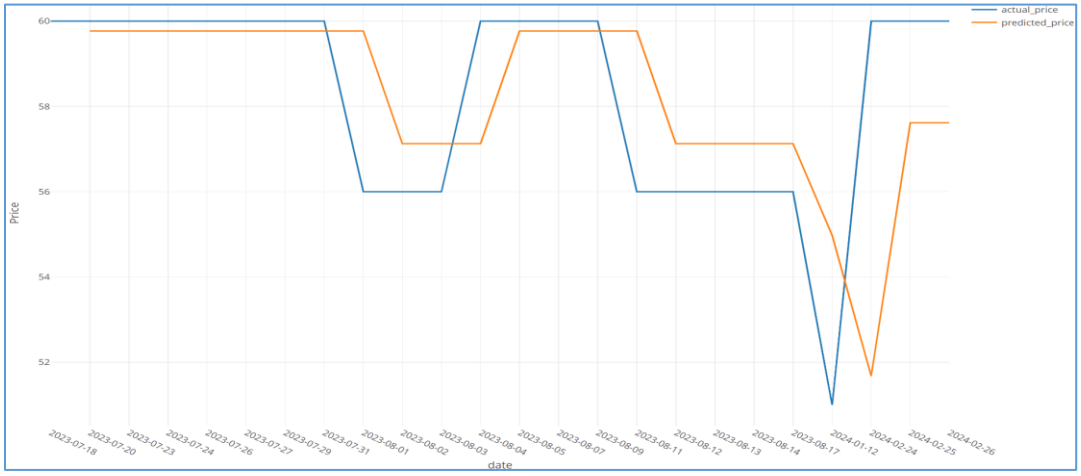


Figure 1.29

Milky Mist Salted Butter (100 g) Actual vs Predicted price for Big Basket

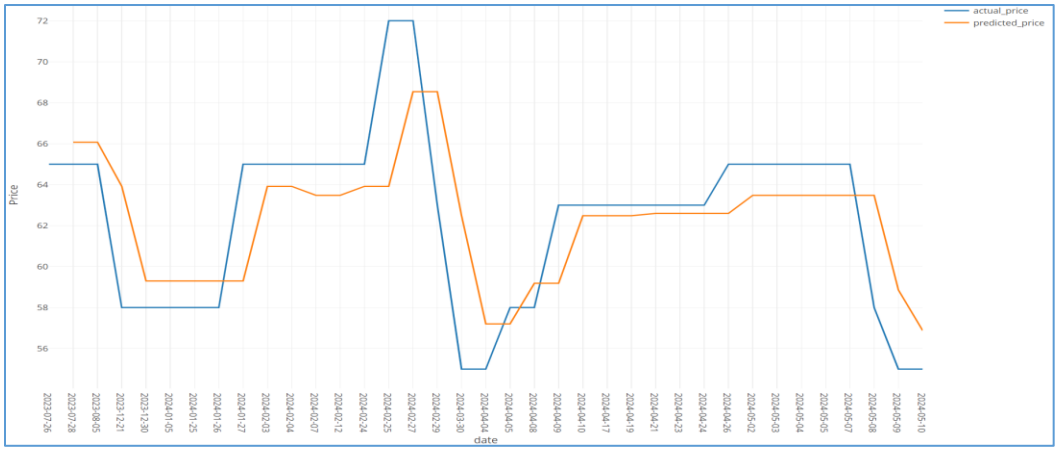


Table 1.49

Amul Salted Butter (100 g) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Saimart	1	₹ 25.00	₹ 56.00	124%
bigbasket.com	1	₹ 44.00	₹ 58.00	32%
BasketHunt	1	₹ 46.00	₹ 46.00	0%
Frivery.in	1	₹ 46.00	₹ 46.00	0%
saltandpepperretail.com	1	₹ 47.00	₹ 47.00	0%
Gharstuff	1	₹ 48.00	₹ 48.00	0%
Bajarhaat	64	₹ 49.00	₹ 53.00	8%
JioMart	64	₹ 51.00	₹ 56.00	10%
Flipkart	1	₹ 53.00	₹ 53.00	0%
Kiosk The store	1	₹ 55.00	₹ 55.00	0%
Malani stores	1	₹ 55.00	₹ 55.00	0%
Gobazaar	1	₹ 56.00	₹ 56.00	0%
Iceland Frozen Foods	1	₹ 56.00	₹ 56.00	0%
InsanelyGood	1	₹ 56.00	₹ 56.00	0%
Satvacart	1	₹ 56.00	₹ 56.00	0%
Zepto	64	₹ 56.00	₹ 58.00	4%
Andaman Greengrocers	1	₹ 58.00	₹ 58.00	0%
GetZi	1	₹ 58.00	₹ 58.00	0%
StepToDoors	1	₹ 58.00	₹ 58.00	0%
Utkal Grocery	1	₹ 58.00	₹ 58.00	0%
Amazon.in	1	₹ 76.00	₹ 76.00	0%

Figure 1.30

Amul Salted Butter (100 g) Actual vs Predicted price for JioMart

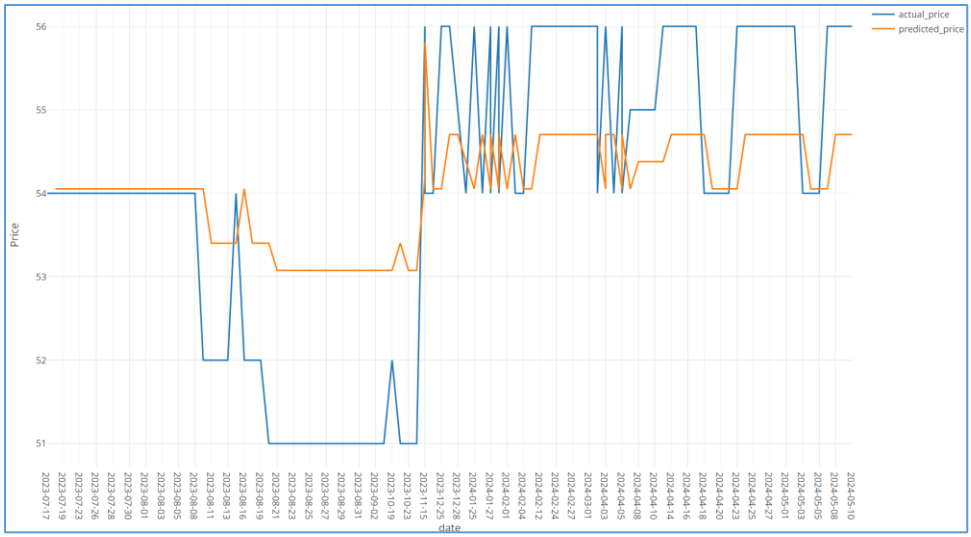


Figure 1.31

Amul Salted Butter (100 g) Actual vs Predicted price for Big Basket

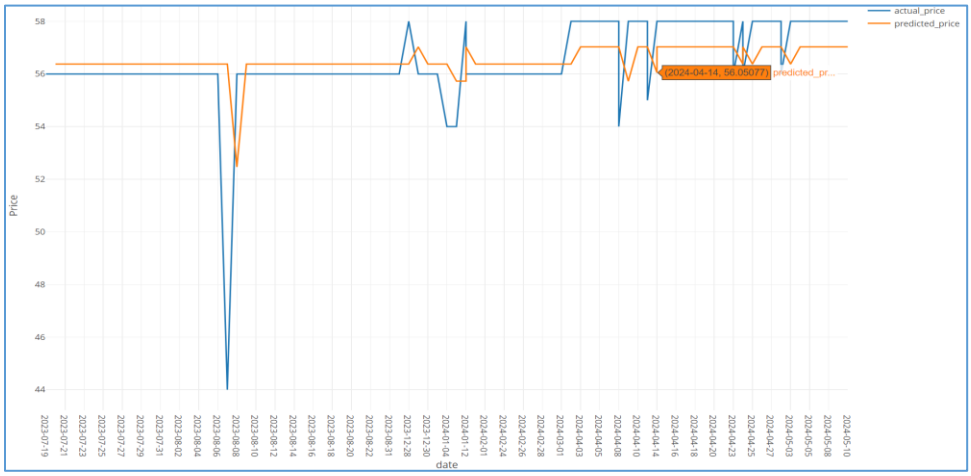


Table 1.50

A24 Mantra Organic Chana Dal (1 KG) store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Well curve	9	₹ 95.00	₹ 95.00	0%
Garg Dastak	9	₹ 166.00	₹ 166.00	0%
Big basket	8	₹ 175.00	₹ 195.00	11%
blinkit	8	₹ 179.00	₹ 184.00	3%
JioMart	8	₹ 181.00	₹ 185.00	2%
Lulu Hypermarket	9	₹ 185.00	₹ 194.00	5%

Milk basket	2	₹ 185.00	₹ 185.00	0%
Amazon	8	₹ 195.00	₹ 195.00	0%
Freshlee	2	₹ 195.00	₹ 195.00	0%
Spencer's Online	8	₹ 195.00	₹ 195.00	0%
Fast EMI	12	₹ 234.00	₹ 234.00	0%

Figure 1.32

24 Mantra Organic Chana Dal (1 KG) Actual vs Predicted price for Big Basket

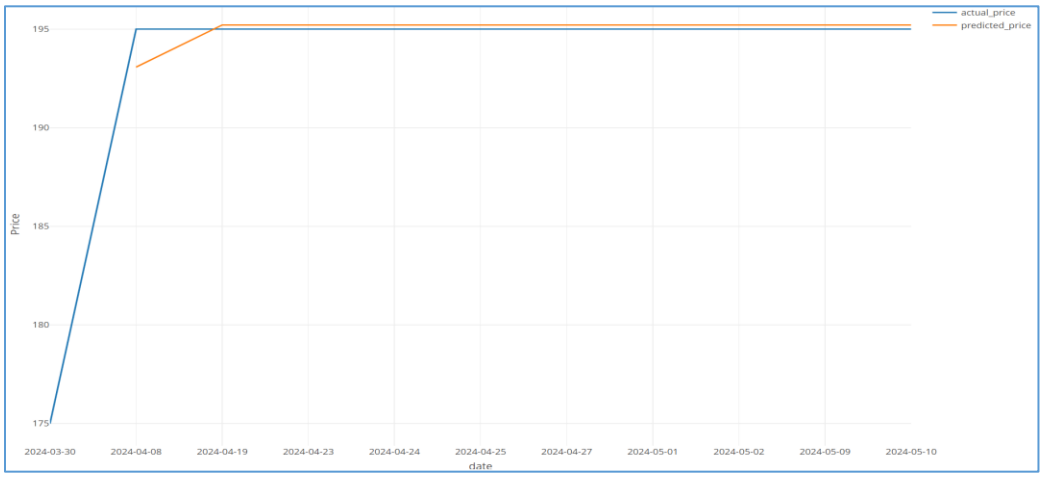


Figure 1.33

24 Mantra Organic Chana Dal (1 KG) Actual vs Predicted price for Lulu Hypermarket

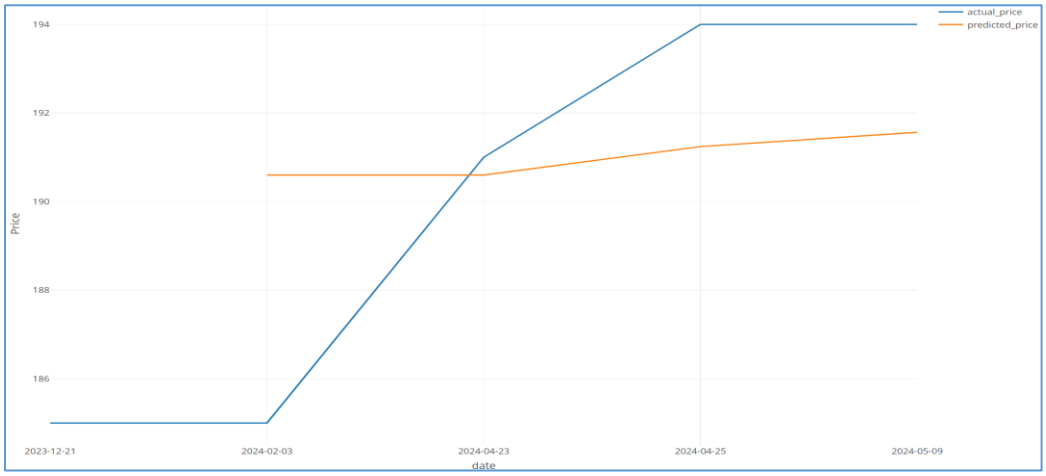


Table 1.51

LG 139 cm (55 inches) 4K Ultra HD Smart NanoCell TV store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Amazon	2	₹ 55,990.00	₹ 58,990.00	5%
Bidbuddy	1	₹ 55,990.00	₹ 58,990.00	5%
Flipkart	2	₹ 55,990.00	₹ 94,999.00	70%
LG Electronics India	1	₹ 55,990.00	₹ 56,989.00	2%

Figure 1.33

LG 139 cm (55 inches) 4K Ultra HD Smart NanoCell TV Actual vs Predicted price for Amazon

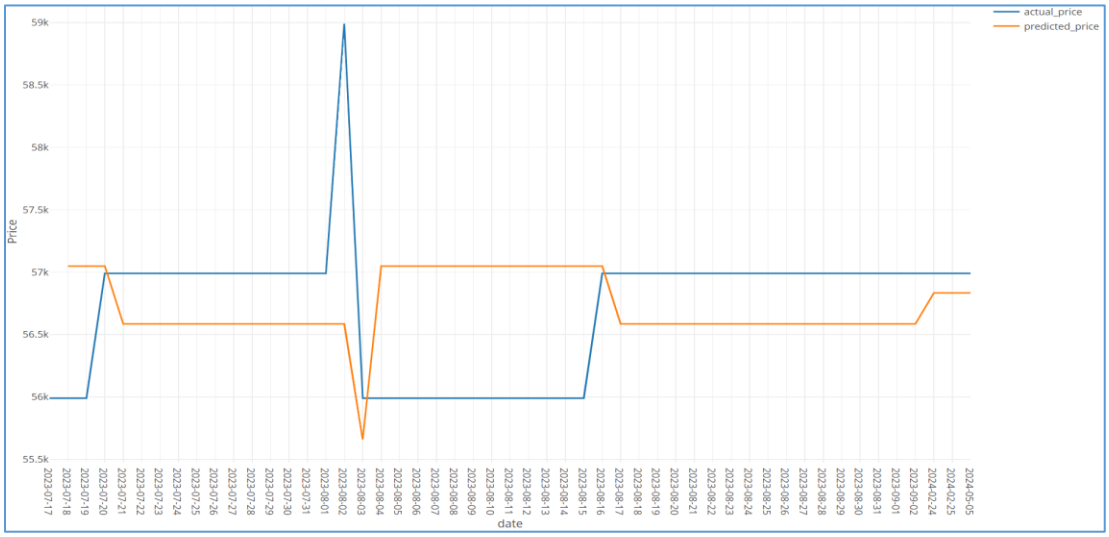


Table 1.52

Mi 139.70 cm (55 inch) Ultra HD (4K) LED Smart TV store-wise price variance

Store	#_user_feedback	min_price	max_price	price_variance
Favobliss	13	₹ 29,899.00	₹ 29,899.00	0%
JioMart	7	₹ 32,990.00	₹ 47,999.00	45%
myG	5	₹ 39,999.00	₹ 39,999.00	0%
Gadgets Now	82	₹ 41,990.00	₹ 59,999.00	43%
Amazon	24	₹ 42,999.00	₹ 69,999.00	63%
Flipkart	93	₹ 42,999.00	₹ 59,999.00	40%
Mi	93	₹ 42,999.00	₹ 59,999.00	40%
Reliance Digital	5	₹ 43,990.00	₹ 47,999.00	9%
Bidbuddy	51	₹ 44,999.00	₹ 58,990.00	31%

Addmecart	24	₹ 46,499.00	₹ 47,999.00	3%
Jmdcommunication	13	₹ 46,999.00	₹ 46,999.00	0%
buyatsunshine	24	₹ 46,999.00	₹ 46,999.00	0%
Croma	6	₹ 47,990.00	₹ 47,999.00	0%
Oxygen The Digital Expert	93	₹ 49,999.00	₹ 56,999.00	14%
BNew Mobiles & Electronics	92	₹ 59,999.00	₹ 59,999.00	0%
Vijay Sales	51	₹ 59,999.00	₹ 59,999.00	0%
Zebrs	72	₹ 59,999.00	₹ 59,999.00	0%

Figure 1.34

Mi 139.70 cm (55 inch) Ultra HD (4K) LED Smart TV Actual vs Predicted price for JioMart

Figure 1.35

Mi 139.70 cm (55 inch) Ultra HD (4K) LED Smart TV Actual vs Predicted price for Amazon

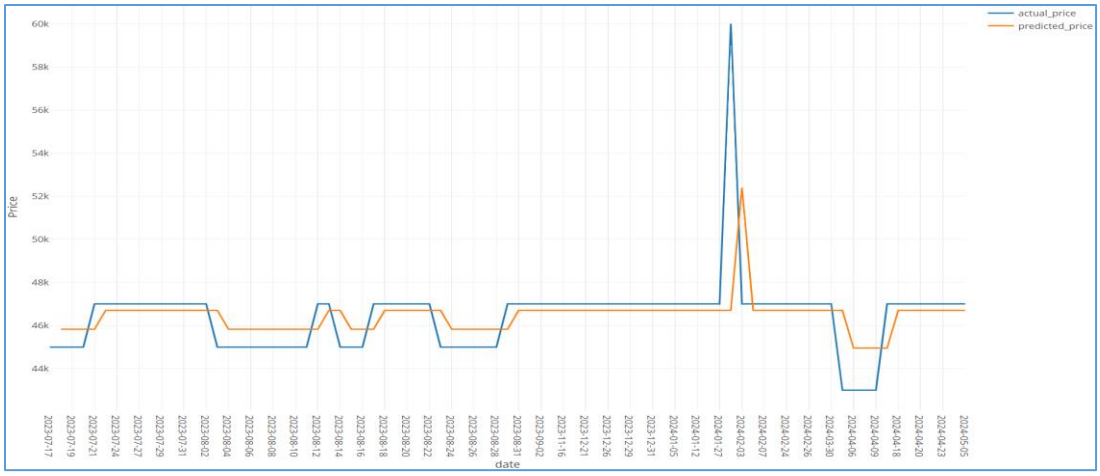


Figure 1.36

Mi 139.70 cm (55 inch) Ultra HD (4K) LED Smart TV Actual vs Predicted price for Flipkart

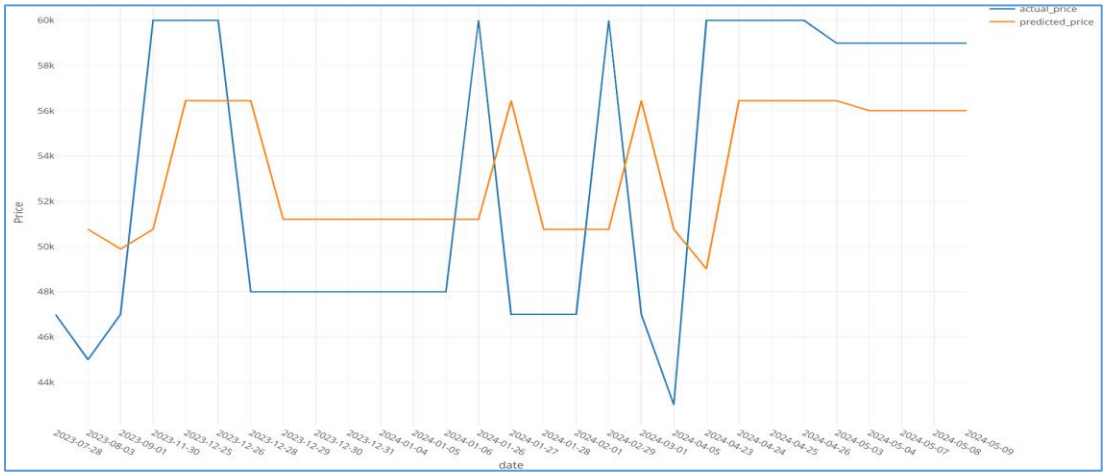


Table 1.53

Samsung 7 138 Cm 55 Inch Ultra HD 4k Led Smart Tizen TV store-wise price variance

Store	#_user_feedback	min_price	max_price	price_variance
Flipkart	101294	₹ 43,990.00	₹ 60,699.00	38%
Gostor	101294	₹ 46,990.00	₹ 46,990.00	0%
Croma	101091	₹ 47,290.00	₹ 47,290.00	0%
Reliance Digital	96236	₹ 47,290.00	₹ 56,990.00	21%
Electronic Paradise	80392	₹ 47,900.00	₹ 47,900.00	0%
Mahajan Electronics	96236	₹ 50,999.00	₹ 52,490.00	3%
Oxygen The Digital Expert	80392	₹ 51,900.00	₹ 51,900.00	0%

Lotus Electronics	96236	₹ 54,599.00	₹ 56,599.00	4%
JioMart	96236	₹ 54,990.00	₹ 56,990.00	4%
Viveks	81111	₹ 57,990.00	₹ 70,050.00	21%
Nikshan Electronics	101282	₹ 58,900.00	₹ 58,900.00	0%
EMI Snapmint	3233	₹ 59,990.00	₹ 59,990.00	0%
Samsung.com	96236	₹ 59,990.00	₹ 61,990.00	3%
sharptronics.in	29077	₹ 61,000.00	₹ 61,000.00	0%
Gadgets Now	89447	₹ 61,990.00	₹ 69,800.00	13%
Vijay Sales	101091	₹ 61,990.00	₹ 61,990.00	0%
Bidbuddy	1241	₹ 64,500.00	₹ 64,500.00	0%
JustJaldi	1241	₹ 86,900.00	₹ 86,900.00	0%

Figure 1.37

Samsung 7 138 Cm 55 Inch Ultra HD 4k Led Smart Tizen TV Actual vs Predicted price for Flipkart

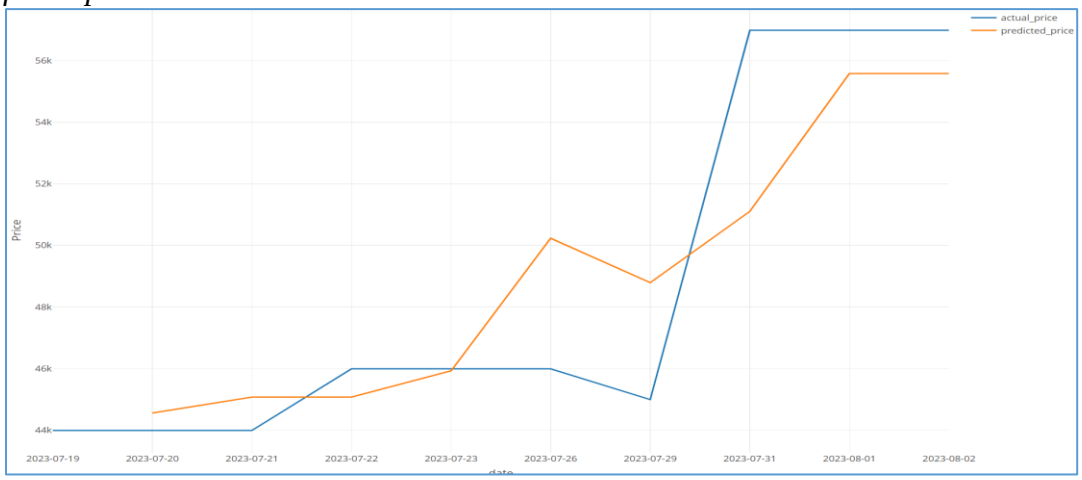


Figure 1.38

Samsung 7 138 Cm 55 Inch Ultra HD 4k Led Smart Tizen TV Actual vs Predicted price for Reliance Digital

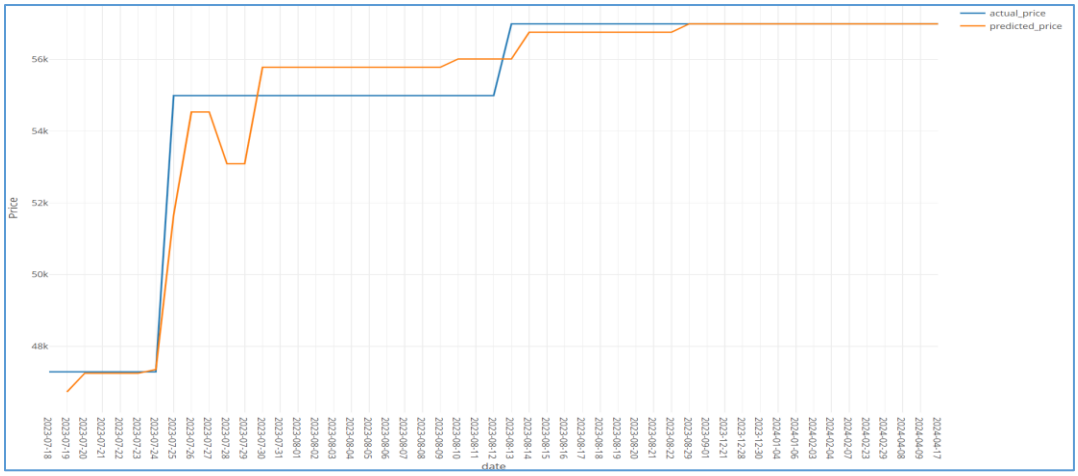


Table 1.54

Sony Bravia 139 cm (55 inches) 4K Ultra HD Smart LED Google TV store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Unilet Stores	3704	₹ 61,100.00	₹ 73,031.00	20%
Amazon	3469	₹ 73,990.00	₹ 74,690.00	1%
Bajaj Mall	3704	₹ 74,690.00	₹ 74,690.00	0%
Fast EMI	3704	₹ 74,690.00	₹ 74,690.00	0%
Reliance Digital	3968	₹ 74,690.00	₹ 78,849.00	6%
Vijay Sales	3401	₹ 74,690.00	₹ 74,690.00	0%
Viveks	3968	₹ 74,691.00	₹ 74,691.00	0%
OhLocal	3704	₹ 77,410.00	₹ 77,410.00	0%
Rishis Retail	4251	₹ 78,725.00	₹ 78,725.00	0%
Khosla Electronics	3704	₹ 78,740.00	₹ 78,740.00	0%
JioMart	3968	₹ 78,849.00	₹ 89,990.00	14%
Sahu Agencies	3704	₹ 80,740.00	₹ 80,740.00	0%
Lulu hypermarket	3577	₹ 84,990.00	₹ 1,29,900.00	53%
Gadgets Now	3968	₹ 85,490.00	₹ 85,490.00	0%
Flipkart	3469	₹ 85,999.00	₹ 94,990.00	10%
Industry Buying	3704	₹ 88,800.00	₹ 88,800.00	0%

Figure 1.39

Sony Bravia 139 cm (55 inches) 4K Ultra HD Smart LED Google TV Actual vs Predicted price for Lulu Hypermarket

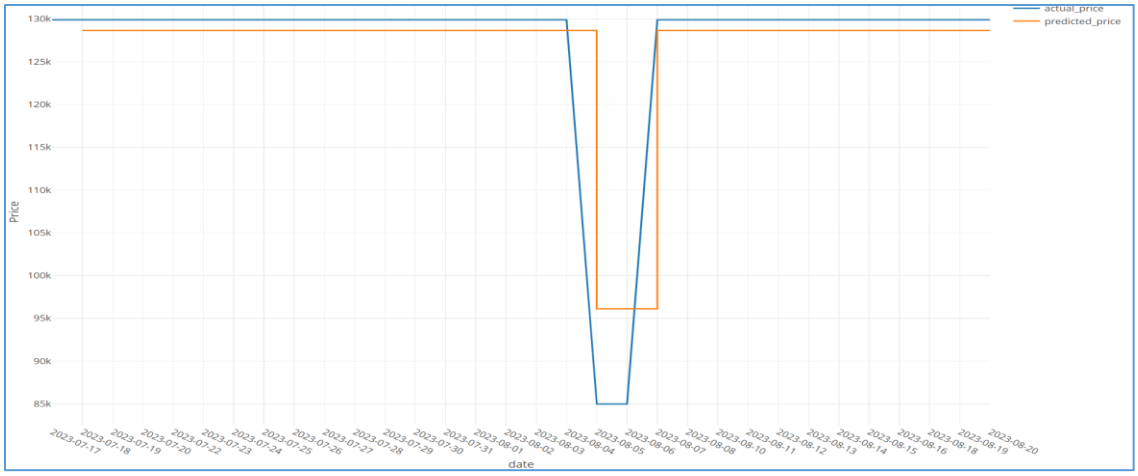


Figure 1.40

Sony Bravia 139 cm (55 inches) 4K Ultra HD Smart LED Google TV Actual vs Predicted price for JioMart

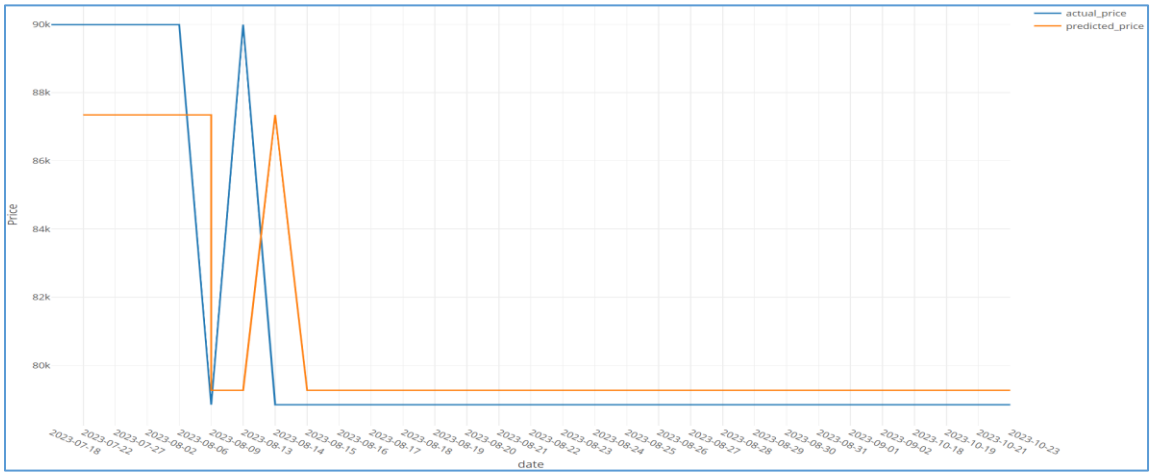


Table 1.55

HP Pavilion 14-ek0078TU x360 Intel Core i5 12th Gen laptop store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Amazon	879	₹ 68,990.00	₹ 75,070.00	9%
Flipkart	879	₹ 69,980.00	₹ 73,500.00	5%
Reliance Digital	991	₹ 71,999.00	₹ 73,499.00	2%
Vijay Sales	832	₹ 73,469.00	₹ 73,469.00	0%
HP Store India	991	₹ 76,999.00	₹ 76,999.00	0%

Figure 1.41

HP Pavilion 14-ek0078TU x360 Intel Core i5 12th Gen laptop Actual vs Predicted price for Amazon

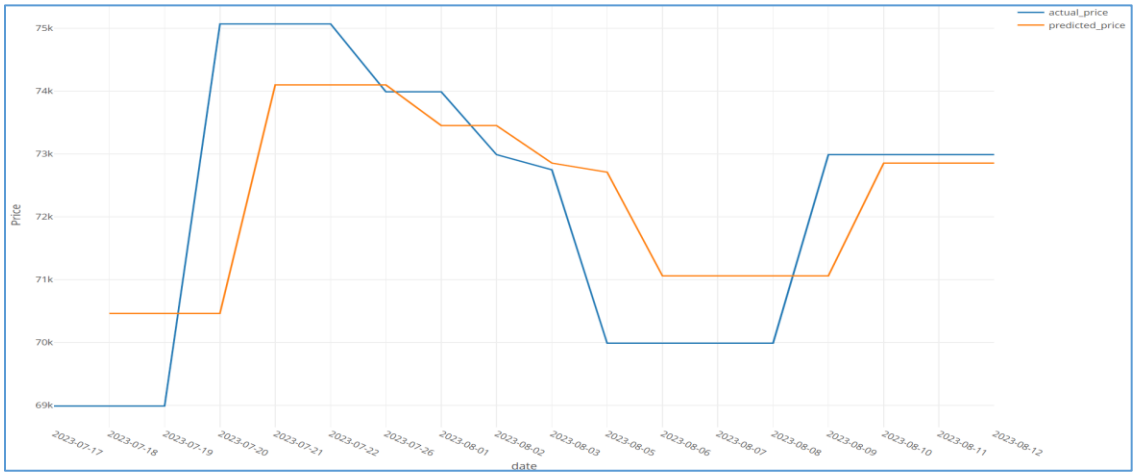


Figure 1.42

HP Pavilion 14-ek0078TU x360 Intel Core i5 12th Gen laptop Actual vs Predicted price for Amazon

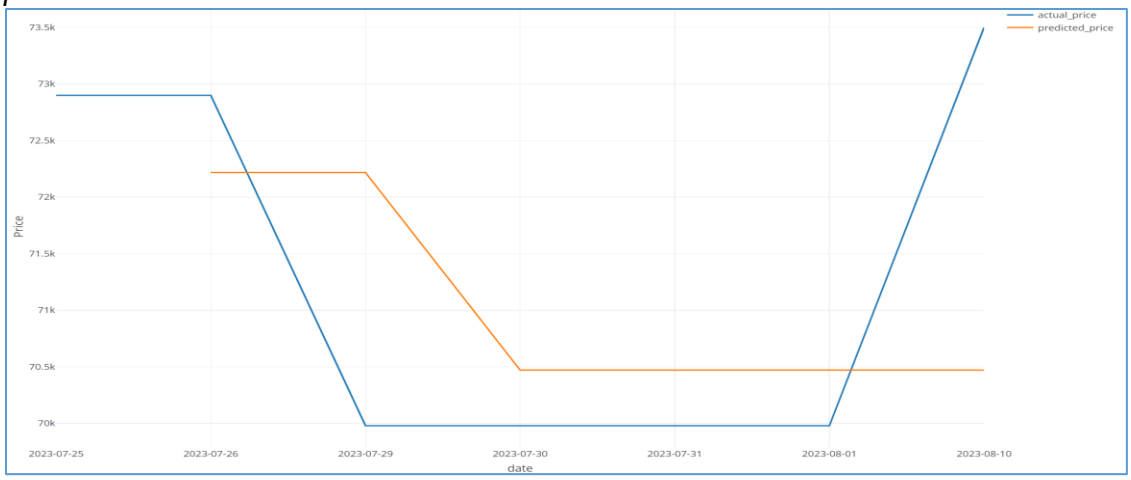


Table 1.56

Lenovo IdeaPad Flex 5 Intel Core I3 Laptop store-wise price variance

store	#_user_feedback	min_price	max_price	price_variance
Reliance Digital	432	₹ 53,989.00	₹ 56,990.00	6%
Oxygen The Digital Expert	151	₹ 54,252.00	₹ 54,252.00	0%
JioMart	151	₹ 54,634.00	₹ 56,990.00	4%
Lenovo	151	₹ 54,890.00	₹ 54,890.00	0%
Amazon.in	432	₹ 55,900.00	₹ 55,900.00	0%

Flipkart	432	₹ 57,222.00	₹ 58,970.00	3%
Gadgets Now	333	₹ 58,990.00	₹ 58,990.00	0%
Ampro , The Laptop Store	834	₹ 61,600.00	₹ 61,600.00	0%

Figure 1.43

Lenovo IdeaPad Flex 5 Intel Core I3 Laptop Actual vs Predicted price for Reliance Digital

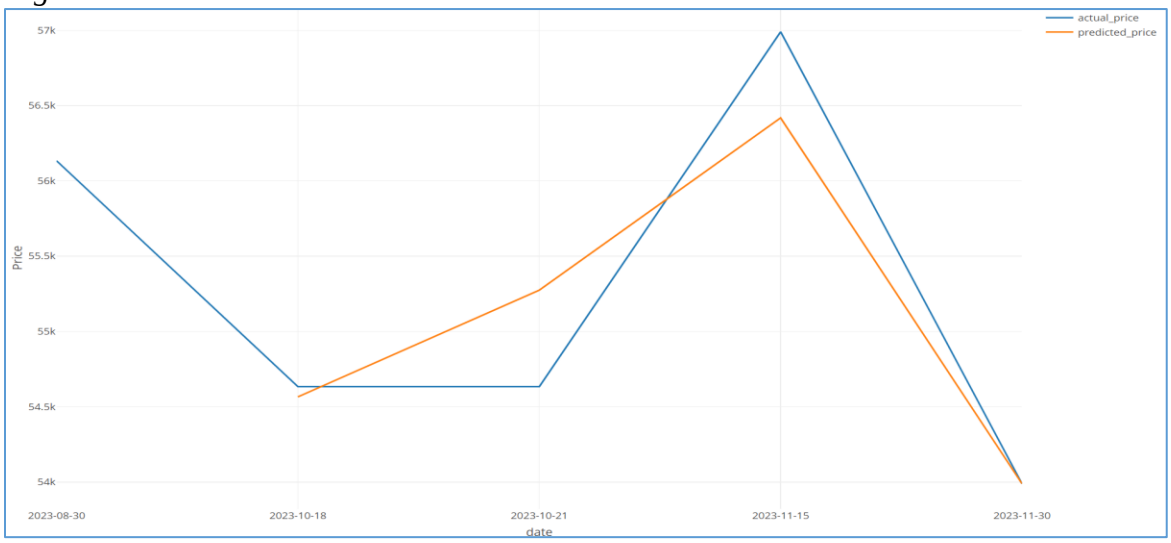


Table 1.57

percentage of stores displaying price variance for different products

Model	percent_of_stores_showing_variance
24 Mantra Organic Chana Dal (1 KG)	36
Amul Salted Butter (100 g)	24
Apple iPhone 13 (128 GB/Blue) New	62
Apple iPhone 13 (128 GB/Blue) Old	29
Apple iPhone 13 (128 GB/Pink) New	38
Apple iPhone 13 256 GB Blue New	50
Apple iPhone 13 Pro 512 GB Graphite New	40
Daawat Rozana super Basmati rice (5 KG)	40
Fortune Biryani Special Basmati Rice (5 KG)	25
HP Pavilion 14-ek0078TU x360 Intel Core i5 12th Gen laptop	60
Infinix Hot 10S Heart of Ocean (4 GB/64 GB/New)	20
Infinix Hot 10S Heart of Ocean (4 GB/64 GB/Used)	100
Infinix Hot 30i Black (8 GB/128 GB/New)	17

Infinix Hot 30i Blue (8 GB/128 GB/New)	38
LG 139 cm (55 inches) 4K Ultra HD Smart NanoCell TV	100
Lenovo IdeaPad Flex 5 Intel Core I3 Laptop	38
Mi 139.70 cm (55 inch) Ultra HD (4K) LED Smart TV	59
Milky Mist Salted Butter (100 g)	56
Motorola Moto G82 Meteorite Gray (6 GB/128 GB/New)	25
Motorola Moto G82 White Lily (8 GB/128 GB/New)	38
Nokia C32 Beach Pink (4 GB/128 GB/New)	23
Nokia C32 Breezy Mint (4 GB/128 GB /New)	64
OPPO F23 Bold Gold (8 GB/256 GB /New)	42
OPPO F23 Cool Black (8 GB/256 GB /New)	33
OPPO Find N2 Flip Astral Black (8 GB/256 GB /New)	31
OPPO Find N2 Flip Astral Black (8 GB/256 GB /Used)	67
OPPO Find N2 Flip Moonlit Purple (8 GB/256 GB /New)	13
OPPO Find N2 Flip Moonlit Purple (8 GB/256 GB /Used)	20
OnePlus 10 Pro Volcanic Black (128 GB/8 GB /New)	55
OnePlus 10 Pro Volcanic Black (128 GB/8 GB/Used)	50
POCO X5 Pro Astral Black (8 GB/256 GB /New)	75
Samsung 7 138 Cm 55 Inch Ultra HD 4k Led Smart Tizen TV	44
Samsung Galaxy F12 Celestial Black (128 GB/4 GB /New)	20
Samsung Galaxy F12 Celestial Black (128 GB/4 GB /Used)	100
Samsung Galaxy F12 Celestial Black (64 GB/4 GB /New)	33
Samsung Galaxy S23 Ultra 5G Black (256 GB/12GB/New)	44
Samsung Galaxy S23 Ultra 5G Black (256 GB/12GB/Used)	67
Samsung Galaxy S23 Ultra 5G Black (512 GB/12GB/New)	10
Samsung Galaxy S23 Ultra 5G Green (256 GB/12GB/New)	20
Samsung Galaxy S23 Ultra 5G Green (256 GB/12GB/Used)	67

Samsung Galaxy S23 Ultra 5G Green (512 GB/12GB/New)	15
Samsung Galaxy S23 Ultra 5G Green (512 GB/12GB/Used)	100
Samsung Galaxy Z Fold 4 5G Beige (256 GB/12 GB /New)	46
Samsung Galaxy Z Fold 4 5G Beige (256 GB/12 GB/Used)	67
Sony Bravia 139 cm (55 inches) 4K Ultra HD Smart LED Google TV	38
Vim Fresh Lemon Dishwash Bar (200 g)	100
Xiaomi 12 Pro Blue (256 GB/12 GB /New)	43
Xiaomi 12 Pro Blue (256 GB/12 GB /Used)	33
vivo Y16 Gold (128 GB/4 GB/New)	37
vivo Y16 Gold (128 GB/4 GB/Used)	100