ECONOMICS FOR DECISION-MAKING

PRACTICAL REPORT

Submitted by

SRIHARAN T

Reg. No. 23MST033

Under the Guidance of

Dr. A. AMUTHA M.A., M.Phil., Ph.D.

Assistant Professor

POST GRADUATE AND RESEARCH DEPARTMENT OF ECONOMICS

PSG COLLEGE OF ARTS & SCIENCE

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Coimbatore-641 014

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I. FIRM-SPECIFIC ANALYSIS OF PROFIT

PROFIT MAXIMIZATION

Profit maximization is the process by which a firm determines the price and output level that returns the greatest profit. This concept is fundamental to both microeconomics and business operations. It assumes that firms will seek to operate in a way that increases their financial returns, subject to various constraints.

KEY CONCEPTS IN PROFIT MAXIMIZATION

Revenue: Total income generated from selling goods or services. It is calculated by multiplying the price (P) by the quantity sold (Q):

$$\boldsymbol{Revenue = P * Q}$$

Costs: The total expenses incurred in producing goods or services. This includes:

- Fixed Costs (FC): Costs that do not change with the level of output (e.g., rent, salaries).
- Variable Costs (VC): Costs that vary directly with the production level (e.g., raw materials, labor).
- Total Cost (TC): The sum of fixed and variable costs:

$$\boldsymbol{TC = FC + VC}$$

Profit: The difference between total revenue and total cost. The firm's objective is to maximize this value:

$$\boldsymbol{Profit = Revenue - total\ cost}$$

Marginal Revenue (MR): The additional revenue generated by selling one more unit of output. It is the derivative of total revenue concerning quantity (Q):

$$\boldsymbol{MR = \frac{d(Revenue)}{dQ}}$$

Marginal Cost (MC): The additional cost of producing one more unit of output. It is the derivative of total cost concerning quantity:

$$\boldsymbol{MC = \frac{d(Total\ Cost)}{dQ}}$$

Profit Maximization Rule

To maximize profit, a firm needs to produce the quantity of output where marginal revenue equals marginal cost (MR = MC). This condition is critical because:

- If MR > MC: Producing additional units increases profit.
- If MR < MC: Producing additional units reduces profit.
- When MR = MC: The firm achieves the maximum possible profit.

SHORT-RUN VS LONG-RUN PROFIT MAXIMIZATION

- *Short-Run:* In the short run, some inputs (like capital) are fixed. Firms will maximize profit by adjusting output based on current capacity constraints. The short-run supply curve is derived from the marginal cost curve above the average variable cost.
- *Long-Run*: In the long run, all inputs can be varied. Firms can enter or exit the market, and they will continue to adjust production until profits are maximized at the most efficient scale of operation. In the long run, economic profit (supernormal profit) typically disappears as new firms enter the market, driving down prices.

GRAPHICAL REPRESENTATION

In a standard graph:

- The MC curve is U-shaped, reflecting increasing then decreasing marginal costs.
- The MR curve typically slopes downwards due to diminishing marginal returns or market power.
- The profit-maximizing output is found at the point where the MC curve intersects the MR curve. If the price is above the average total cost (ATC), the firm earns a profit; otherwise, it incurs a loss.

MARKET STRUCTURES AND PROFIT MAXIMIZATION

- *Perfect Competition*: Firms are price takers, meaning they accept the market price. In this case, profit maximization occurs where the price equals marginal cost (P = MC).
- *Monopoly:* A monopolist controls the market and sets prices. Profit maximization occurs where MR = MC, but the monopolist will charge a price higher than marginal cost, resulting in supernormal profits.
- *Monopolistic Competition*: Firms differentiate their products and have some price-setting power. In the long run, profits tend to be zero due to the entry of new competitors.
- *Oligopoly:* Firms in an oligopoly consider the reactions of competitors when setting output and prices, leading to strategic decision-making that can impact profit maximization.

LIMITATIONS OF PROFIT MAXIMIZATION

Market Power: Firms with market power can set prices above marginal costs, but this may lead to regulatory scrutiny or ethical concerns.

Externalities: Profit maximization might ignore social costs, leading to negative externalities like pollution.

Information Asymmetry: Profit maximization assumes perfect information, which is often not the case in real markets.

Stakeholder Considerations: In modern businesses, maximizing shareholder value may conflict with other goals, such as corporate social responsibility.

FIRM OUTLOOK

Lakshmi Machine Works Limited, a leading Textile Machinery Manufacturer in India and one of the three in the world to produce the entire range of Spinning Machinery. In 1962, LMW was founded to provide Indian textile mills with the latest Spinning Technology. It caters to the domestic market as well as exports products to the Asian and Oceanic regions diversified into CNC Machine Tools and is a brand leader in manufacturing customized products. LMW Foundry makes Precision Castings for industries the world over. LMW has added the Advanced Technology Centre to manufacture components for the Aerospace Industry.

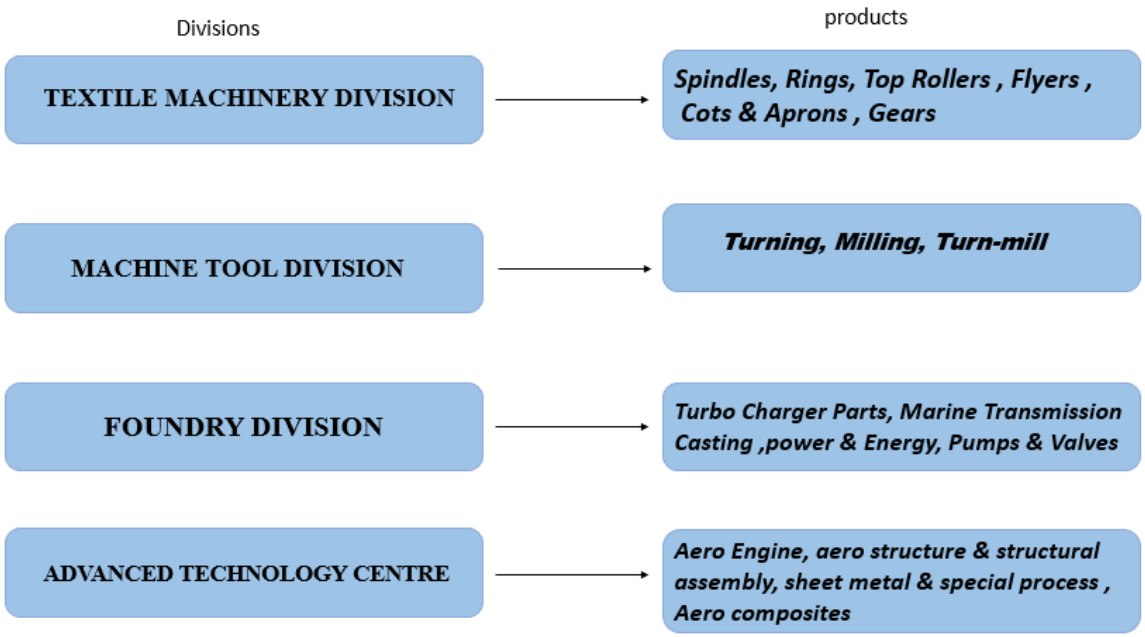
- ***Founded**:* 1962
- ***Headquarters**:* Coimbatore, Tamil Nadu, India
- ***Industry**:* Textile Machinery Manufacturing, CNC Machine Tools, and Foundry
- ***Parent Group***: Lakshmi Group
- ***Primary Products***: Spinning machinery (for yarn production), CNC machine tools, and castings
- ***Key Markets**:* India and international markets (over 70 countries)

"To enhance customer satisfaction and our image globally and achieve exponential growth to leadership through world class products and service."

"To deliver greater value to our customers by providing complete competitive solutions through technological leadership and manufacturing excellence that are responsive to dynamic market needs."

CORE AREAS OF OPERATION:

- ***Textile Machinery**:* LMW is the largest producer of spinning machinery in India and a major exporter worldwide. It manufactures machines used in various stages of yarn production, from ginning to spinning.
- ***CNC Machine Tools***: LMW diversified into CNC machining solutions, producing high-precision machines in industries like aerospace, automotive, and engineering.
- ***Foundry Division**:* The company also has a foundry division, catering to the needs of various engineering industries by producing quality castings.



GROWTH STATUS:

- ***Market Leadership in Textile Machinery***: LMW has retained its position as a market leader in India's textile machinery sector and is a dominant player globally. The company's focus on technological advancements and energy-efficient machinery has given it an edge over competitors.
- ***Diversification into CNC and Engineering***: In response to growing global demand for precision engineering, LMW expanded into the CNC machining sector. This has helped diversify its revenue streams and reduce dependence on the textile industry alone.
- ***R&D and Innovation****:* A significant part of LMW's success has been driven by its focus on research and development. The company invests heavily in innovation, developing next-generation machinery with automation, digital integration, and energy-saving features, which align with global trends towards sustainability and Industry 4.0.
- ***Global Expansion****:* LMW has successfully expanded its international presence by exporting textile machinery to over 70 countries. It has established itself as a key supplier to emerging markets as well as developed nations, which has bolstered its global footprint.
- ***Post-COVID Recovery****:* The textile machinery industry faced disruptions during the COVID-19 pandemic, but LMW's diversified portfolio helped it navigate the challenging times. As global demand for textiles rebounded post-pandemic, LMW benefited from increased demand for spinning machinery.
- ***Sustainability Focus****:* With a growing emphasis on sustainable and eco-friendly production processes in the textile industry, LMW has been developing energy-efficient machinery that meets global sustainability standards. This positioning has made it attractive to manufacturers looking to reduce their environmental impact.

- ***Financial Growth**:* LMW has shown steady financial growth in recent years, despite global challenges such as the pandemic. As of its latest financial reports, the company continues to generate healthy profits, with rising demand for its machines in domestic and international markets.

FINANCIAL GROWTH

Lakshmi Machine Works Limited reported earnings results for the fourth quarter ended March 31, 2024. For the fourth quarter, the company reported sales were INR 9,706.5 million compared to INR 13,030.4 million a year ago. Revenue was INR 10,108.5 million compared to INR 13,509.1 million a year ago. Net income was INR 659.8 million compared to INR 941.1 million a year ago. Basic earnings per share from continuing operations was INR 61.76 compared to INR 88.09 a year ago. Diluted earnings per share from continuing operations was INR 61.76 compared to INR 88.09 a year ago.

II. STATISTICAL METHOD FOR TREND ANALYSIS

METHODOLOGY

Forecasting is the process of predicting or estimating future values based on historical data and analysis of trends. It involves using statistical techniques and models to project future outcomes in areas such as economics, finance, weather, demand, and more.

Types of Forecasting:

- ***Qualitative Forecasting***: Based on expert judgment, intuition, or experience, used when data is limited (e.g., new products). Examples: Delphi method, market research, and expert panels.

- ***Quantitative Forecasting:*** Relies on historical data and statistical models. This approach assumes patterns from the past will continue in the future.

    a. *Time Series Models:* Use patterns in historical data (trends, seasonality, etc.) to predict future values. Examples: Moving averages, exponential smoothing, ARIMA.

    b. *Causal Models*: Assume the variable to be forecasted is dependent on other variables (e.g., sales based on marketing spend or economic indicators). Example: Linear regression.

Make predictions: Use the fitted model to forecast future values. In linear trend analysis, the forecast for time $t+k$ (future period) is given by:

$$\hat{Y}_{t+k} = \beta_0 + \beta_1(t + k)$$

The *Forecast Sheet* feature in Excel allows you to create future projections based on historical data, incorporating trends and seasonality automatically. Below is the step-by-step methodology used to generate the forecasting total revenue for the next 10 years in LMW:

Data Preparation:

- Input historical data with two columns: **Dates** (e.g., years) and **Values** (e.g., total revenue).
- Ensure data is consistent and recorded at regular intervals.

Create Forecast Sheet:

- Select the data range (both columns).
- Go to the **Data** tab and click on **Forecast Sheet**.
- Choose a **Line Chart** or **Column Chart**.

Adjust Forecast Options:

- Set the **Forecast End Date** (e.g., 2034).
- Choose a **Confidence Interval** (e.g., 95%).
- Specify **Seasonality** if needed.

Analyse the Results:

- Review the generated table with historical and forecasted values.
- Interpret the trend line and confidence intervals on the chart.

Fine-Tuning:

- Adjust data range, confidence intervals, or seasonality settings as necessary.

Finalize:

- Click **Create** to generate the forecast sheet.
- Use the forecasted data for further analysis or planning.

ANALYSIS

Using the firm historical data from the relevant website, the total revenue was forecasted for the next 10 years and the linear trend is identified for the study in the EXCEL forecast sheet.

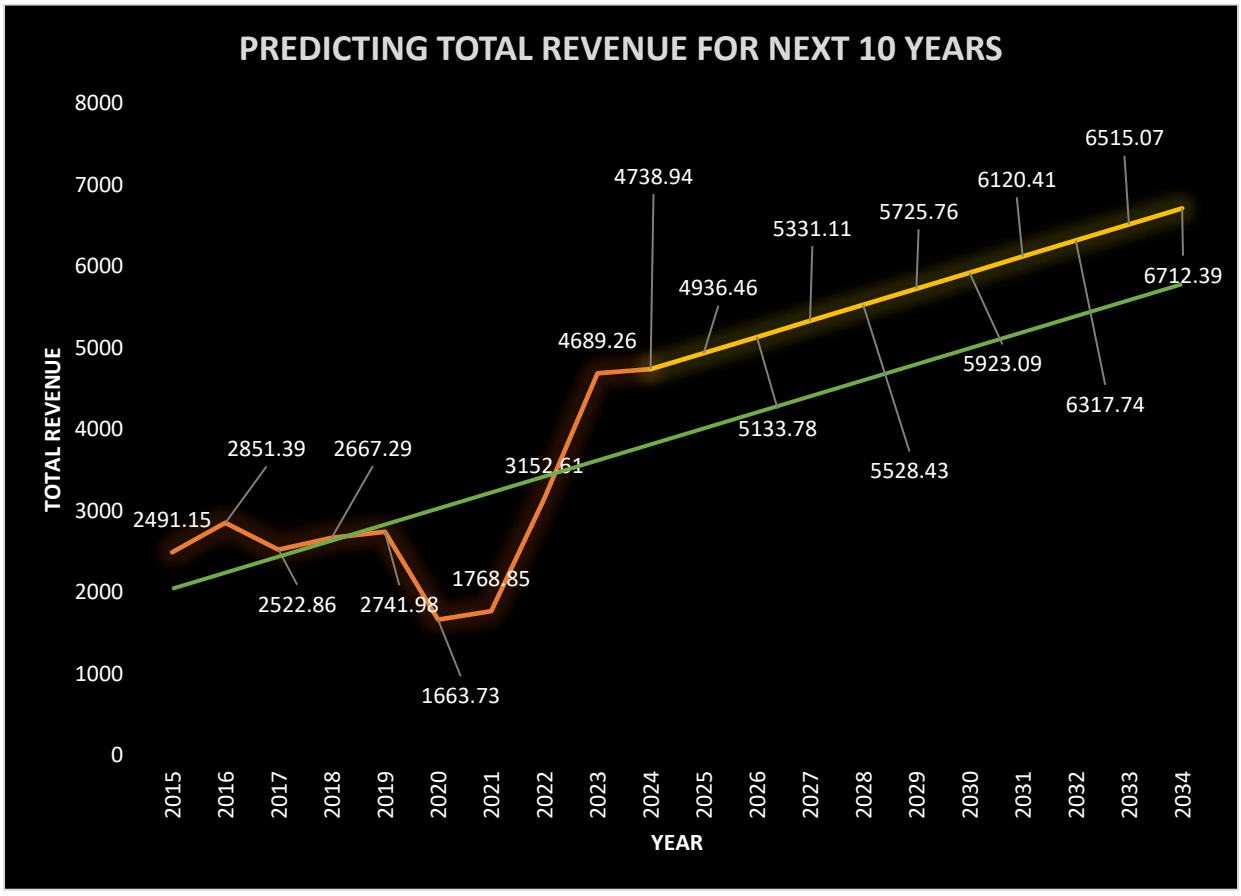


Figure 1: Forecasting using linear trend

INTERPRETATION

Figure 1, provided shows a revenue forecast for the next 10 years, from 2024 to 2034, based on past data from 2015 to 2023. Here's an interpretation of the key points:

1. **Revenue Trend (2015-2023)**:
    - From 2015 to 2023, the revenue fluctuated and experienced a significant dip, with a low point in 2020 at around 1663.73. This drop could indicate an economic challenge, such as the pandemic.
    - After 2020, the revenue begins to recover sharply, rising to 3152.61 in 2023, which may signify a period of recovery or strategic business changes.
2. **Revenue Forecast (2024-2034)**:
    - The forecasted revenue shows consistent growth, reaching 6712.39 by 2034.
    - The predicted trend (in yellow) suggests steady growth, following the recovery from the earlier dip.
    - The green line represents a linear trend, showing a gradual and steady increase in revenue. However, the forecast (orange-yellow line) indicates more aggressive growth in the short term before levelling out.
3. **Key Years of Growth**:
    - Significant jumps are observed in 2024 and 2025, where the revenue surges past 4000 and then 5000, respectively.
    - After 2027, the growth stabilizes but continues at a moderate pace.

The Total revenue, after a turbulent period, is forecasted to grow steadily over the next 10 years, suggesting positive future business performance.

III. PRICING METHOD OF A FIRM – TESLA

INTRODUCTION

A pricing strategy is an approach taken by businesses to decide how much to charge for their goods and services. The interaction between margin, price, and selling level is given specific consideration while pricing products. Therefore, it's important and complicated to design a proper pricing plan that ensures business success.

Two common types of pricing methods are **price skimming** and **price penetration**. **Price skimming** involves setting a high initial price for a new or innovative product to maximize profit from early adopters before gradually lowering the price to attract a broader audience. On the other hand, **price penetration** sets a low initial price to quickly capture market share, attract price-sensitive customers, and deter potential competitors from entering the market.

ANALYSIS OF TESLA'S PRICE SKIMMING STRATEGY

1. Tesla's Use of Price Skimming

Tesla's strategy revolves around launching its new, innovative products (vehicles) at high prices, targeting affluent early adopters. Over time, as production scales and competition intensify, Tesla lowers the prices or introduces more affordable models.

Key Aspects of Tesla's Price Skimming Strategy:

- High Initial Prices for Premium Models:
    - When Tesla introduces new models like the Model S or Model X, it targets a luxury segment, offering advanced technology, longer range, and superior performance, often with premium pricing.
    - These prices allow Tesla to capture maximum value from early adopters who are willing to pay a premium for innovation, status, and brand exclusivity.
- Gradual Introduction of Lower-Priced Models:

- Once the luxury segment is saturated, Tesla introduces more affordable versions of its vehicles, like the Model 3 and Model Y, which are aimed at a broader, more price-sensitive consumer base.
- By doing this, Tesla “skims” the market, first targeting high-end customers, then lowering the price to attract the mass market.

- Example: The Tesla Model S, introduced in 2012, had a starting price above $70,000. It targeted wealthier consumers interested in the latest electric vehicle technology. Years later, Tesla launched the Model 3 at around $35,000, significantly lower, to appeal to a wider audience. This was a textbook example of price skimming, as Tesla moved from a high-end to a more accessible price range.

2. Conditions That Made Price Skimming Effective for Tesla

Innovation Leadership and Unique Products:

- Tesla was able to charge high prices initially because it offered something truly unique: electric vehicles with a much longer range, superior technology, and performance compared to competitors.
- Tesla's strong brand image and association with innovation allowed it to set a higher price point without deterring early adopters.

Lack of Immediate Competition:

- When Tesla first entered the market, it faced relatively little competition in the high-performance, long-range electric vehicle space. This allowed Tesla to capitalize on its first-mover advantage and set premium prices without the pressure of immediate price competition.
- Over time, as more automakers introduced electric models, Tesla gradually reduced prices to maintain its market share.

Recouping Development Costs:

- Electric vehicle technology, including battery development, infrastructure, and software integration, required significant research and development (R&D) investments. Price skimming helped Tesla recover these initial costs by charging higher prices to early buyers.
- As the technology matured and production became more cost-effective, Tesla could afford to lower prices while still maintaining profitability.

3. Evidence of Tesla’s Price Skimming in Action

Initial Premium Pricing:

- Tesla's Model S was initially priced at a luxury level, making it inaccessible to mass-market buyers. Only affluent customers or early adopters with a strong interest in environmental sustainability and innovation could afford these vehicles.

Gradual Price Reductions:

- Over time, Tesla has made efforts to reduce prices through innovations in manufacturing (e.g., its Giga factories producing batteries at scale), leading to more affordable models.
- Tesla has also reduced the price of the Model 3 in several markets to increase accessibility and compete with new entrants in the EV market. By lowering the price of its earlier models, Tesla continues to target more price-sensitive consumers.

Higher Margins at Introduction, Lower Margins with Mass Adoption:

- Tesla achieved higher margins in the initial phase of each model's launch. As production scaled and the price was reduced, the company focused more on volume sales rather than maintaining the initial high profit margins, benefiting from economies of scale.

4. How Price Skimming Helped Tesla Dominate the EV Market

Tesla's price skimming strategy allowed it to:

- Capture High Margins: By targeting affluent consumers first, Tesla maximized profitability in the early stages of each model launch.
- Build Brand Loyalty: Early adopters of Tesla's high-end models became brand ambassadors, helping Tesla establish a strong, premium image.
- Fuel Innovation: The high prices Tesla charged at the start of each vehicle's lifecycle funded further R&D, allowing the company to maintain its technological edge.
- Expand Market Share: By gradually lowering prices, Tesla opened its product line to more mainstream consumers, expanding its market share while still retaining its innovative image.

5. Challenges of Price Skimming for Tesla

- Risk of Alienating Early Buyers: As prices drop, early buyers who paid premium prices may feel alienated if they perceive the price difference as unfair.
- Increased Competition: As more automakers enter the EV market with competitive pricing, Tesla has to balance lowering prices with maintaining its premium brand image.
- Perception of Quality: Dropping prices too much may risk lowering the perception of Tesla as a luxury brand, especially with the introduction of more affordable models.

IV. CURRENT ECONOMIC EVENTS

CURRENT ECONOMIC EVENTS IN INDIA (2024)

1. **India's Green Hydrogen Initiative Expands:**

   - In 2024, India launched a $10 billion Green Hydrogen Mission to become a global leader in hydrogen energy production. This initiative is aimed at reducing the nation's reliance on fossil fuels.
   - The plan includes the development of hydrogen production plants, with an emphasis on renewable energy sources like solar and wind power.

2. **India's GDP Growth Slows in Q2:**

   - India's GDP growth rate for the second quarter of 2024 slowed to 5.6%, driven by weaker exports and a decline in private consumption.
   - The manufacturing and services sectors showed modest growth, but inflationary pressures continued to affect consumer spending.

3. **RBI Increases Repo Rate to Tackle Inflation:**

   - In early 2024, the Reserve Bank of India (RBI) raised the repo rate by 50 basis points to 6.75% in an effort to combat rising inflation, which stood at 6.3%.
   - This hike came after a surge in food and fuel prices, putting pressure on consumer prices and slowing demand.

4. **India Surpasses UK in Auto Manufacturing:**

   - India overtook the UK in 2024 to become the third-largest automobile manufacturer globally, following China and the US, due to rising domestic demand and foreign investment.
   - Major carmakers, including Tata Motors and Mahindra, expanded their electric vehicle (EV) production capacities to meet growing demand.

5. **India's Digital Currency Pilot Program Launched:**

   - The Reserve Bank of India launched the Digital Rupee pilot program in January 2024, with trials in several major cities to explore the viability of Central Bank Digital Currency (CBDC).
   - This initiative is aimed at reducing reliance on physical cash, promoting financial inclusion, and increasing the efficiency of the financial system.

CURRENT INTERNATIONAL ECONOMIC EVENTS (2024)

1. **Global Oil Prices Surge Amid Middle East Instability:**

   - In early 2024, global oil prices spiked to $120 per barrel due to political instability and supply disruptions in the Middle East.
   - This price surge affected global economies, with inflation rates rising and major oil-importing countries like India and Japan facing increased energy costs.

2. **China's Economy Contracts Amid Real Estate Crisis:**

   - In 2024, China's GDP contracted by 1.3%, marking its first economic shrinkage in decades, due to a continued real estate sector crisis and reduced global demand for exports.
   - The Chinese government announced stimulus measures worth $300 billion to revive domestic demand and stabilize the housing market.

3. **European Union Imposes Carbon Border Tax:**

   - In April 2024, the EU implemented a Carbon Border Adjustment Mechanism (CBAM) on imports from non-EU countries with lower carbon emissions standards.
   - This measure impacted industries like steel, cement, and aluminium, encouraging trading partners to adopt greener practices to avoid higher tariffs.

4. **US Federal Reserve Holds Interest Rates Steady:**

   - The US Federal Reserve decided to maintain its benchmark interest rate at 5.5% in 2024, signalling that inflation has been contained and the economy was stabilizing after a period of rapid hikes.
   - The decision was influenced by moderating inflation, a resilient labour market, and steady growth in consumer spending.

5. **African Continental Free Trade Area (AfCFTA) Expansion:**

   - In 2024, the African Continental Free Trade Area (AFTRA) added 10 new member states, expanding the world's largest free trade zone to 46 countries.
   - The expansion is expected to boost intra-African trade and promote economic development by reducing tariffs and barriers across the continent.

V. CUSTOMER BEHAVIOR ANALYSIS AND CHURN PREDICTION IN THE TELECOM SECTOR

ABSTRACT

The telecom industry is a highly competitive space, with customer churn posing a major challenge. This study analyses customer behavior in the telecom sector using a detailed dataset. It explores key factors influencing churn and applies classification techniques to predict customer attrition. A cohort study is performed to uncover patterns in customer segments over time. The findings offer actionable insights into churn prevention and long-term customer retention strategies.

INTRODUCTION

Customer churn, the process by which customers stop using a company's services, is a critical issue for telecom operators. Since it is frequently more expensive to acquire a new customer than to keep an existing one, predicting and reducing churn is a top concern. This study uses a real-world dataset to examine customer attrition behavior in the telecom industry. It looks into the financial, service-related, and demographic elements that lead to customer attrition and creates a prediction model to find those clients most likely to quit. Cohort analysis reveals additional patterns in the behaviour of customers over time. Telecommunication companies face a significant challenge in managing customer churn, which refers to the process where customers discontinue their services and switch to a competitor. Churn can be voluntary, where the customer actively decides to leave, or involuntary, due to factors such as non-payment or service changes. The impact of customer churn is profound, as it leads to a direct loss of revenue and the costs associated with acquiring new customers often exceed the cost of retaining existing ones.

Several factors contribute to customer churn in the telecom industry:

- *Customer Satisfaction:* A major driver of churn is dissatisfaction with the service. Poor network coverage, slow internet speeds, billing issues, or unresponsive customer service can push customers to seek alternatives.
- *Competition***:** In highly competitive markets, customers have several options to choose from, including different pricing plans, better offers, or innovative features that may lure them away from their current provider.
- *Pricing and Promotions:* Many telecom companies offer promotional pricing or special deals to attract new customers. However, when these offers expire and regular pricing resumes, customers may switch to a competitor offering a better deal.
- *Service Quality and Reliability:* Inconsistent service quality, frequent call drops, or poor customer service are common reasons for customer dissatisfaction, leading to increased churn.
- *Technological Advancements:* With rapid technological advancements, customers expect their telecom providers to offer the latest features and services. If a provider lags behind in adopting new technologies or services like 5G, customers may leave for more tech-savvy competitors.

- *Contract Terms and Exit Fees:* Lengthy contracts and high exit fees may deter some customers from switching providers. However, once these contracts expire, they may be more likely to churn.

Telecom companies have employed various strategies to reduce churn, such as loyalty programs, improved customer service, and predictive analytics. By leveraging customer data, they can anticipate which customers are most likely to leave and proactively take steps to retain them. This might involve offering personalized deals, improving service quality, or addressing specific complaints. Additionally, advanced machine learning models are being increasingly used to predict churn by analysing historical customer behaviour, usage patterns, and service satisfaction levels. Reducing churn is critical for telecom providers as it not only stabilizes revenue but also fosters long-term customer relationships, which are crucial for profitability and growth in a saturated market.

TELECOM SECTOR OVERVIEW

The telecommunications industry is an essential part of modern society, providing a range of services such as voice, internet, and television. In recent years, the sector has undergone rapid transformation, driven by advancements in mobile technology, 5G networks, and the increasing demand for high-speed internet services. With the rise of smartphones and streaming platforms, consumers now demand seamless connectivity and superior service quality. The telecommunications industry is marked by rapid technological advances, competitive pricing strategies, and a diverse customer base. Customers have access to multiple service providers, resulting in high churn rates. Operators are required to offer not only competitive pricing but also superior service quality, enhanced product offerings, and better customer support to retain subscribers. This study delves into the churn phenomenon, examining key metrics that shape customer decisions in this competitive landscape.

INCIDENT

One notable historical event related to telecommunications (telco) churn is the period of intense competition during the deregulation of **the telecommunications industry in the 1990s**, especially in the United States and Europe.

In the U.S., the **Telecommunications Act of 1996** was a landmark event that led to massive changes in the telco landscape. Before the Act, the industry was largely controlled by a few major players, but the new law encouraged competition by allowing new entrants to offer local and long-distance services. This shift opened the market for many new telecommunications companies and made it easier for customers to switch service providers, leading to significant customer churn. During this period, many established telecom companies experienced high churn rates as customers sought better pricing, more innovative services, and improved customer service from newer competitors. These changes led to the development of churn management strategies, including customer retention efforts and the use of advanced analytics to predict customer behaviour and prevent defections. A similar deregulation happened in Europe, particularly after the European Telecommunications Liberalization of the late 1990s, which allowed new telecom companies to enter the market, driving competition and customer mobility.

OBEJCTIVES OF THE STUDY:

- Analyse Customer Behaviour: To study patterns in customer behaviour within the telecom sector, identifying key factors influencing customer satisfaction and service retention.
- Perform Cohort Study: To conduct a cohort study, analysing customer retention and churn patterns over different stages of the customer lifecycle.
- Data Visualisation: To visualise the relation between the variables.
- Provide Retention Strategies: To recommend actionable strategies for telecom companies to reduce churn, such as loyalty programs, personalized offers, and long-term contract incentives.

COHORT STUDY

A cohort study is performed by dividing customers into groups based on their sign-up date and analysing their behaviour over time. This approach helps in understanding the retention patterns and the likelihood of churn at different stages of the customer lifecycle. Key insights include:

Early Churners: Customers who churn within the first few months often cite dissatisfaction with services or find better deals with competitors.

Long-Term Customers: Customers with higher lifetime value (CLTV) are less likely to churn, often tied to longer contracts and bundled services.

Contract Analysis: Month-to-month contracts have the highest churn rate, indicating that customers on flexible plans are more likely to switch providers.

DATA SET EXPLANATION

The Telco customer churn data contains information about a fictional telco company that provided home phone and Internet services to 7043 customers in California. The dataset contains 33 columns and over 7,000 customer records, with features capturing demographic, service-related, and financial details. Noteworthy variables include Customer, Monthly Charges, Total Charges, Churn Label, Churn Reason, Contract Type, and Churn Score. This comprehensive dataset enables us to explore various dimensions of customer behaviour and churn.

DATA VISUALIZATION

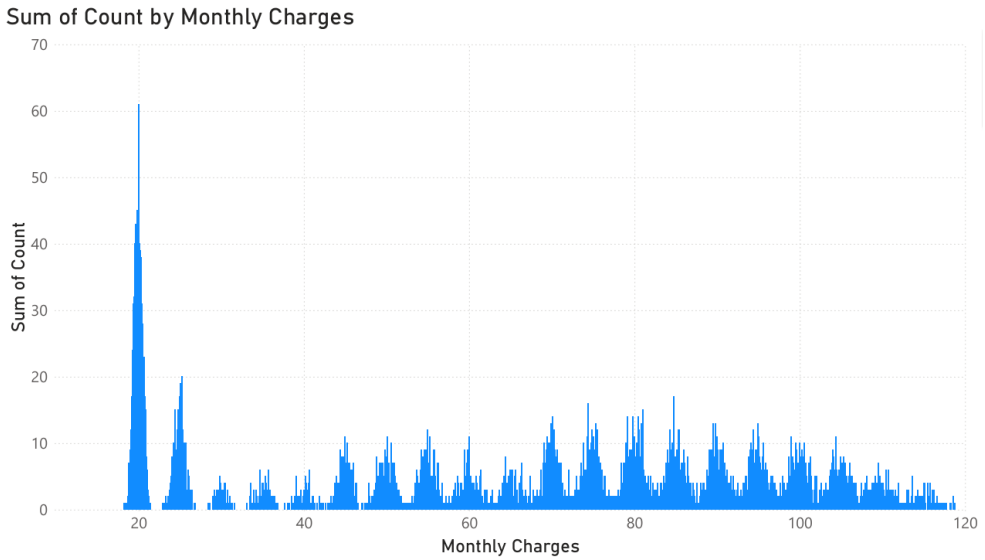


Figure 1: The Distribution of Customer Counts Across Different Monthly Charge Ranges.

Figure 1 illustrates that a large number of telecom customers are concentrated around the $20 monthly charge, suggesting a significant portion of users subscribe to low-cost or basic plans. Beyond this, there is a more evenly spread distribution of customers paying between $40 and $100 per month, with multiple smaller peaks, indicating popular price points for mid- and high-tier plans. The number of customers paying over $100 gradually declines, reflecting fewer subscribers on premium plans. This distribution suggests that low-cost customers might be more sensitive to price changes, potentially affecting churn rates in this segment.

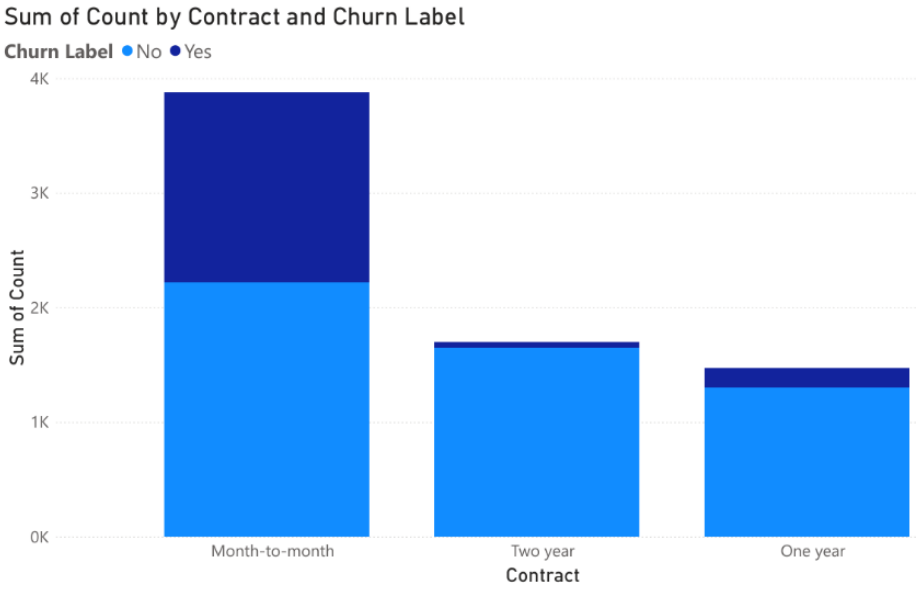


Figure 2: The Number of Customers with Different Contract Types (Month-To-Month, Two-Year, One-Year) And Whether They Churned or Not.

Figure 2, shows the relationship between contract types and customer churn, revealing that churn is highest among customers with month-to-month contracts, where a significant portion of the light blue section represents those who left the service. In contrast, churn is much lower for customers with one-year and two-year contracts, indicated by the smaller light blue sections. This suggests that longer-term contracts are associated with higher customer retention, while the flexibility of month-to-month contracts increases the likelihood of churn. Encouraging customers to commit to longer contracts may help reduce churn rates.

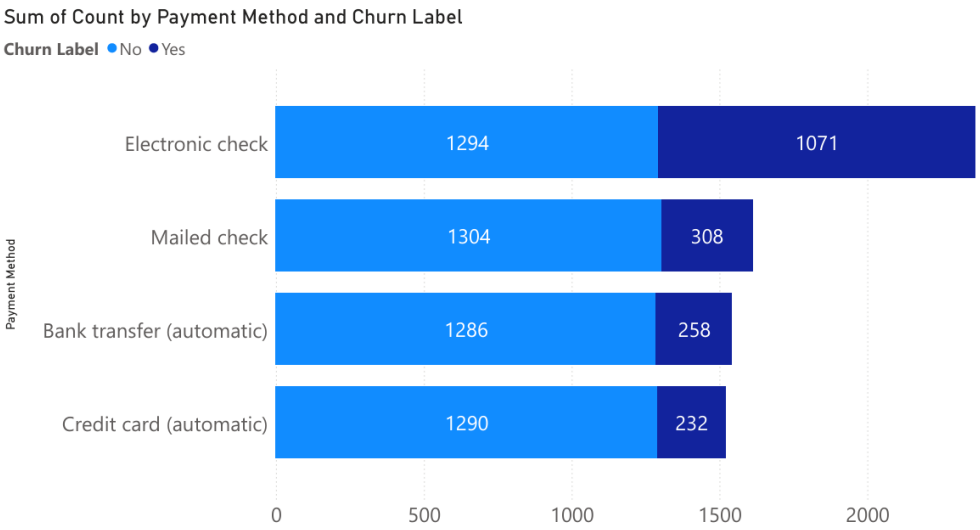


Figure 3: The Churn Rate Based on Different Payment Methods

Figure3, highlights the relationship between payment methods and customer churn, showing that churn is highest among customers using electronic checks, with 1,071 out of 2,365 customers leaving the service. Mailed check users also have a notable churn rate, though lower than electronic check users. In contrast, customers using automatic payment methods, such as bank transfers or credit cards, show much lower churn rates, indicating better retention. This suggests that encouraging customers to use automatic payment options, particularly credit card or bank transfers, could reduce churn and improve overall customer loyalty.

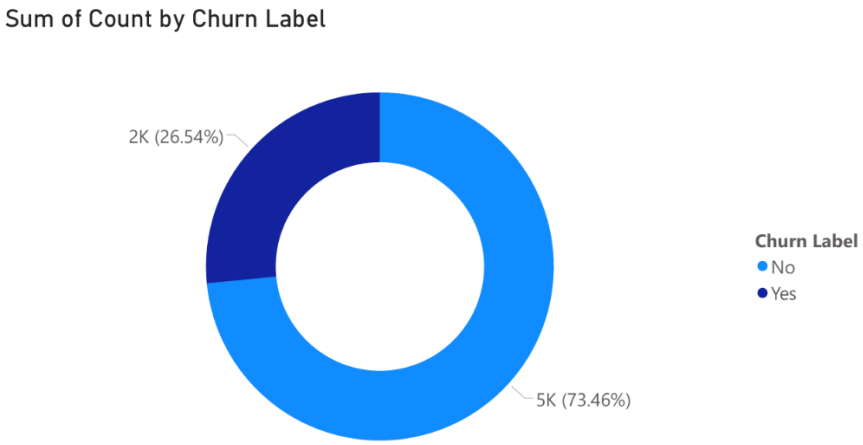


Figure 4: The Overall Churn Rate

Figure 4, illustrates the overall churn rate among customers, where 73.46% (5,000 customers) have not churned, while 26.54% (2,000 customers) have left the service. The larger light blue portion represents the customers who stayed, and the smaller dark blue section indicates those who churned. This distribution shows that while a significant majority of customers remain loyal, over a quarter of the customer base has churned, suggesting that churn is a critical issue that the company needs to address to retain a larger portion of its customer base.

INTERESTING INFERENCES

- *Impact of Contract Type:* Customers with month-to-month contracts have a churn rate of over 40%, significantly higher than those on one- or two-year contracts.
- *Churn Reasons:* The most common reasons for churn are competitors offering better devices and financial considerations such as lower prices or better package deals.
- *High-Risk Customers:* Customers with high monthly charges and electronic billing show a higher propensity to churn, potentially due to dissatisfaction with service costs.
- *Retention Strategies:* Providing bundled services (internet, phone, and TV) and offering long-term contracts with financial incentives could significantly reduce churn.

CUSTOMER BEHAVIOR ANALYSIS

The customer behaviour analysis for the Telco Customer Churn dataset provides valuable insights into factors influencing customer retention and churn. By examining key variables such as contract type, monthly charges, tenure, and service usage, we can identify patterns that differentiate churners from loyal customers. Customers with month-to-month contracts tend to exhibit higher churn rates, likely due to their flexibility to switch providers without the long-term commitment. In contrast, customers on one- or two-year contracts are more likely to remain loyal, especially during the contract period.

High monthly charges and additional services, like tech support or premium internet packages, can increase the likelihood of churn, particularly among price-sensitive customers. Tenure also plays a critical role, with newer customers showing a higher propensity to churn compared to those who have been with the company for a longer time, reflecting brand loyalty and customer satisfaction over time. Understanding these behavioural patterns enables the telecom provider to develop targeted retention strategies, such as offering promotions to high-risk customers or improving service quality to reduce churn.

STRATEGIES TO BE IMPLEMENTED TO REDUCE CHURN RATES

Incentivize Long-Term Contracts: Offer discounts or bundled packages for one- or two-year contracts to reduce churn among month-to-month customer

Personalized Discounts: Target high-risk customers with price-sensitive discounts, loyalty programs, or customized service offers.

Improve Customer Experience: Enhance customer support and offer proactive technical assistance to increase satisfaction and prevent churn.

Better Onboarding: Focus on early engagement by offering seamless setup and support to new customers, especially during the first few months.

Use Predictive Analytics: Leverage machine learning models to identify high-risk customers and provide retention offers before they leave.

Retention Offers Near Contract Expiration: Offer incentives for customers nearing contract end to encourage renewals.

Flexible Pricing Plans: Provide tiered pricing options for various customer needs and preferences.

Provide Value-Added Services: Offering bundled services, such as internet, mobile, and TV packages at a discounted rate can help reduce churn rate and increase customer satisfaction

CONCLUSION

This study underscores the importance of understanding customer behavior and leveraging data analytics for churn prediction in the telecom sector. Telecom operators can enhance customer loyalty and reduce churn rates by implementing targeted retention strategies and monitoring churn indicators.

REFERENCES:

[1] https://www.kaggle.com/datasets/abdallahwagih/telco-customer-churn/data

[2] Smith, J., & Williams, P. (2020). *Customer Churn Analysis in the Telecom Sector: Predictive Modeling Approaches*. Journal of Data Science and Telecommunications, 15(3), 45-62.

[3] Johnson, R., & Lee, A. (2019). *Reducing Customer Attrition through Predictive Analytics: A Case Study in Telecoms*. International Journal of Business Analytics, 10(2), 28-39.

[4] Thompson, K., & Patel, S. (2021). *The Impact of Service Quality on Customer Retention in the Telecom Industry*. Telecommunications Review, 24(1), 75-90.

[5] Gupta, V., & Chen, M. (2018). *Cohort Analysis and Customer Lifecycle Management in Telecommunications*. Journal of Consumer Analytics, 9(4), 102-117.

[6] Anderson, D., & Clark, N. (2020). *Leveraging Machine Learning to Predict Churn in Telecom Companies*. Journal of Artificial Intelligence in Business, 12(5), 33-47.