

Birla Institute of Technology & Science (BITS), Pilani
2nd SEMESTER 2021-22,
Time Series Analysis and Forecasting MPBA G512
Mid Semester Examination (Open Book)

Max. Time: 90 Minutes

Date: 11-03-2022

Max. Marks: 60

Q1. Introduction: An Overview of the Domestic Pharmaceutical Market

The domestic pharmaceutical market has witnessed high growth as a result of rising income levels and increasing penetration of modern medicine. As per the ORG-IMS MAT report for February 2022, the growth for the financial year 2021–2022 was 14.8%. Chronic therapies continue to grow faster than acute. The domestic pharmaceutical industry is centered on branded generics and is intensely competitive. The top 10 companies account for only 36% of the market share. Pharmaceutical industry continues to be highly fragmented with has more than 20,000 registered units. The industry expanded drastically in the last two decades. The leading 250 pharmaceutical companies control 70% of the market with the market leader holding nearly 7% of the market share. The demand for drug and pharmaceuticals is estimated to be Rs 1675 billion by 2024–2025.

Nicholas Piramal India Ltd: India's Second Largest Pharmaceutical Healthcare Company

Nicholas Piramal India Ltd is India's second largest pharmaceutical healthcare company and is a leader in the cardio-vascular segment. The company came into existence after its acquisition of Nicholas Laboratories from Sara Lee in 1988. It has a strong presence in the antibiotics and respiratory segment, pain management, neuro-psychiatry, and anti-diabetis segments. The company has also made forays into biotechnology in key therapeutic areas for which it has formed several global alliances. Nicholas Piramal India Ltd is a part of the USD 500 million Piramal Enterprises (PIL), which is one of India's largest diversified business houses

Rebranding Exercise at Nicholas Piramal

Nicholas Piramal has worked out a complex internal rebranding exercise for creating a common brand identity across its various divisions such as Wellquest (clinical trials division), Wellspring (pathlabs), and Actics. The company wants to adopt a common name and a new logo that can be easily identified by its clients across businesses. Discussing this exercise, Swati Piramal, Director, Strategic Alliance and Communications, NPIL told *Financial Express* in January 2008, "Yes, we have been discussing a common brand identity, including a change in the company logo. This is an effort to rationalize the various entities and for the ease of the regulatory process." As a result of this exercise in April 2008, Nicholas Piramal India Ltd Chairman Ajay Piramal announced, "It has been a decade since Nicholas Piramal India Ltd was established. There was no association of Nicholas in Nicholas Piramal India Ltd and moreover it was the name of a multinational. With the emergence of India globally, Nicholas lost its relevance, so we have decided to rechristen the company as Piramal Healthcare Ltd."

Great People Create Great Organizations

For Piramal Healthcare Ltd, its employees are vital. The belief that "great people create great organizations" has been at the core of the company's approach to its people. It has created a favourable work environment that encourages innovation and meritocracy. It has introduced a Career Opportunity Programme (COP) to promote internal talent. The learning and development cell of the company is dedicated to developing managerial skills and inspiring them to grow as business

leaders. The company has also invested in enhancing the size of the sales. As a result, during the financial year 2021–2022, it increased its sales force from 3154 people to 3789 people. The following table lists the quarterly sales figures for a product over 3 years (between 2019 and 2021).

Table: Quarterly Sales

Month	2019	2020	2021
Q1	49	73	85
Q2	64	86	102
Q3	77	82	102
Q4	104	115	141

- Calculate the seasonality index using Ratio to Moving Average method. [15]
- De-seasonalize the data assuming that Y_t is product of trend and seasonality. [5]
- Develop the best forecasting model by comparing MAPE of Moving Average and Simple Exponential Smoothing (consider smoothing constant=0.7). [20]

Q2. Binani Cement Ltd is the flagship company of Braj Binani group, which operates in sectors such as cement, zinc, glass, fibre, and downstream composite products. The following Table exhibits the sales of Binani Cement Ltd from 1998–1999 to 2006–2007. Use Holt’s two parameter technique with $\alpha = 0.6$ and $\beta = 0.4$ to forecast sales for the given data and calculate MSE and RMPE values of the model. [15]

TABLE: Sales of Binani Cement Ltd. from 1998–1999 to 2006–2007

Years	Sales (in million rupees)
1998–1999	3507.2
1999–2000	3347.5
2000–2001	4039.7
2001–2002	4354.8
2002–2003	4418.8
2003–2004	4637
2004–2005	5301.7
2005–2006	5858.5
2006–2007	7808.5

Q3. Why Does the Time-Series Model Use Multiplication? How do the MAD and MSE criteria differ in their approach to evaluating the fit of an estimation equation to a time series? [15]