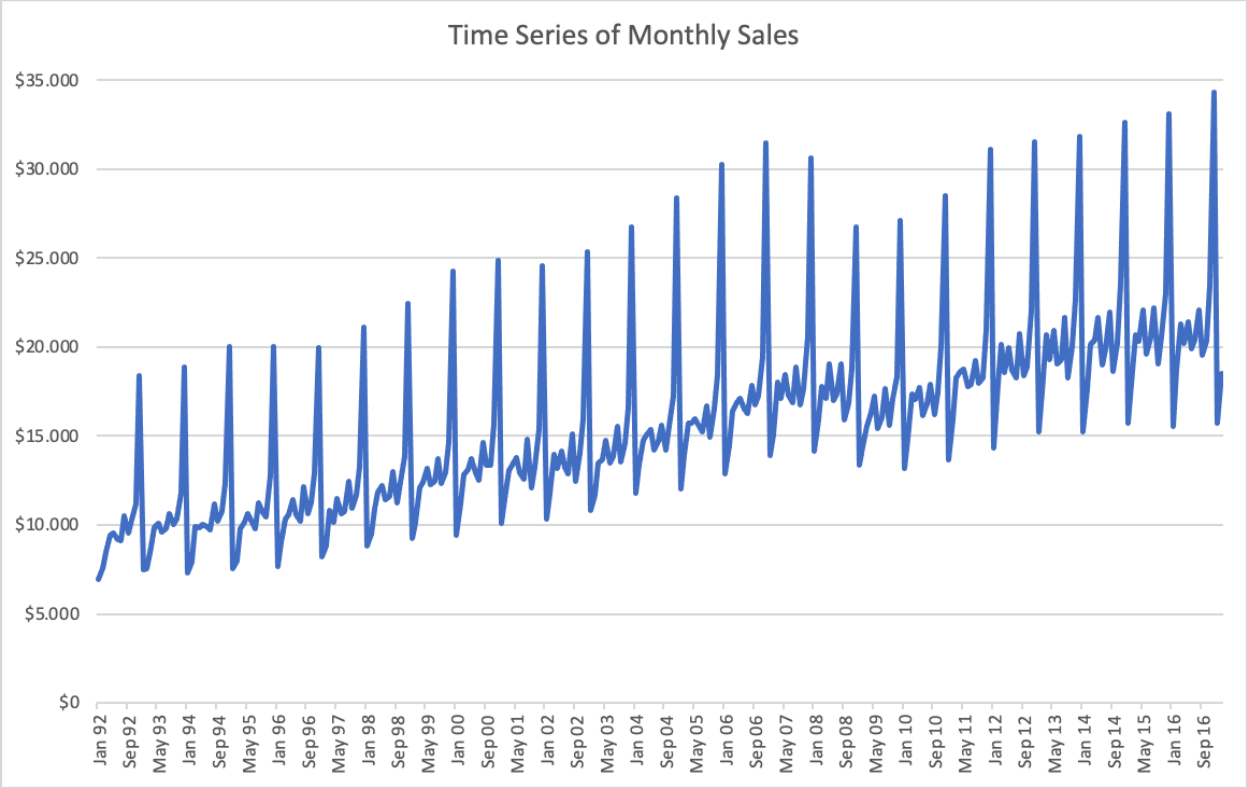
5.6: Time Series Analysis & Forecasting

Marta Majer

Time series



What characteristics does the pattern display (e.g., seasonality, stationarity)? Write a short paragraph to explain your answer.

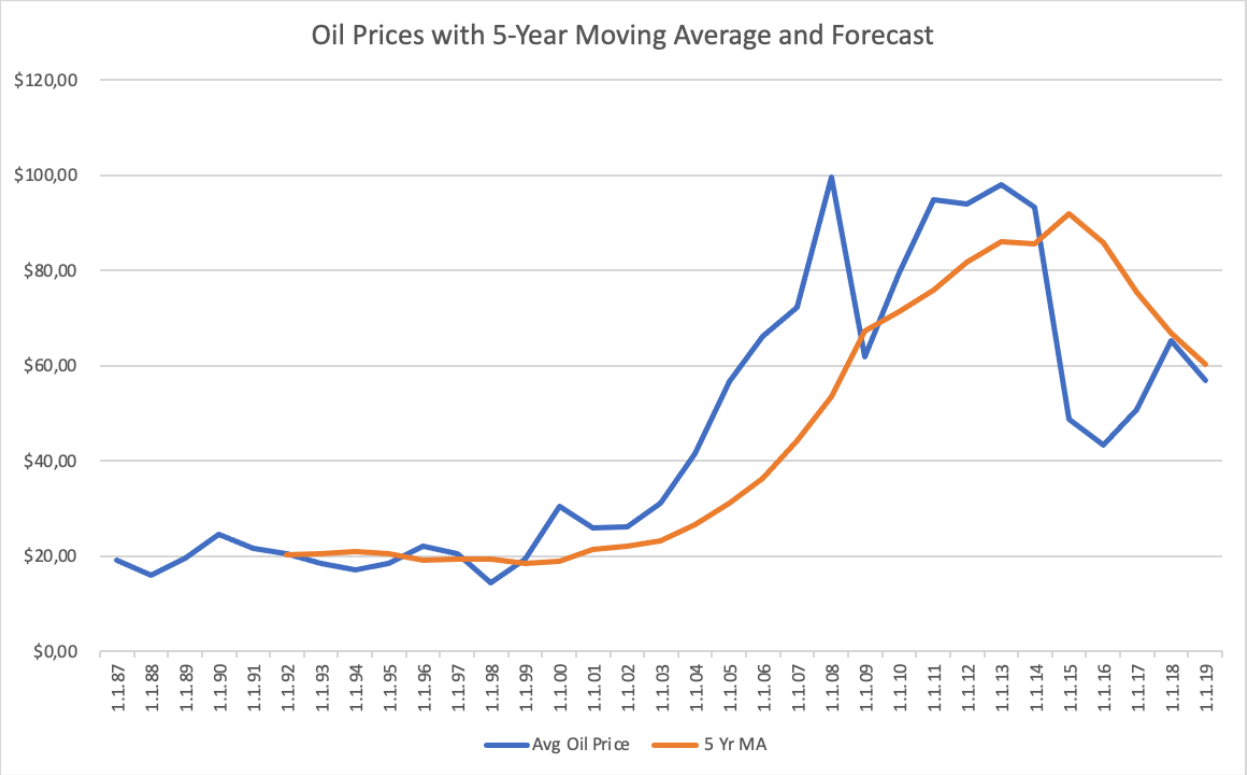
The observed sales pattern exhibits yearly seasonality, particularly in December, where there are noticeable peaks corresponding to the holiday shopping period. This seasonal trend indicates a strong consumer interest in products during this time. Additionally, the series appears to be non-stationary, as it demonstrates a consistent upward trajectory over time. This growth trend could be attributed to factors such as inflation and rising prices, which may impact overall sales.

What advice might you give your client based on this time series. Why?

To address the significant fluctuations in sales during December, it would be beneficial to analyze the underlying factors contributing to this seasonality and explore strategies to smooth out sales throughout the year. This could involve improving stocking practices to better align inventory with consumer demand, potentially increasing monthly sales. Additionally, addressing

supply chain planning issues is crucial, as excess unsold inventory has been taking up valuable space, while certain popular items have experienced stockouts. Given the shop's location in a mall, it's essential to consider peak shopping times, especially during the holiday season, when customers are likely to be purchasing gifts. Implementing these strategies could enhance product availability and overall sales performance year-round.

Moving average



Is there a certain characteristic to the pattern and trend? Make sure to provide a short explanation for your answer.

Explain how the moving average affects oil price volatility and how it makes forecasting easier.

The chart shows that oil prices experienced a general uptrend until the early 2010s, followed by a decline. There is significant volatility, with sharp peaks and drops. The 5-year moving average smooths out these fluctuations, showing a more stable long-term trend.

Effect of Moving Average: It reduces price volatility by filtering out short-term changes, making the overall trend clearer. This simplifies forecasting by highlighting the general direction of prices, aiding in identifying long-term momentum.

This Exercise mainly looked at non-stationary time series. Briefly explain why you might convert a non-stationary time series into a stationary time series before applying a forecasting model. (If you need help answering this question, check out the Resources above.)

Converting a non-stationary time series to a stationary one is important because many forecasting models, like ARIMA, assume stationarity to produce accurate results. Stationarity ensures that the statistical properties (mean, variance) are consistent over time, making it easier to model the relationships and patterns within the data. This improves the model's ability to learn and predict future values effectively.

Do some research on the ARIMA model and one other model not covered in this Exercise; Facebook Prophet is one example that's become popular in recent years.
Imagine you have to explain these models to a colleague who's unfamiliar with them. Write two short paragraphs (1 for each model) without going into the technical details. Include links to the resources you found during research.

ARIMA Model: ARIMA is a method used to analyze and forecast trends in time-related data, like stock prices or monthly sales figures. It helps identify patterns based on previous observations, making it ideal for situations where current values are influenced by past trends. Think of it as using history to make educated guesses about the future. For instance, if sales usually drop after a holiday, ARIMA can detect that pattern and help predict future sales dips.

Source

Facebook Prophet: Prophet is a forecasting tool developed by Facebook, designed to be simple and user-friendly. It's great for handling everyday business data, like website traffic or seasonal sales spikes. The main advantage of Prophet is that it can easily adapt to sudden changes, making it helpful for real-world scenarios where data isn't always perfect. It's perfect for business analysts or managers who need quick insights without needing to understand complex math or programming.

Source