FORECASTING

NIKE'S

ANNUAL REVENUE

ALEX PETTIS

ECO-5740

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December 2023

Abstract

Revenue forecasting plays a pivotal role in steering organizational strategies and future decisions. Analyzing Nike's annual sales revenue data spanning from 1988 to 2023, sourced directly from the company, revealed a consistent upward trajectory. The Ljung-Box test indicated characteristics resembling white noise within the series. Initially using the Drift method as our benchmark model, we aimed to refine our techniques for better prediction accuracy. Comparative analysis of models including ARIMA and Holt-Damped identified the Drift model as the most accurate, showcasing an RMSE of 1652.515 and an MASE of 2.079861. However, our residual diagnostics unveiled deviations from the anticipated normal distribution around zero, deviating from the expected pattern of white noise. This suggests limited residual information contributing significantly to forecasting accuracy. With Nike's last reported revenue at $22 billion, our forecast model projects an estimated revenue of approximately $26 billion by the year 2030.

Introduction

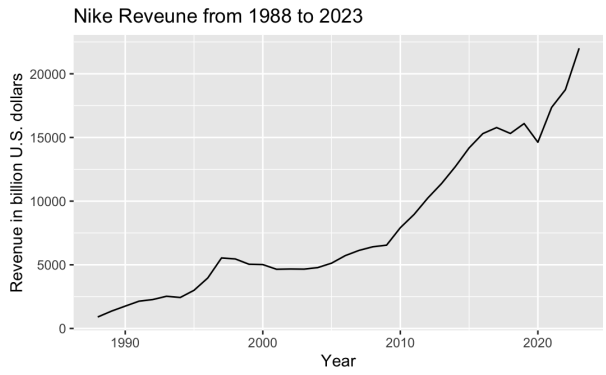
Founded as Blue Ribbon Sports and later rebranded as Nike, Inc. in 1971, Nike attained global recognition through strategic partnerships and pioneering branding initiatives. Notable milestones include the transformative collaboration with Michael Jordan in 1984 and the iconic launch of the 'Just Do It' slogan in 1988. Expanding its influence through innovative sportswear

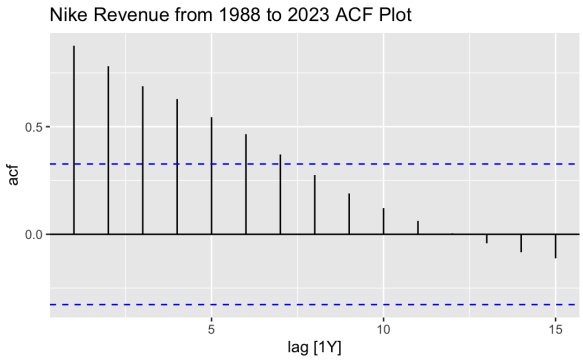
and strategic acquisitions, Nike solidified its position in niche markets and athletic advancements. Overcoming early obstacles, Nike's commitment to ethical manufacturing practices and athlete endorsements established its prominence in sportswear and cultural impact. Phil Knight's leadership until 2016 marked an era of significant growth for the company.

Forecasting models serve as invaluable tools in comprehending a company's trajectory, aiding essential decision-making processes like resource allocation, talent acquisition, and strategic planning. Despite inherent uncertainties stemming from external factors, leveraging statistical evidence allows companies such as Nike to assess their current business landscape and anticipate potential future scenarios. These models empower informed decisions, guiding crucial areas such as marketing strategies, budget allocation, and overall business planning.

Data Description

We start our forecast analysis using Nike Annual revenue data (Tighe, 2023) using annual revenue from 1988 to 2023. We plot the time-series graph as follows



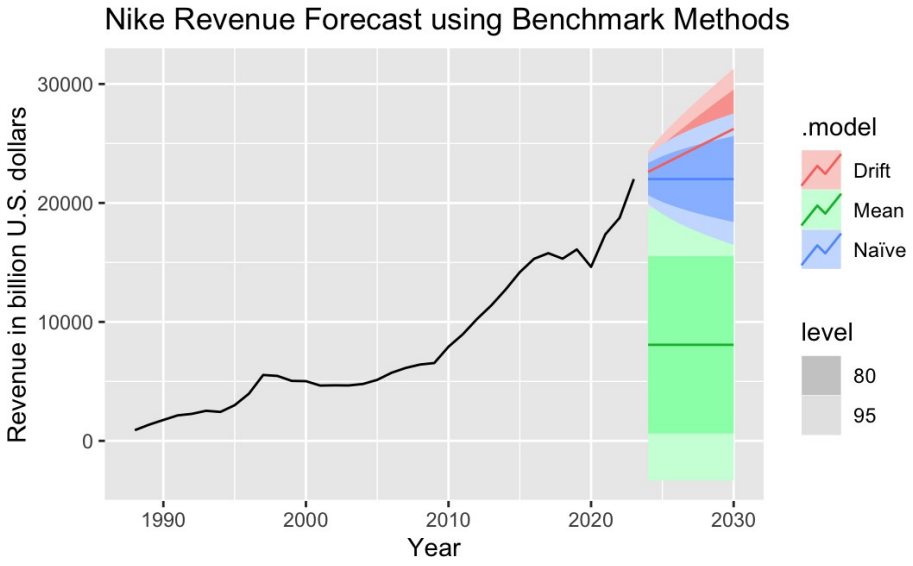


The dataset illustrates Nike's annual revenue in billions of dollars. Examination of the autocorrelation function (ACF) plot displays an upward trend within the series. Initially, there was steady revenue growth until 2015. Subsequently, a significant uptick in revenue was observed, notably from 2015 to 2020, followed by a considerable surge in sales figures.

After conducting the ACF analysis, a Ljung-Box test was performed to evaluate the presence of white noise in the dataset. The test yielded a p-value of 0.3990961, exceeding the significance level of 0.05. Consequently, we accept the null hypothesis, indicating that the data exhibits characteristics consistent with white noise, suggesting minimal autocorrelation.

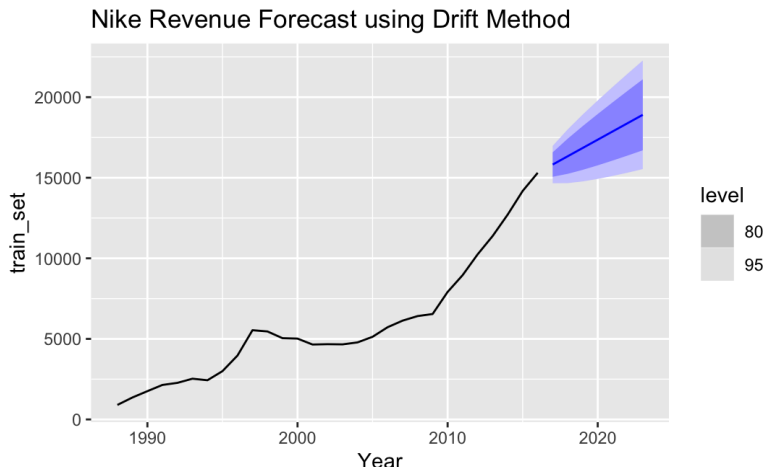
Statistical methods

We start our analysis by dividing the dataset into separate training and test sets, initiating our modeling exploration using the training data. Initially, we investigate fundamental benchmark methods such as the average, naive, and drift models. However, the lack of seasonality limits the use of the Seasonal Naive method.



From the benchmark models, we choose the Drift model as our baseline due to its RMSE of 1652.515. Subsequently, we aim to improve accuracy by employing advanced models including regression, Holt, Holt-Damped, ETS, Simple Exponential Smoothing (SES), theta, ARIMA, dynamic regression, neural networks, and various ensemble methods.

Each model undergoes evaluation using the test set to compute the RMSE, allowing us to gauge their accuracy. Based on this metric, the Drift model emerges as the most suitable choice for our dataset.



The visual illustration presents the forecast derived from the training dataset, demonstrating how well the model aligns with the upward trend observed in the series.

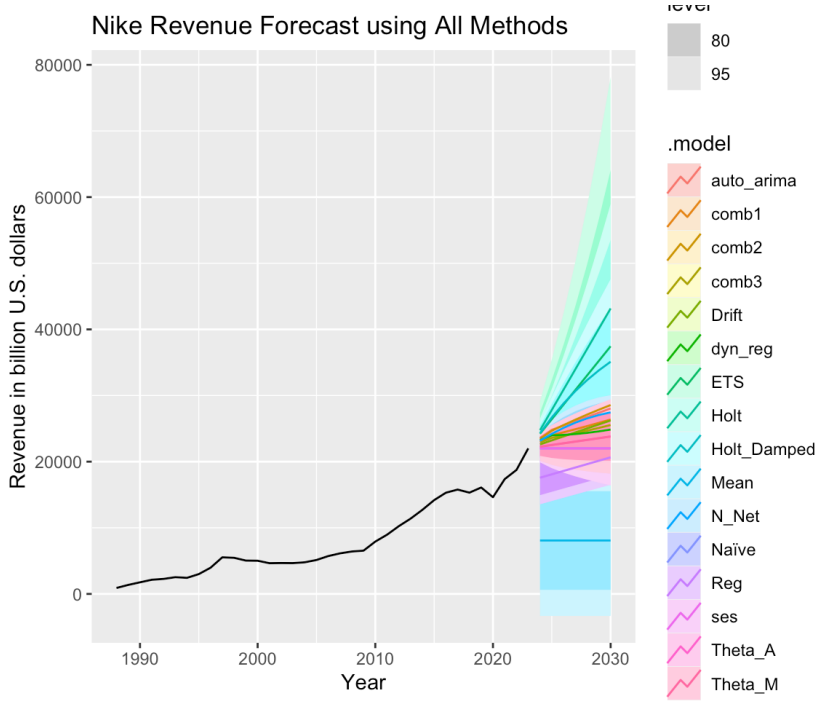
Results

We opted to use RMSE and MASE as the metrics to guide our model selection process. The table below showcases the calculated accuracy of each model:

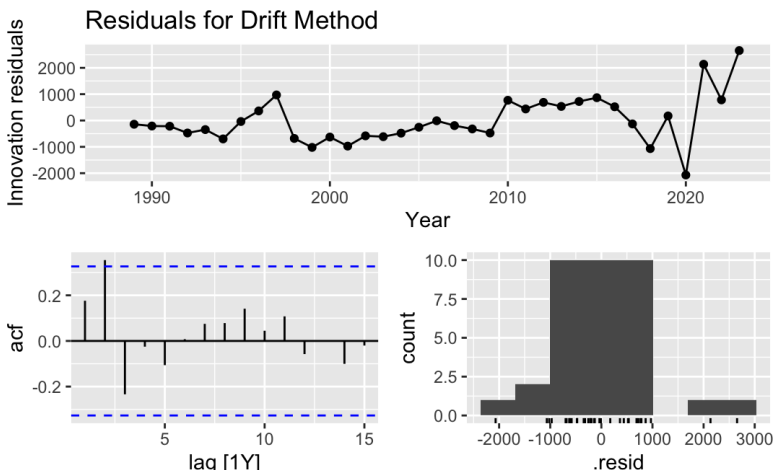
Methods	RMSE	MASE
Drift	**1652.51533**	**2.07986064**
comb1	1718.195	2.258607
comb3	1746.865	2.153843
comb2	1769.477	2.425033
dyn_reg	1884.40617	2.30336594
auto_arima	1914.1092	2.82061776
N_Net	2225.07593	2.84259636

Holt_Damped	2225.00602	3.33564755
Theta_A	2279.9018	2.65446507
Theta_M	2279.9018	2.65446507
Naïve	2984.31378	3.45357543
ses	2984.3827	3.45371264
ETS	3343.6735	5.1338723
Holt	3401.6722	5.23527647
Reg	4294.66069	6.68783286
Mean	11487.1995	19.1980393

Our initial benchmark, the drift method, provided a preliminary insight into our target metrics and eventually delivered the most favorable performance. However, both the regression and mean methods displayed inadequate forecasting capabilities for our dataset, exhibiting lower accuracy scores compared to our preferred drift method.



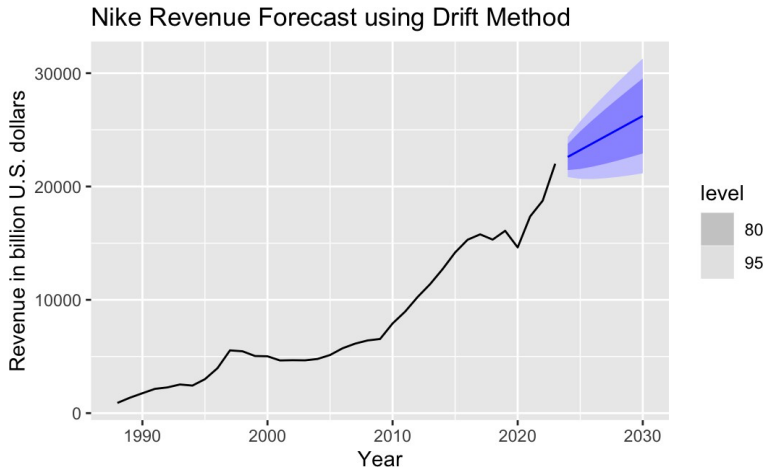
No method surpassed the performance of the drift benchmark method. Although certain ensemble methods, combining drift, Holt-Damped, and Auto-ARIMA, yielded promising forecasts with favorable RMSE and MASE values, the analysis favored the drift model due to its superior metrics, exhibiting an RMSE of 1652.51533 and an MASE of 2.07986064. Following the selection of the drift model for our forecast, we proceeded with conducting residual diagnostics on this model.



Upon conducting residual diagnostics, observations reveal normally distributed residuals centered around 0. Additionally, the ACF plot indicates a notable but relatively insignificant spike, suggesting the residuals exhibit characteristics akin to white noise. The Ljung-Box test conducted on these residuals resulted in a p-value of 0.3990961 with 10 degrees of freedom, significantly surpassing the conventional significance level of 0.05. Hence, we lack substantial evidence to reject the null hypothesis, signifying the lack of statistically significant autocorrelation within the residuals.

Discussions

Utilizing the Drift model, we generate a forecast with a horizon of h = 7, depicted in the following plot:



The forecast shows that the revenue of Nike will continue to grow, following the current upward trend. The prediction shows that the revenue will reach close to $26 billion dollars by 2030. From this analysis, we first used some forecasting benchmark techniques, then we moved to more sophisticated models and finally settled with the Drift method based on the accuracy metric.

While the sales figures indicate a rising trend in the series for Nike, it's crucial to consider potential industry disruptions stemming from external factors, such as the aftermath of COVID-19 and the ongoing global instability. Amidst the pandemic, there was a substantial surge in demand for various products, including sportswear and athleisure, due to increased virtual interactions. This surge could have contributed to the revenue increase post-2020. However, as the situation gradually normalizes, there might be a slowdown in demand, potentially impacting the growth rate.

Additionally, the ongoing global instability, including conflicts affecting the supply chain, has resulted in disruptions for many industries. For Nike, this could translate into challenges related to the supply of essential components, such as raw materials or manufacturing inputs. The global supply chain disruptions, particularly the microchip shortages affecting various sectors, including sportswear manufacturing, might adversely affect production capabilities.

It's imperative for Nike to strategize and plan accordingly, considering these potential challenges. Careful planning and adaptation to the changing market conditions will be vital to achieving forecasted revenue targets, especially amidst uncertainties related to demand fluctuations and supply chain disruptions.

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