

BACKORDER REDUCTION

Objective

- To get and compare the prediction accuracy of Stock Keeping Units (SKU's) that were NOT backordered by Auto-AI and Precision AI² SXI.
- Target a **20%** increase in SKU's that were **NOT** backordered from the current level of backorders.

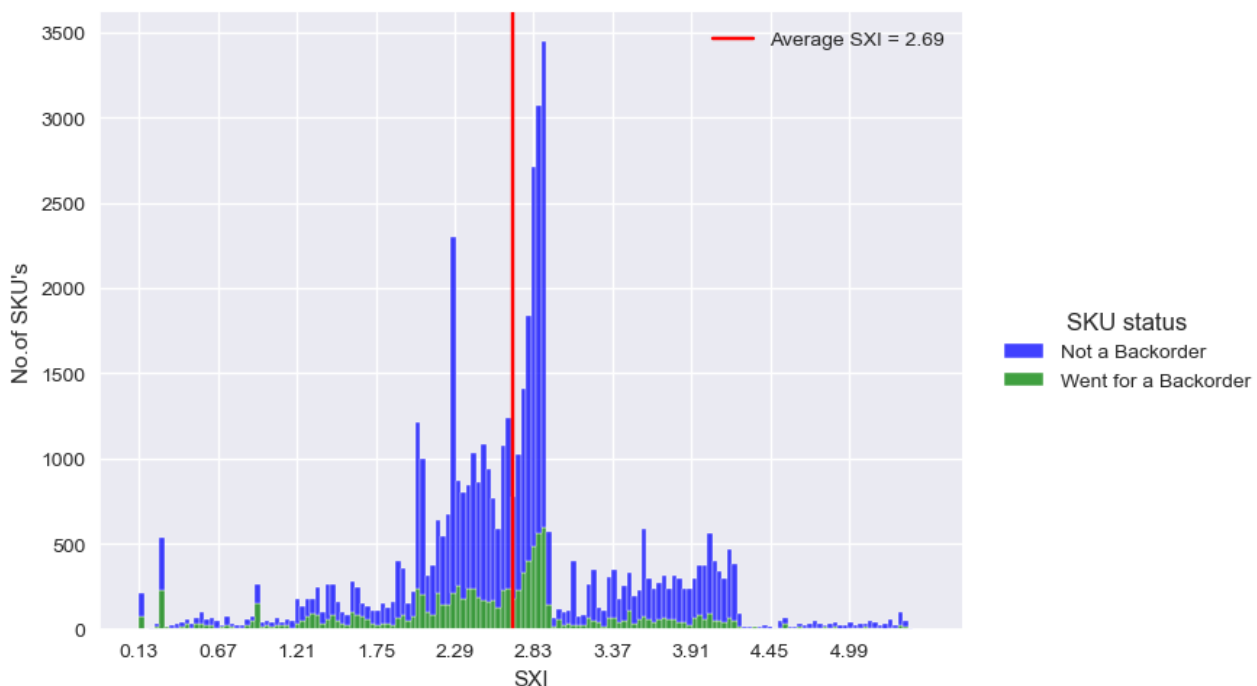
SXI Hypothesis

- SXI is a proxy/surrogate for all features responsible for ensuring SKUs were backordered or not. The higher the SXI, the lower backorder rate and hence increasing SXI score should lead to lower backorder rate and lower number of backorder SKUs.

SXI Definition

- **Sriya Expert Index (SXI)**: Dynamic score/index obtained from a proprietary formula consisting of weights from 10 ML algorithms. SXI is a super feature and is a true weighted representative of all important features. Converts a multi-dimensional hard to solve problem into a simpler 2-dimensional solution (problem solved).
- **SCORE + CORRELATE = IMPROVE**

Discussion & Results



1. Exploratory Data Analysis

50,000 SKUs were distributed to **39,137** good and **10863** bad. Good are SKU's that were not backordered and Bad are SKU's that were backordered. So, **78.27%** of the SKU's that were not backordered/good and **21.73%** of the SKU's that were backordered/bad.

2. SXI - Exploratory Data Analysis

The current Average SXI is **2.69**. No. of SKUs above 2.69 is **26033** and of these **5040** are SKU's that were backordered and **20993** are SKU's that were not backordered. So, SKU's that were not backordered (%) is **80.64%** and SKU's that went for a backorder is **19.36%**.

Correspondingly No. of SKUs below 2.69 is **23967** and of these **18144** are SKU's that were not backordered and **5823** are SKU's that went for a backorder. So, SKU's that were not backordered (%) is **75.07%** and SKU's that went for a backorder is **24.93%**.

So SXI is a reasonable proxy/surrogate for SKU's that were not backordered and above average SXI ratio of good outcome is **1.03x** of the overall average and below average SXI ratio of good outcome is **0.96** overall average. So, the increase in SXI leads to an increase in SKU's that were not backordered.

3. Predictive AI²

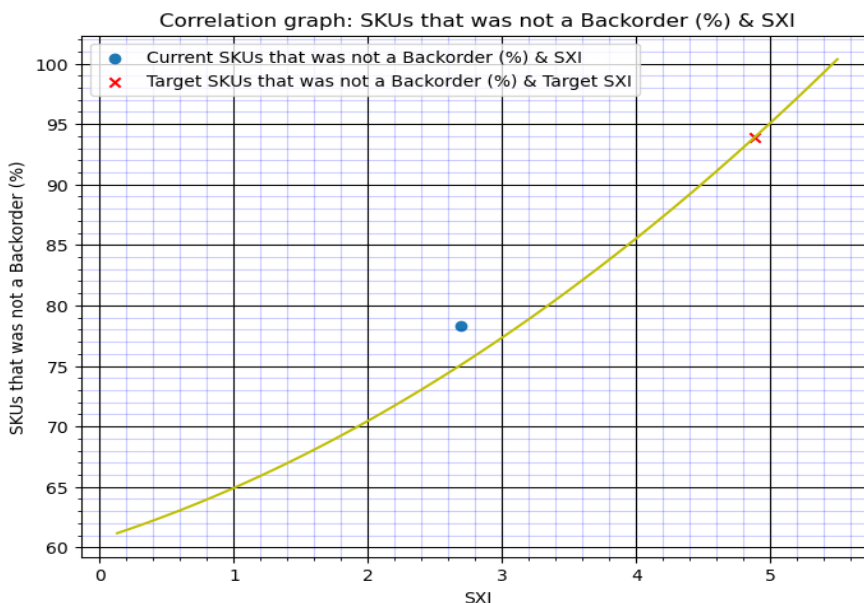
- Auto-AI Prediction accuracy is **93.02%** and the best performing algorithm is **Random Forest**.
- SXI Prediction accuracy of Not a Backorder is **97%**.
- Ratio of SXI/Auto-AI prediction accuracy is **1.04**

4. Precision AI²

The desired increase in target outcome which is SKU's that were not backordered is 20%. The original SKU's that were not backordered is **78.27%** so a **20%** increase should lead to a **93.9%** overall SKU's that were not backordered ($78.27 * 1.2$). Which means **46,964** of the SKUs from 50,000 would become SKU's that were not backordered rather than current **39,137**.

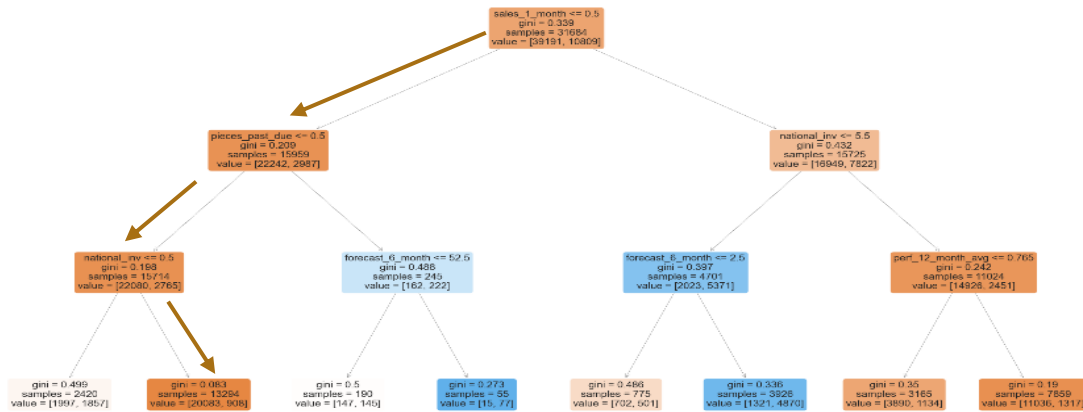
This would result in **7827 lower** number of backorder SKUs.

The correlation between SXI and SKU's that were not backordered is **0.85**. This implies that SXI and SKU's that were not backordered are highly positively correlated to each other. Hence, an increase in SXI will result in an increase in SKU's that were not backordered.



Current SXI and Target SXI Decision Trees

a. Current SXI Decision Tree



Interpretation

Node 1: Sales quantity for the prior 1 month ≤ 1 (Number of SKU's that were not back ordered in parent node: 39191)

Left split: 22242 – majority positive class; gini: 0.209, **Right split:** 16949; gini: 0.432.

(Total value for the next split: 22242)

Node 2: Amount overdue from source < 1

Left split: 22080 – majority positive class; gini: 0.198, **Right split:** 162; gini: 0.488.

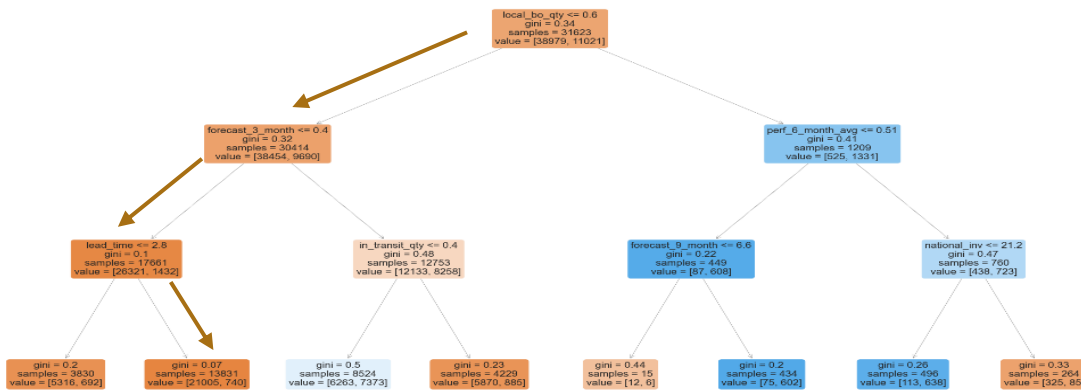
(Total value for the next split: 22080)

Node 3: Current inventory level for the product > 1 (Right split, so it is False. Hence, symbol changes from $<$ to $>$)

Left split: 1997; gini:0.499, **Right Split:** 20083 - majority positive class; gini:0.083 – Final Leaf Node

- ✓ SKU's not a back order/ backorder ratio is **22.11**.

b. Target SXI Decision Tree



Target SXI from correlation curve for 20% increase in target outcome of SKU’s that didn’t go for a backorder is **4.88**.

Interpretation

Node 1: Amount of stock orders overdue <= 1 (Number of SKU’s that were not back ordered in parent node: 38979)

Left split: 38454 – majority positive class; gini: 0.32, Right split: 525; gini: 0.41.

(Total value for the next split: 38454)

Node 2: Forecast sales for the next 3 months < 1

Left split: 26321 – majority positive class; gini: 0.1, Right split: 12133; gini: 0.48.

(Total value for the next split: 26321)

Node 3: Transit time for the product > 2.8 days (Right split, so it is False. Hence, symbol changes from < to >)

Left split: 5316; gini:0.2, Right Split: 21005 - majority positive class; gini:0.07 – Final Leaf Node

✓ SKU’s not a back order/ backorder ratio is **28.39**.

Conclusion

1. SXI backorder Prediction accuracy was **4-10% higher** than standard Sriya-AI.
2. **7827 lower** number of backorder SKUs.
3. Target **20%** increase in SKU's that were not backordered is achievable by increasing target SXI to **4.88** from current **2.69** levels. This would result in **46,964** of the SKUs up from current **39,137** levels.

Initial Increase from current levels:
20% or 7,827.

SXI Impact
Potential

4. Target SKU's not a back order/ backorder ratio is **28.39** while the current ratio is **22.11**. This represents a **potential 28.40% compounded increase** if all recommendations in **target SXI = 5.4** are completely implemented.

Compounding Increase from current levels:
28.40% or 11,115.

SXI Impact
Potential