

Food Ration Demand Planning for United Nations Mission in Darfur

Motivation / Background



Agility provides the end-to-end food supply chain for United Nations Peacekeeping mission in Darfur (UNAMID). The current procurement lead time is two times longer than the time when orders are placed, and Agility forecasts demand a half year in advance.

- Current Forecasting Period = Lead Time = 150 Days
 - Bulk Order in Advance: 80 Days
 - ✓ Final Order Confirmation: 21 Days

Key Question / Hypothesis

Key Question: Can sophisticated forecasting techniques be applied to improve demand planning for food rations at the UNAMID?

The Problem

- Stiff penalties are incurred by Agility if they deliver less than 100% or more than 102% of the final contracted amount of food. Therefore, an accurate forecast is critical.
- Currently, due to lead time and ordering constraints, Agility is not consistently able to hit these contracted targets.
- Our project aims to improve the accuracy of their forecast to reduce the frequency and amount of penalties.



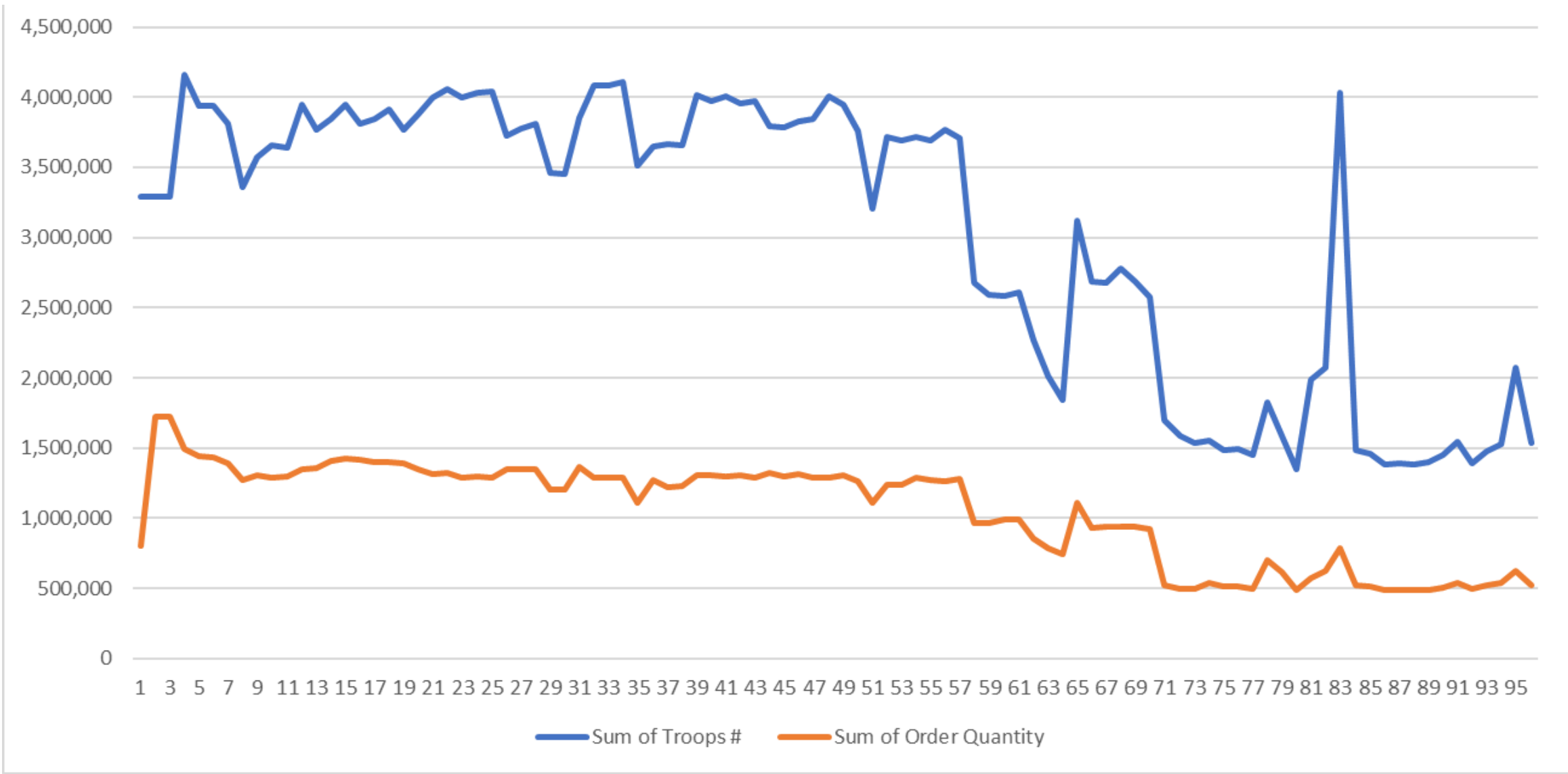
Methodology

Currently, Agility uses a simple Moving Average with 3-periods to forecast demand for food items. Our Methodology to improve this includes 4 parts:

- 1) We studied product characteristics on 350 active food items. Some line items do not have consistent demand, thus represent small portion of total costs. After consulting with Agility, we decided to segment by total cost, then chose the top 20 SKUs (approx. 55% of total cost) to forecast.
- 2) We explored various forecasting models to determine the most accurate forecast for each of the top 20 SKUs. These forecasts were combined with inventory on-hand and inventory in-transit levels to determine the optimal order quantity.
- 3) We adjusted the training and testing dataset for the forecast model to account for substantial withdraws in troop numbers, while aiming to minimize the total cost.
- 4) We generated three recommendations for future demand forecasting.

Research Results

Troop Number VS. Food Demand



Cost Comparison on Holt-Winters vs. MA(3)

	Line Item Cycle Service Level	Order Quantity Fill Rate	Inv Spoilage	Inv Holding	Total
Holt-Winter	(94,646)	(93,135)	(4,828)	(499)	(193,107)
MA(3)	(102,364)	(112,408)	(3,534)	(463)	(218,770)

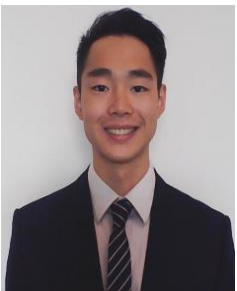
Results

- \$25,663 Annual Savings
- Improved MAPE on 19 SKUs
- Improved Adjusted R² on 17 SKUs

Recommendations

- Monitor smoothing parameters
- Align forecasting period with stable period of troops
- Develop forecasting platform based on advance forecasting techniques

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