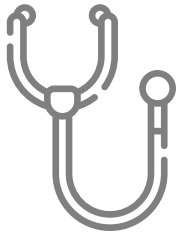


Inventory management

Health & wellness

- Optimized Inventory to determine optimal inventory levels based on demand forecasts, variability, vendor lead times and variability, service level, etc.
- Developed inventory strategy to evaluate moving part of the manufacturing process to U.S. (from Asia)

Health & wellness company needs inventory management

INVENTORY MANAGEMENT

Picture this…

You're looking to understand the finished good (FG) inventory to be maintained to ensure minimal stock-outs accounting for variability in demand, working capital and storage capacity. Additionally, you want the flexibility to change fulfillment strategy i.e., fulfilling demand from existing one DC (Distribution Center) to two DCs.

You turn to Accordion.

We partner with your team to optimize inventory to determine optimal inventory levels based on demand forecasts, variability, vendor lead times and variability, service level, etc. Also, to develop inventory strategy to evaluate moving part of the manufacturing process to U.S. (from Asia), including:

1) Identifying the optimal inventory levels, estimated the optimal service level at a SKU level as a trade-off between the cost of inventory and the cost of stock-outs with a flexibility to toggle lead time variability, etc. Additionally, built a Monte-Carlo model to estimate the % lost sales for a given service level to help the client with the service level targets
2) Based on the service level identifying above, estimating the safety stock to meet the target service level and building an inventory model with the optimal inventory levels at a SKU-week level for each of the DCs with flexibility to change the fulfillment strategy i.e., fulfilling the demand from existing one DC to two DCs
3) For the seasonal SKUs, estimating the one-time order quantity using the newsvendor model considering the salvage value as the Seasonal SKUs come with special packaging that cannot be sold during the off-season
4) Evaluating the option to move part of the manufacturing process (bottle printing) to U.S. to help with the stock-outs. Performing a trade-off cost analysis and highlighting that the manufacturing costs would increase if part manufacturing were to move to U.S. Alternatively, maintaining minimal blank bottle inventory to avoid stock-outs.

Your value is enhanced.

You have customized inventory model to help streamline the inventory management process and identified the right inventory levels allowing to meet the service level targets with minimal stock-outs. You have also helped in taking an informed decision on their inventory strategy i.e., moving part of the manufacturing to U.S. (from China), by providing visibility into the merits vs. de-merits. You have also suggested a more economical solution on how to address the problem without completely changing the manufacturing process.

KEY RESULT

- Impact 1…
- Impact 2…

VALUE LEVERS PULLED

- Monte-Carlo model
- Optimum inventory model
- Newsvendor model

Inventory management for a health and wellness brand

Situation

- Client wanted to understand the finished good (FG) inventory to be maintained to ensure minimal stock-outs accounting for variability in demand, working capital and storage capacity. Additionally, wanted the flexibility to change fulfillment strategy i.e., fulfilling demand from existing one DC (Distribution Center) to two DCs
- Partnered with client for inventory analysis to determine company's optimal inventory levels based on demand forecasts, variability, vendor lead times and variability, service level, etc. Additionally, helped the client with the inventory strategy to evaluate moving part of the manufacturing process to US (from Asia)

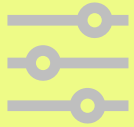
Accordion Value Add

- To identify the optimal inventory levels, estimated the optimal service level at a SKU level as a trade-off between the cost of inventory and the cost of stock-outs with a flexibility to toggle lead time variability, etc. Additionally, built a Monte-Carlo model to estimate the % lost sales for a given service level to help the client with the service level targets
- Based on the service level identified above, estimated the safety stock to meet the target service level and built an inventory model with the optimal inventory levels at a SKU-week level for each of the DCs with flexibility to change the fulfillment strategy i.e., fulfilling the demand from existing one DC to two DCs
- For the seasonal SKUs, estimated the one-time order quantity using the newsvendor model considering the salvage value as the Seasonal SKUs come with special packaging and cannot be sold during the off-season
- Evaluated the option to move part of the manufacturing process (bottle printing) to US to help with the stock-outs. Performed a trade-off cost analysis and highlighted that the manufacturing costs would increase if part manufacturing were to move to US. Alternatively, suggested maintaining minimal blank bottle inventory to avoid stock-outs.

Impact

- Customized inventory model helped the company streamline their inventory management process and identified the right inventory levels allowing them to meet the service level targets with minimal stock-outs
- Helped the company take an informed decision on their inventory strategy i.e., moving part of the manufacturing to US (from China), by providing visibility into the merits vs. de-merits. Also, suggested a more economical solution on how the company can address the problem without completely moving the manufacturing process

Approach & methodology



Optimal service level

- Calculated the theoretical optimal service levels at a SKU level **based on trade-off between inventory cost and opportunity cost due to lost sales** with a flexibility to toggle lead time variability, etc.
- **The high contribution margins and low carrying costs resulted in very high optimal service levels** across the SKUs (> 98%) with large SKU-level safety stocks
- Given the high optimal service level, estimated safety stock to meet the SLAs was also high resulting in high capex, inventory storage, etc.
- As service level gives the probability of stock-outs and not the actual impact on sales, **sales impact for a given service level was quantified.**
- **Built a Monte-Carlo model** to simulate the actual demand and **estimate the % lost sales** for a given service level
- Given the high optimal service levels, this **helped the client to take a top-down service-level decision** as opposed to using the optimal inventory level at an SKU level, **based on the total % lost sales**

Finished Goods Inventory

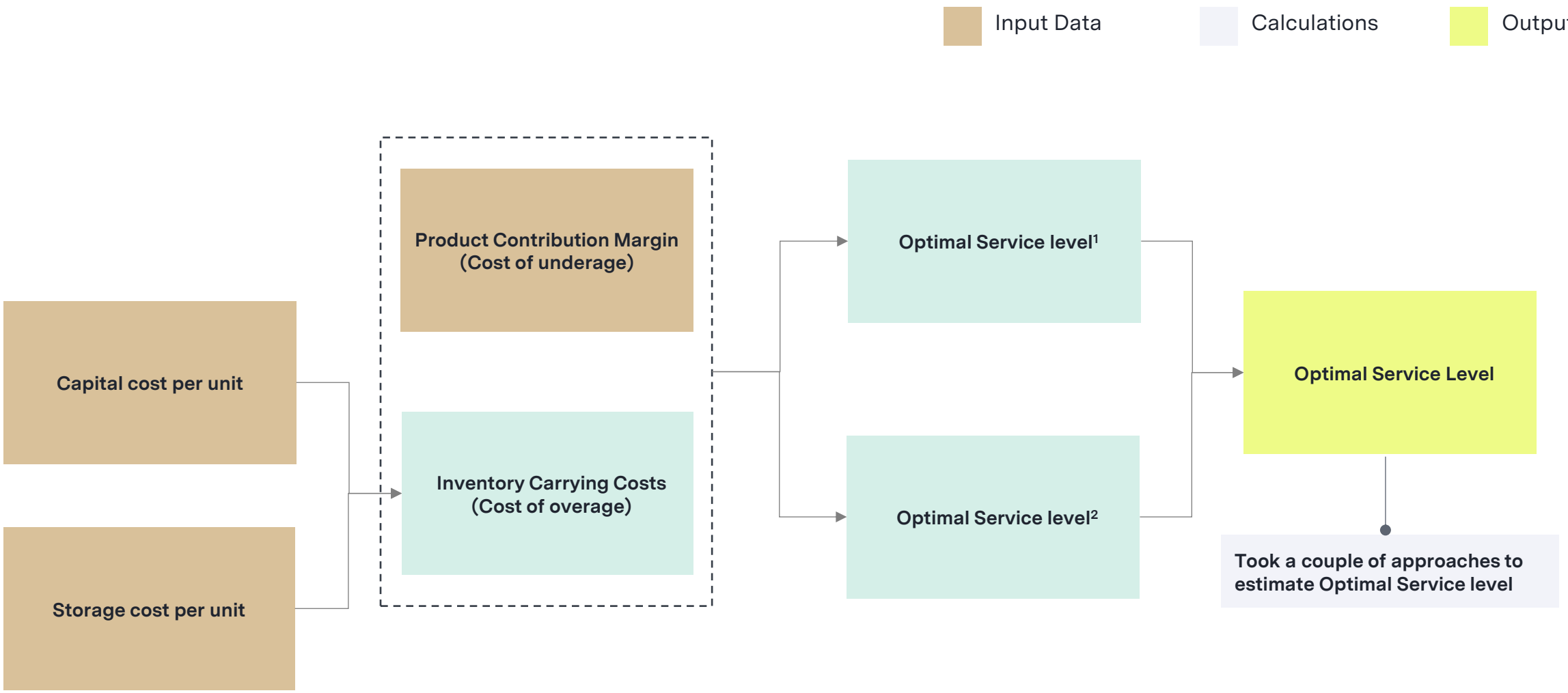
- **Built the inventory model** with the optimal inventory levels at a SKU-week level for each of the DCs based on the review cycle demand
- Provided flexibility to toggle with service level and fulfillment strategy enabling client to input the distribution of demand fulfillment among the two DCs
- Given client does not stock seasonal SKUs (with customized packaging) and places a one-time order based on the forecasted demand, order quantity to be placed was calculated accounting for forecast error
- For the seasonal SKUs, **used newsvendor model to determine the one-time-buy order quantity** i.e., optimum service level = cost of underage / (cost of overage + cost of underage) accounting for the salvage value of the products
- Aggregate of quantity calculated based on the optimal service level above and forecasted demand gives the one-time order quantity for seasonal SKUs

Inventory Strategy

- Manufacturing was based out of China, and this helped the client incur lower manufacturing costs. However, this resulted in longer lead times and higher safety stock
- To address, **client wanted to evaluate if there is an opportunity to get blank bottles from China and get the printing done in US** as significant share of products are sold in bottles
- **Printing onshore** (in US) i.e., having blank bottle inventory onshore **helps client account for any variability in the historical forecast error, avoiding stock-outs** for a given service level
- Analyzed the costs trade-off and identified that **completely moving the printing onshore is not economica**l due to high onshore printing costs and low storage costs for finished goods
- To address this, suggested **maintaining a minimal blank bottle inventory onshore** to avoid stock-outs for a given service level. This will help reduce the buffer stock to be maintained resulting in lower capex costs

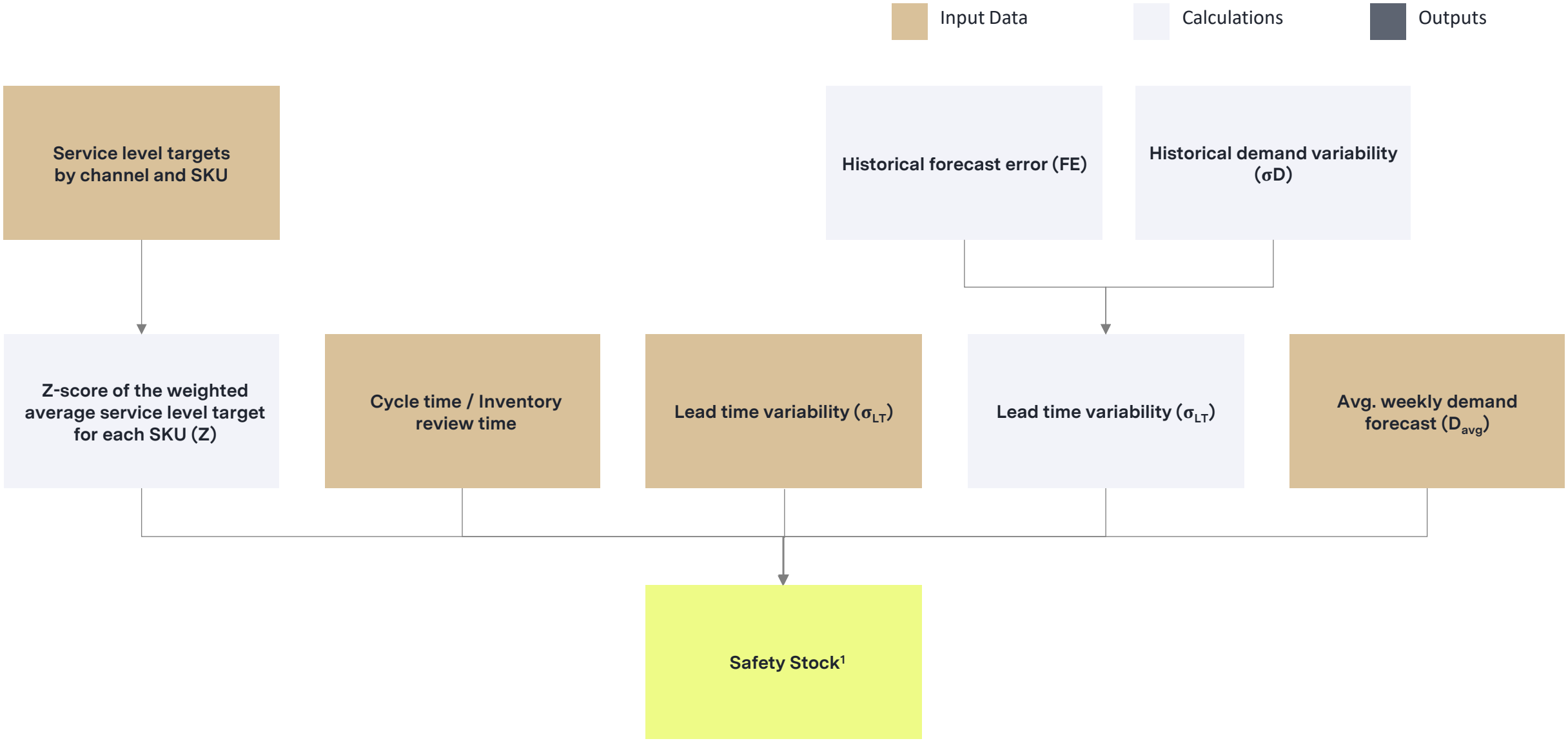
ILLUSTRATIVE

Optimal service level methodology



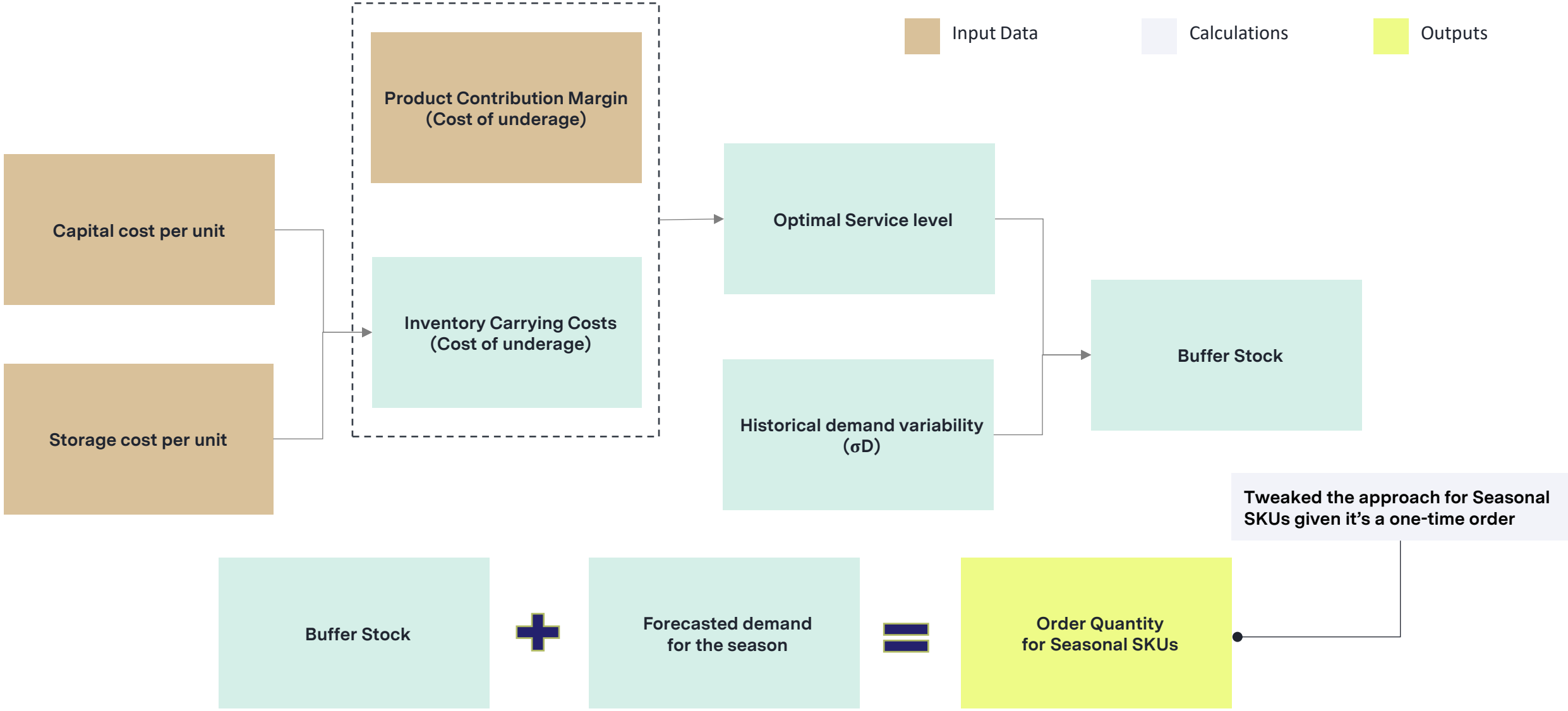
ILLUSTRATIVE

Safety stock methodology



ILLUSTRATIVE

One-time order quantity calculation for seasonal SKUs



Optimal service level calculation

Fulfillment strategy	Current state
Margin Multiplier	1
Lead time variability input	0%
Inventory review time (days)	90

Input the ecommerce split for future state here ↓

DC split >>	Ecom: Current state	Ecom: Future State
DC1	100%	70%
DC2	0%	30%

Optimal service level calculations

Item number	Product Name	Sub category	Distribution Centre	Country	Capital cost per unit for lead time($) (1)	Storage cost per unit for lead time ($) (2)	Carrying cost (Storage + Capital Costs) per unit for lead time ($) - (1+2)	Lead time (days)	Average Weekly Demand (#)	Optimum service level[1]	Optimum service level[2]
17	Product Name 1	Sub Category 1	USDC	US	$0.70	$0.09	$0.79	199	7	98.2%	99.3%
22	Product Name 2	Sub Category 2	USDC	US	$0.26	$0.09	$0.35	198	74	98.6%	99.5%
26	Product Name 3	Sub Category 3	USDC	US	$0.15	$0.09	$0.24	198	59	98.6%	99.5%
28	Product Name 4	Sub Category 4	USDC	US	$0.23	$0.09	$0.32	198	12	98.5%	99.5%
67	Product Name 5	Sub Category 5	USDC	US	$0.18	$0.08	$0.26	170	25	98.5%	99.5%
107	Product Name 6	Sub Category 6	USDC	US	$0.12	$0.09	$0.21	197	23	97.5%	99.0%
109	Product Name 7	Sub Category 7	USDC	US	$0.13	$0.09	$0.22	197	21	97.3%	99.0%
110	Product Name 8	Sub Category 8	USDC	US	$0.11	$0.09	$0.20	196	23	97.6%	99.1%
131	Product Name 9	Sub Category 9	USDC	US	$0.14	$0.08	$0.22	178	24	97.7%	99.2%
136	Product Name 10	Sub Category 10	USDC	US	$0.20	$0.08	$0.28	177	17	97.5%	99.0%
139	Product Name 11	Sub Category 11	USDC	US	$0.21	$0.08	$0.29	177	11	97.3%	99.0%
141	Product Name 12	Sub Category 12	USDC	US	$0.29	$0.08	$0.37	180	11	93.1%	96.7%
143	Product Name 13	Sub Category 13	USDC	US	$0.29	$0.08	$0.37	177	19	93.1%	96.7%
224	Product Name 14	Sub Category 14	USDC	US	$0.23	$0.08	$0.32	181	12	97.8%	99.2%
430	Product Name 15	Sub Category 15	USDC	US	$0.13	$0.08	$0.21	180	23	98.8%	99.6%
10301	Product Name 16	Sub Category 16	USDC	US	$0.27	$0.09	$0.36	198	17	99.1%	99.7%
10501	Product Name 17	Sub Category 17	USDC	US	$0.23	$0.09	$0.32	198	100	99.4%	99.8%
13401	Product Name 18	Sub Category 18	USDC	US	$0.31	$0.09	$0.40	196	11	98.1%	99.3%
14101	Product Name 19	Sub Category 19	USDC	US	$0.63	$0.09	$0.72	198	22	97.8%	99.2%
14301	Product Name 20	Sub Category 20	USDC	US	$0.25	$0.09	$0.34	198	11	98.7%	99.6%
15101	Product Name 21	Sub Category 21	USDC	US	$0.16	$0.09	$0.25	198	11	99.1%	99.7%

Optimal service levels at an SKU level based on trade-off between inventory cost and opportunity cost due to lost sales with a flexibility to toggle lead time variability, etc.

Safety stock calculation

Fulfillment strategy	Current state
Margin Multiplier	1
Lead time variability input	0%
Inventory review time (days)	90

Input the ecommerce split for future state here ↓

DC split >>	Ecom: Current state	Ecom: Future State
DC1	100%	70%
DC2	0%	30%

Safety Stock calculations

Item number	Product Name	Sub category	Distribution Centre	Country	Weekly Forecast error (forecast vs actual) (#)	Safety stock across service levels (#)							Weeks of safety stock across service levels (#)						
						80%	85%	90%	95%	98%	Optimum service level[1]	Optimum service level[2]	80%	85%	90%	95%	98%	Optimum service level[1]	Optimum service level[2]
17	Product Name 1	Sub Category 1	USDC	US	16	88	108	133	171	214	218	258	12	15	18	24	30	30	36
22	Product Name 2	Sub Category 2	USDC	US	122	661	814	1,006	1,291	1,612	1,716	2,019	9	11	14	17	22	23	27
26	Product Name 3	Sub Category 3	USDC	US	89	479	590	730	937	1,170	1,259	1,478	8	10	12	16	20	21	25
28	Product Name 4	Sub Category 4	USDC	US	40	217	267	330	424	529	558	657	18	22	28	36	45	47	55
67	Product Name 5	Sub Category 5	USDC	US	45	230	283	350	449	560	592	698	9	12	14	18	23	24	28
107	Product Name 6	Sub Category 6	USDC	US	18	95	117	145	186	232	221	264	4	5	6	8	10	10	11
109	Product Name 7	Sub Category 7	USDC	US	20	105	130	160	206	257	241	289	5	6	8	10	12	11	14
110	Product Name 8	Sub Category 8	USDC	US	17	93	115	142	182	227	220	262	4	5	6	8	10	9	11
131	Product Name 9	Sub Category 9	USDC	US	13	68	84	104	133	167	163	194	3	4	4	6	7	7	8
136	Product Name 10	Sub Category 10	USDC	US	21	107	132	163	209	261	249	297	6	8	10	13	16	15	18
139	Product Name 11	Sub Category 11	USDC	US	17	87	107	132	169	212	199	238	8	9	12	15	18	17	21
141	Product Name 12	Sub Category 12	USDC	US	6	31	38	47	60	75	54	67	3	3	4	5	7	5	6
143	Product Name 13	Sub Category 13	USDC	US	23	121	149	185	237	296	214	265	6	8	10	13	16	11	14
224	Product Name 14	Sub Category 14	USDC	US	10	55	67	83	107	133	131	156	5	6	7	9	11	11	13
430	Product Name 15	Sub Category 15	USDC	US	56	294	363	448	576	719	794	929	13	16	19	25	31	34	40
10301	Product Name 16	Sub Category 16	USDC	US	23	125	154	191	245	306	355	412	7	9	11	14	18	21	24
10501	Product Name 17	Sub Category 17	USDC	US	90	487	600	742	952	1,189	1,443	1,665	5	6	7	9	12	14	17
13401	Product Name 18	Sub Category 18	USDC	US	8	44	54	66	85	107	108	128	4	5	6	8	10	10	12
14101	Product Name 19	Sub Category 19	USDC	US	14	75	92	114	146	183	180	214	3	4	5	7	8	8	10

Safety stock calculated at an SKU level based on the service level, lead time variability, and forecast error