6.4. Analyzing Expected Stockouts and Overstocks

Streamline is able to identify upcoming stockout and overstock situations and estimates expected lost sales or excess quantities. Shortages and overages are determined based on the generated forecasts, thus, Streamline calculates *expected* stockouts or overstocks that might happen to an item in the future.

In addition, Streamline computes expected distortion values based on the item balance value or purchase price.

In this article we:

- describe the rules that Streamline uses to determine a stockout or an overstock;
- show how you can view stockout and overstock information in Streamline; and
- analyze items based on the calculated distortion values.

Stockout and Overstock Rules

Basically, there are three situations that might happen to an item in future: 1) a stockout expected, 2) an overstock expected, and 3) no overstock or stockout is expected.

Streamline recognizes items and drops them into these categories. To explain the rules making these categories, let's introduce the following notation:

- *D*(*LT*) the demand forecast during the lead time period.
- *D(OC)* the demand forecast during order cycle period going after the lead time period.
- SS(OC) the safety stock for the order cycle period going after the lead time period.
- InTrn(LT) the in transition quantity that should arrive during the lead time period.
- *InTrn(LT+OC)* the in transition quantity that should arrive during the lead time plus order cycle period.
- *PndSales(LT)* the pending sales orders quantity that should be shipped to customers during the lead time period.
- *PndSales(LT+OC)* the pending sales orders quantity that should be shipped to customers during the lead time plus order cycle period.

In addition, Streamline implements a special color-coding for the inventory report that helps you easily to discern items with insufficient inventory or excess quantity.

To explain the rules and color-coding, let's show the **Demand forecast** and **Purchase plan** sections in the inventory report. To do this, go to the **Settings** of the **Inventory planning** tab and check the options shown in the figure below.

General Project ABC	analysis	Inventory	Distribution cent	ter
oeneral Project Noe		,	Distribution com	
Default lead time 🛛 30 🗦	days			
Default order cycle 1	months	-		
	line (r			
Default average shelf life exc	ceeding 5	▼ %		
Safety stock				
Maximum of				
🗹 Service level 🛛 98 🚔 9	% (2.05.σ	√cycle)		
Demand of the future	1.0 🗘	months		
Show columns				
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Further, we proceed with the example project.

Stockout

To calculate a stockout, Streamline performs the event-based simulation modeling of stock movements during the lead time period. The lowest (negative) inventory level obtained during this simulation is the **Stockout** amount.

A crude version of the formula that does not account for the passage of time for stockout calculation would be the following:

Stockout = MAX(0, D(LT) - On hand - InTrn(LT) + PndSales(LT)).

Consequently, a crude rule for stockout determination is:

D(LT) > On hand + InTrn(LT) - PndSales(LT). (1)

Let's consider the item H1010. To demonstrate how the formula (1) works, we have overridden the

item **On hand** and **Qty to receive** (see figure below).

			Days	Pending		Lead time,	Order cycle,		Safety			Purchase pla	an				Demand	forecast			
Item code	Model type	On hand	of supply	sales orders	In transition	days	months	Min lot	stock	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Stockout
C1020	Seasonal	120	40	10	0	30	1	0	3	56	75	71	81	82	100	63	75	71	81	82	0
F1020	Seasonal	208	213	0	0	30	1	0	3	0	0	0	0	0	25	25	29	29	35	35	0
H9010	Seasonal	230	512	0	0	60	2	0	2	0	0	0	0		11	13	13	13	16	16	0
H1010	Seasonal	10	12	0	10	30	1	50	1	50	0	0	0	50	25	12	12	11	14	15	5
H1020	Seasonal	30	4	0	0	30	1	50	11	250	250	250	350	300	218	207	263	269	325	305	188
H2010	Seasonal	35	4	0	50	90	1	50	13	350	400	350			240	231	303	320	392	353	689
H2020	Seasonal	20	2	0	0	90	1	50	13	350	400	350			240	231	303	320	392	353	754
L2010	Seasonal	50	121	0	10	30	1	0	1	0	0	0	4	13	11	12	14	13	13	13	0
L2020	Seasonal	5	3	0	0	60	2	0	3	91	0	99	0		42	39	46	42	49	50	76
L2030	Seasonal	73	317	5	0	60	2	0	1	0	0	0	0		6	6	7	7	8	8	0

In our case, the inequality (1) is true:

25 > 10 + 10 - 0.

The stockout quantity is shown in the **Stockout** column of the report. In our example, it is **5** units.

Streamline does not take into account safety stock when calculates stockouts.

Streamline indicates such items in the inventory report as follows (see figure above):

- Corresponding cell of the **On hand** and **Stockout** columns has a red background.
- The future periods which demand can't be covered by the **On hand** + *InTrn(LT) PndSales(LT)* quantity have a red background in the **Demand forecast** section.

As you see, there is currently a purchase recommendation. Streamline suggests to order **50** units by 1 of **January** to cover the demand of **12** units in **February**. The over-order is because of the minimum lot size of **50** units.

Overstock

To determine an overstock, Streamline also performs the event-based simulation modeling of stock movements during the lead time plus order cycle period. The inventory level at the end of the simulation is the **Overstock** quantity.

The rough, static version of the overstock formula would be:

Overstock = MAX(0, On Hand - PndSales(LT+OC) - D(LT+OC) + InTrn(LT+OC) - SS(OC)).

Consequently, a crude rule for an overstock determination is:

On hand + InTrn(LT+OC) - PndSales(LT+OC) > D(LT) + D(OC) + SS(OC). (2)

To calculate an overstock quantity, Streamline uses the following formula:

Let's consider the item **L2010** (see figure below).

		Pending		Lead time,	Order cycle,	Safety		1	Purchase pla	an				Demand	forecast				0
Item code	On hand	sales orders	In transition	days	months	stock	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Stockout	Overstock
C1020	120	10	0	30	1	3	56	75	71	81	82	100	63	75	71	81	82	0	0
F1020	208	0	0	30	1	3	0	0	0	0	0	25	25	29	29	35	35	0	155
H9010	230	0	0	60	2	2	0	0	0	0		11	13	13	13	16	16	0	178
H1010	10	0	10	30	1	1	50	0	0	0	50	25	12	12	11	14	15	5	0
H1020	30	0	0	30	1	11	250	250	250	350	300	218	207	263	269	325	305	188	0
H2010	35	0	50	90	1	13	350	400	350			240	231	303	320	392	353	689	0
H2020	20	0	0	90	1	13	350	400	350			240	231	303	320	392	353	754	0
L2010	50	0	10	30	1	1	0	0	0	4	13	11	12	14	13	13	13	0	36
L2020	5	0	0	60	2	3	91	0	99	0		42	39	46	42	49	50	76	0
L2030	73	5	0	60	2	1	0	0	0	0		6	6	7	7	8	8	0	41

The inequality (2) is true:

50 + 10 - 0 > 11 + 12 + 1.

The overstock quantity is shown in the **Overstock** column of the report. In our example, it is **36** units.

Streamline indicates such items in the inventory report as follows (see figure above):

- Corresponding cell of the **On hand** and **Overstock** columns has a dark-green background.
- The future periods which demand are covered by the **On hand** + InTrn(LT+OC) PndSales(LT+OC) quantity have a light-green background in the **Demand forecast** section.

As you see, there is no purchase recommendation if an overstock happens.

No Overstock or Stockout

This is the ideal situation, which Streamline designed to reach. In this case,

 $D(LT) \leq \text{On hand} + InTrn(LT) - PndSales(LT), (3)$

On hand + InTrn(LT+OC) - $PndSales(LT+OC) \le D(LT) + D(OC) + SS(OC)$. (4)

Let's consider the item **C1020** (see figure below).

	a hard	Days	Pending		Lead time,	Order cycle,	Safety			Purchase pla	an				Demand	forecast			Charles 4	0
Item code	On hand	of supply	sales orders	In transition	days	months	stock	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Stockout	Overstock
C1020	120	40	10	0	30	1	3	56	75	71	81	82	100	63	75	71	81	82	0	0
F1020	208	213	0	0	30	1	3	0	0	0	0	0	25	25	29	29	35	35	0	155
H9010	230	512	0	0	60	2	2	0	0	0	0		11	13	13	13	16	16	0	178
H1010	10	12	0	10	30	1	1	50	0	0	0	50	25	12	12	11	14	15	5	0
H1020	30	4	0	0	30	1	11	250	250	250	350	300	218	207	263	269	325	305	188	0
H2010	35	4	0	50	90	1	13	350	400	350			240	231	303	320	392	353	689	0
H2020	20	2	0	0	90	1	13	350	400	350			240	231	303	320	392	353	754	0
L2010	50	121	0	10	30	1	1	0	0	0	4	13	11	12	14	13	13	13	0	36
L2020	5	3	0	0	60	2	3	91	0	99	0		42	39	46	42	49	50	76	0
L2030	73	317	5	0	60	2	1	0	0	0	0		6	6	7	7	8	8	0	41

In this case, both inequalities are true:

 $100 \le 120 + 0 - 10$,

 $120 + 0 - 10 \le 100 + 63 + 3.$

Streamline indicates such items in the inventory report as follows (see figure above):

- Corresponding cell of the **On hand** column has a light-green background.
- The lead time period is highlighted with a light-green color in the **Demand forecast** section.
- Zero values and no color background in the **Stockout** and **Overstock** columns.

In our case, we can cover the D(LT) – the demand in **January**, however, there is not enough inventory to fulfill the D(OC) – the demand in **February**. That's why Streamline suggests ordering **56** units (which is 100 + 63 + 3 - (120 + 0 - 10)).

Viewing Overstocks and Stockouts

Streamline allows viewing overstocks and stockouts on an item basis or for all of the items in one report.

To view the expected overstock or stockout on an item basis:

- 1. Go to the **Demand forecasting**.
- 2. Select the item in the **Tree view**.
- 3. Go to the **Inventory** tab of the **Panel** and scroll down the properties list (see figure below).

Forecasting	Model	Inventory	KPIs
		Value	
Safety stock		3	
Shelf life, mor	nths	00	
Shelf life exce	eding, %		
Purchase price	e	45	
Gross margin		43.8%	
Turn-earn ind	ex	78.7	
Order now		0	
Purchase valu	e	0	
Stockout		0	
Overstock		155	

To view expected overstocks and stockouts for all of the items in one report, go to the **Inventory planning** tab (see figure below).

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Se	arch		Settings	In tran	sition detail	ls 📓 Export	treport 🏠	Export para	meters 🗸	🏴 Import param	eters 🔻 🛒 Pur	chase orde	rs Overall
	Category	Item code	Model type	On hand	Days of supply	Pending sales orders	In transition	Safety stock	Qty	Order nov Value	v Days of supply	Stockout	Overstock
1	Concrete Block	C1020	Seasonal	120	40	10	0	3	56	2800.00	27	0	0
2	Fence	F1020	Seasonal	208	213	0	0	3	0	0.00		0	155
3	Handles	H1010	Seasonal	15	18	0	10	1	13	46.28	33	0	0
4	Handles	H1020	Seasonal	30	4	0	0	11	250	1957.50	35	188	0
5	Hinges	H2010	Seasonal	35	4	0	50	13	350	3689.00	33	689	0
6	Hinges	H2020	Seasonal	20	2	0	0	13	350	7119.00	33	754	0
7	Nails	H2510	Seasonal	80	15	0	0	6	200	88.00	34	78	0
8	Nails	H2520	Seasonal	0	0	0	0	4	200	266.00	46	118	0
9	Screws	H2810	Seasonal	20	34	0	0	2	100	175.00	164	0	0
10	Screws	H2830	Seasonal	300	94	0	0	3	0	0.00		0	104

To bring items with overstocks or stockouts to the top of the table, sort the table by the **Stockout** or **Overstock** column by clicking the corresponding column header (see figure below).

	Madalahara	On hand	Days	Pending	To be a liter	Lead time,	Order cycle,	Safety		Order now		Charlingt	Oursetsel
Item code	Model type	On hand	ofsupply	sales orders	In transition	days	months	stock	Qty	Value	Days of supply	Stockout	Overstock
L1010	Seasonal	198	8	0	100	90	3	21	2230	98120.00	92	1736	0
H2020	Seasonal	20	2	0	0	90	1	13	350	7119.00	33	754	0
H2010	Seasonal	35	4	0	50	90	1	13	350	3689.00	33	689	0
H7020	Seasonal	20	1	0	60	30	1	11	486	918.54	31	421	0
H7030	Seasonal	5	0	0	0	30	1	7	389	735.21	31	384	0
R1001	Seasonal	30	4	0	0	60	2	6	396	31680.00	62	346	0
H1020	Seasonal	30	4	0	0	30	1	11	250	1957.50	35	188	0
H4010	Seasonal	20	10	100	0	30	1	4	145	253.75	63	139	0
H2520	Seasonal	0	0	0	0	30	1	4	200	266.00	46	118	0
H8010	Seasonal	105	34	0	0	60	2	4	200	868.00	62	80	0

Basically, you can sort the inventory report by any column in two directions.

Analyzing Items Based on Overstock and Stockout Values

Streamline allows you to analyze items based on the calculated expected overstock and stockout values. To enable the calculations the item value should be imported.

You can view expected overstock or stockout value on an item basis or for all of the items in one report.

To view the expected overstock or stockout value on an item basis:

- 1. Go to the **Demand forecasting**.
- 2. Select the item in the **Tree view**.
- 3. Go to the **KPIs** tab of the **Panel** (see figure below).

Forecasting	Model	Inver	ntory	KPIs
				Value
Inventory valu	ie		9360.0	00
Days of supply	/		213	
Expected over	stock valu	e	6975.0	00
Expected stoc	kout value	2	0.00	
Non-moving	inventory	value	0.00	
Turnover Tur	rns/year		1.8	
Turnover Day	/s to sell		203	
Gross margin			43.8%	
Turn-earn ind	ex		78.7	
Annual revenu	Je		29920	.00
Revenue next	year		25920	.00

You can view the distortions value at any level of the tree.

To view expected overstock and stockout value for all of the items in one report, go to the **Reports** tab and select the **KPIs** report (see figure below).

🕤 Start 🛛 🖾	Item view 🔲 L	ist view 🛛 🍳	Inventory re	port							
Search	Selec	t report KPIs		▼ Agg	regate by None	👻 🎡 Setting	gs 🛛 🏠 Export rep	port			
Catagory	Item code	ABC	Inventory	Days	Expected	Expected	Non-moving	Turr	nover	Gross	Turn-earn
Category	Item code	analysis	value	of supply	overstock value	stockout value	inventory value	Turns/year	Days to sell	margin	index
Concrete Block	C1020	A 4.56%	6000.00	40	0.00	0.00	0.00	6.7	55	50%	333.3
Fence	F1020	C 1.71%	9360.00		9225.00	0.00	0.00	1.8	203	43.8%	78.7
Handles	H1010	C 0.0902%	53.40	18	0.00	0.00	0.00	12	30	59.3%	715.2
Handles	H1020	B 2.15%	234.90	4	0.00	2336.84	0.00	101	3.6	37%	3746.4
Hinges	H2010	B 3.6%	368.90	4	0.00	12691.38	0.00	98	3.7	42.8%	4192.4
Hinges	H2020	A 4.99%	406.80	2	0.00	19242.08	0.00	172	2.1	20.3%	3481.1
Nails	H2510	C 0.174%	35.20	15	0.00	100.62	0.00	30	12	65.9%	1953.7
Nails	H2520	C 0.271%	0.00	0	0.00	324.50	0.00			51.6%	
Screws	H2810	C 0.0483%	35.00	34	0.00	0.00	0.00	11	34	55%	599.6
Screws	H2830	C 0.308%	738.00	94	255.84	0.00	0.00	3.9	93	46.1%	181.6
Padlocks	H4010	C 0.136%	35.00	10	0.00	417.00	0.00	40	9.2	41.7%	1660.4

You can also sort the report by the **Expected overstock value** or **Expected stockout value** column from largest to smallest and vice versa by clicking the column header.

The report can be exported to Excel by clicking the **Export report** button found on the **Reports** toolbar (see figure below).

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Search			Select	report KPIs		 Aggreg 	ate by None	👻 🎡 Setting	gs 🏦 Export r	eport						
Category		It	em code	ABC analysis	Inventory value	Days of supply o	Expected verstock value	Expected stockout value	Non-moving inventory value	Tur Turns/year	nover Days to sell	Gross margin	Turn-ear index	rn Annual gross profit	Annua revenu	il ie
Plywood	L	1010)	A 34.8%	8712.00	8 0.0	00	136572.48	0.00	39	9.3	44.1%	1731.7	268619.99	610939.9	9
Roof	R	1001	I	A 18.5%	2400.00	4 0.0	00	51900.00	0.00	72	5.1	46.7%	3358.4	151130.00	323850.0	0
Hinges Lumber Hinges	X			C ² → ∓	PAGELA	YOUT FO	Inventory p ORMULAS	lanning - import	ted, forecasted - FW VIFW	KPIs - Excel	ST TEAM			? 🛧 -	- 🗆 Sic	×
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Roof Handles Roof Stain	0	19 A	B	: X	✓ f _x	80000 E	F	G	H		I	Turnov	J	К	L	V
Roof Handles Roof Stain Stain	0	19 A	B	: X	✓ fx D	80000 E	F Days	G	Expecte	d No	n-moving	Turnov	J Ver	К	L	V
Roof Handles Roof Stain Stain Paint_equipme	0	19 A	B	: X	✓ fx D ABC analysis	80000 E Inventory value	F 7 Days of supply	G Expected y overstock va	Expecte stockou	d No t value inv	n-moving entory value	Turnov 2 Turns/1	j ver year l	K Days to sell	L Gross margin	¥
Roof Handles Roof Stain Stain Paint_equipme Padlocks	0 1 2 3	19 A	B Category Plywood	C Item code	✓ fx D ABC analysis A 34.8%	80000 E Inventory value	F Days of supply	G Expected v overstock va 8	Expecte stockou 0 1365	d No t value inv 72.4844	n-moving entory value	Turnov 2 Turns/1 0 39.29	year 292929	К Days to sell 9.295565553	L Gross margin 44.07%	V
Roof Handles Roof Stain Stain Paint_equipme Padlocks Nails	0 1 2 3 4	19 A 1 1 2	B Category Plywood Roof	: X C Item code L1010 R1001	ABC analysis A 34.8% A 18.5%	80000 E Inventory value 87 24	F Days of supply 712	G Expected overstock va 8 4	Expecte stockou 0 1365	d No t value inv 72.4844 51900	n-moving entory value	Turnov Turns/ 0 39.29 0 71.96	J rer year I 292929 6666667	K Days to sell 9.295565553 5.075266327	L Gross margin 44.07% 46.67%	Y
Roof Handles Roof Stain Stain Paint_equipme Padlocks Nails Paint_equipme	0 1 2 3 4 5	19 A 1 2 3	B Category Plywood Roof Hinges	: C Item code L1010 R1001 H2020	f x D ABC analysis A 34.8% A 18.5% A 4.99%	80000 E Inventory value 8 24 406.80000	F Days of supply 712 400 031	G Expected overstock va 8 4 2	Herein He	d No tvalue inv 72.4844 51900 2.08008	n-moving entory value	Turnov 2 Turns/ 0 39.29 0 71.96 0	year 29292929 6666667 171.5	K Days to sell 9.295565553 5.075266327 2.129737609	L Gross margin 44.07% 46.67% 20.30%	×
Roof Handles Roof Stain Stain Paint_equipme Nails Paint_equipme Nails	0 1 2 3 4 5 6	19 A 1 2 3 4	B Category Plywood Roof Hinges Lumber	: C Item code L1010 R1001 H2020 L2020	f x D ABC analysis A 34.8% A 18.5% A 4.99% A 6.76%	80000 E Inventory value 87 24 406.80000	F Days of supply 712 400 031 665	G Expected overstock va 8 4 2 3	Here and the stockou 0 13657 0 19242 0 19242	d No t value inv 72.4844 51900 2.08008 16264	n-moving entory value	Turnov Turns/ 0 39.29 0 71.96 0 0 0	year 4 2929292 666667 171.5 110.8	K Days to sell 9.295565553 5.075266327 2.129737609 3.296480144	L Gross margin 44.07% 46.67% 20.30% 37.85%	

Next: Creating Purchase Orders

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