REDUCING WASTE AND IMPROVING THE SUPPLY CHAIN MODEL OF TIM HORTONS

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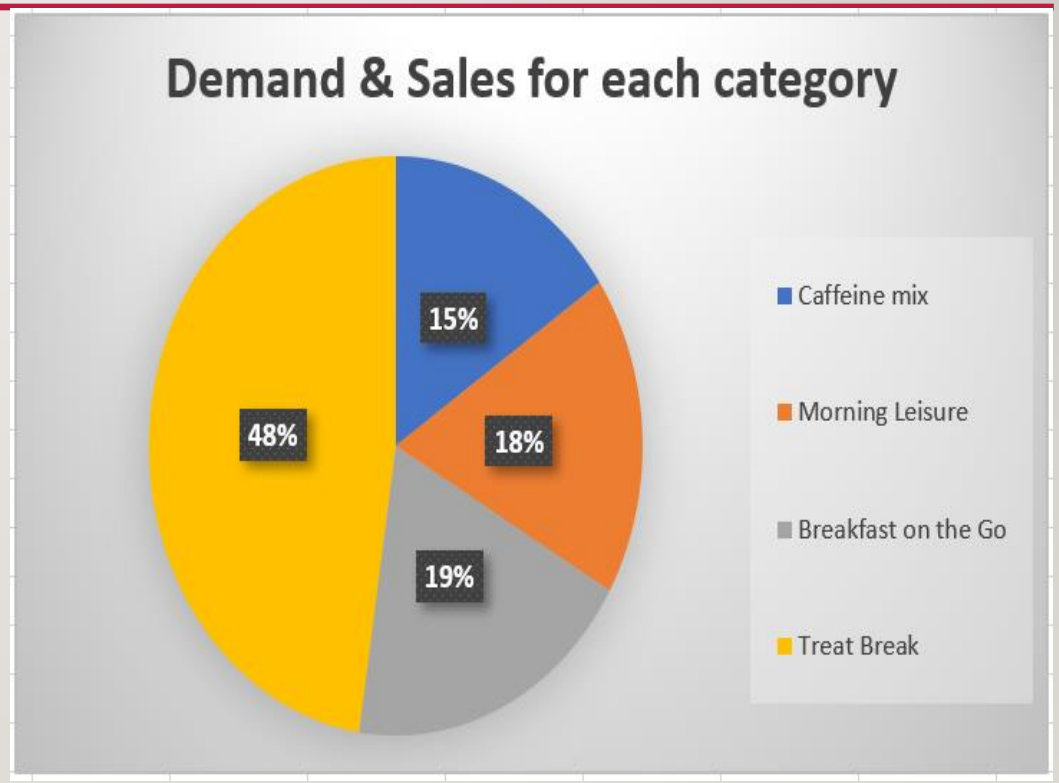
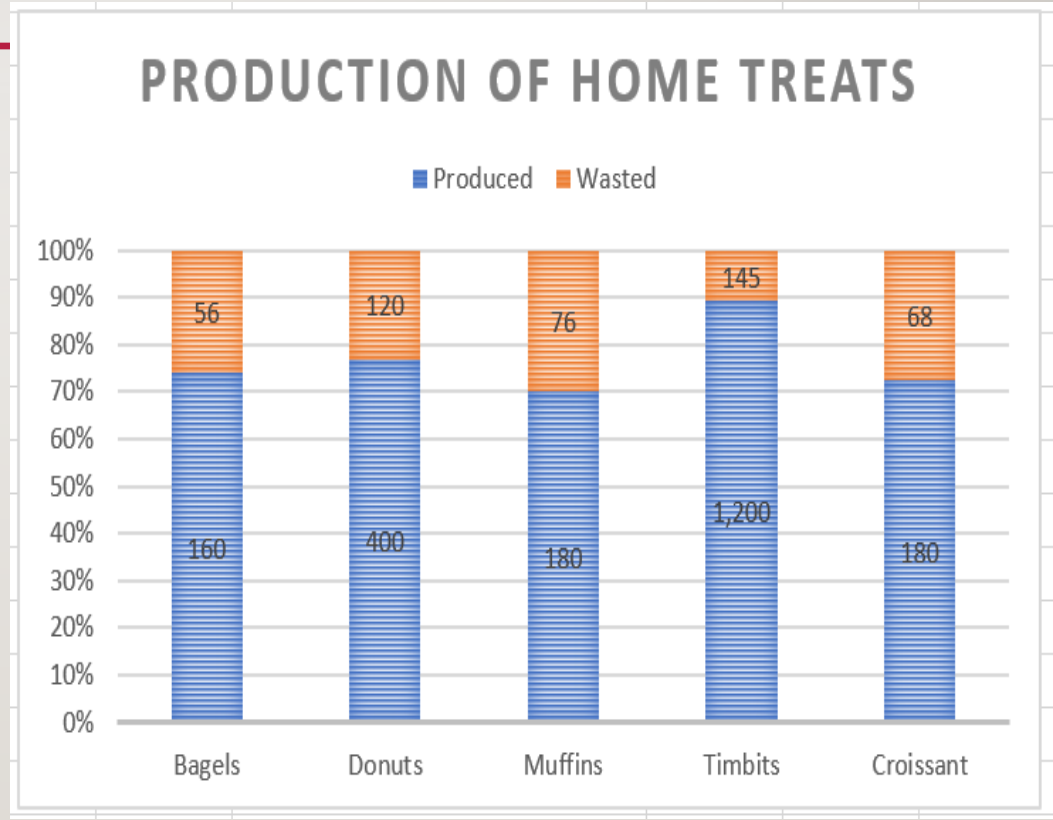
INTRODUCTION

- Our project is based on analyzing the Supply Chain Management for **Canada' #1 Coffee Selling Brand, the Tim Hortons.**
- This popular fast food restaurant chain has made its mark in several parts of Canada operating in more than 4,304 locations as per studies during the year 2013.
- The major areas for running the Supply Chain for Tim Hortons are **Procurement & Logistics, Manufacturing and Warehouse Distribution**.



INTRODUCTION

- The numbers illustrated are analyzed on a daily basis for a period of 8 hours.
- As we observe, close to 20% – 30% of products baked are wasted everyday due to inaccurate planning of demand.



COMPETITIVE STRATEGY

- Tim Hortons' products have price lower than competitor's goods.
- Tim Hortons also does not wish to sacrifice quality, providing the finest Arabica coffee and striving for high quality customer service.
- Compared to Starbucks of the same size, Tim Hortons is much more affordable.

FINANCIAL METRICS

- **Return on equity = Net Income/ Average shareholder equity**

Total current assets of Tim Horton's are valued at = $ 506,892

Liabilities and equity = 453,750$

Net Income = 114, 955 $

Return on Equity = 114, 955/ 506,892 $-453,750 $ =2.163

Tim Horton's is recording is recording a positive net income so return on equity is also positive.

- **Return on assets= Earnings before interest/Average total Assets**

Earnings before interest= 8, 16,866 $

Assets=2,265,752 $

Return on Assets=0.360

FINANCIAL METRICS

- **Accounts payable** = Total supply purchases/ (Beginning accounts payable + Ending Accounts payable)/2 = 180,102 $
- **Cash to Cash cycle** = 44,877$
- **Property, plant and equipment** = 1, 615, 880 $

CUSTOMER SEGMENTATION

Aging Boomers

Millennials

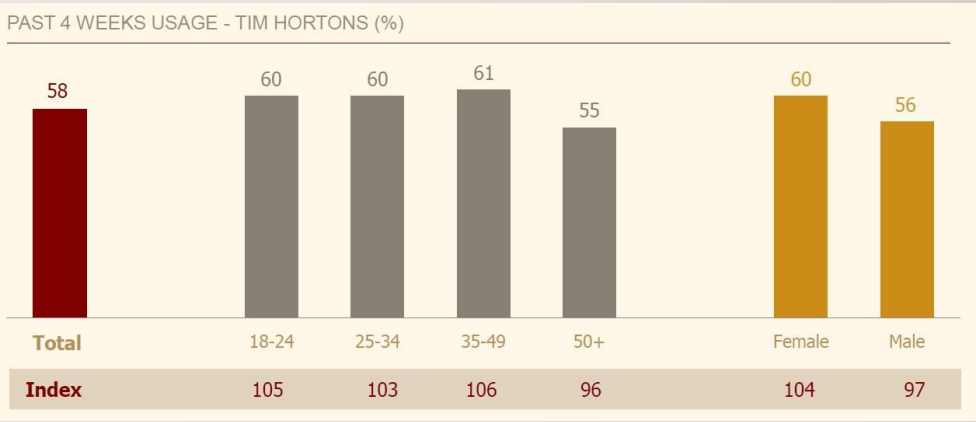
Convenience 'on the go'

Ethnic Diversity

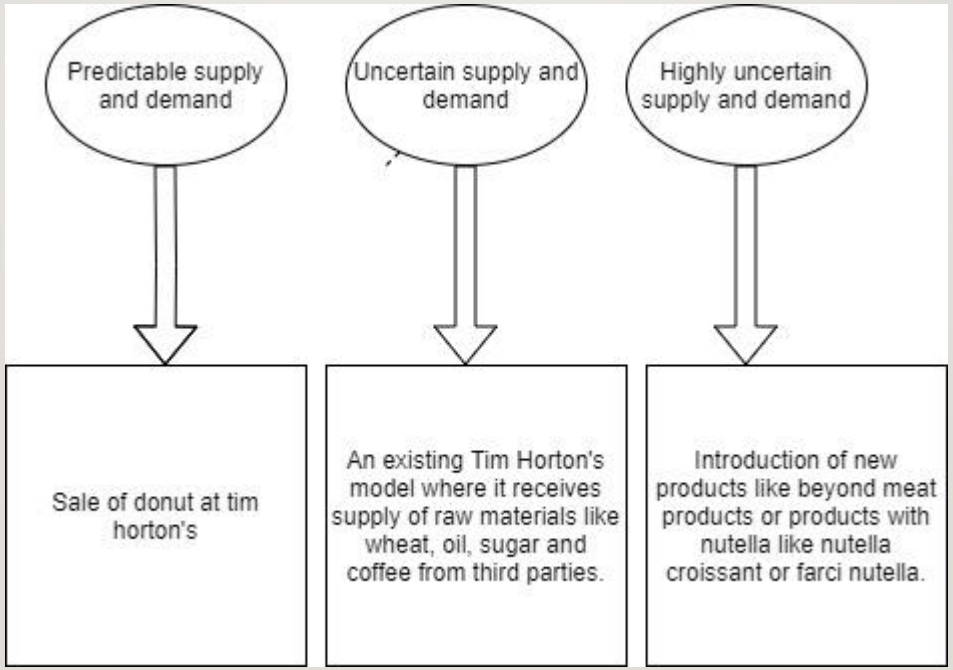
Trading Up

Trading Down

PAST 4 WEEKS USAGE - TIM HORTONS (%)



DEMAND AND SUPPLY UNCERTAINTY AT TIM HORTON'S



DRIVERS OF SUPPLY CHAIN

Facilities & its associated metrics

- Production cost from four potential distribution centers to various Tim Hortons locations are illustrated in the adjacent figure.

Average production cost :625000

S.No	Distribution Centers	Cost
1	Montreal	600,000
2	Hamilton	700,000
3	Calgary	400,000
4	Langley	800,000

INVENTORY AND ITS METRICS

Components of Inventory

- **Cycle Inventory**

Average amount of inventory used to satisfy demand between supplier shipments

Average Inventory for a week =$3300

- **Safety Inventory**

Inventory held in case demand exceeds expectations

Safety inventory for a week=$300-$400

	As at	
	June 29, 2014	December 29, 2013
Raw materials	$ 25,061	$ 22,789
Finished goods	78,332	69,348
	103,393	92,137
Inventory obsolescence provision	(1,418)	(1,754)
Inventories, net	101,975	90,383
Prepaids and other	15,801	13,943
Total Inventories and other, net	**$ 117,776**	**$ 104,326**

TRANSPORTATION RELATED METRICS

Transportation from the four potential distribution centers to different Tim Hortons locations are as below.

S.No	Distribution Centers	Cost
1	Montreal	500,000
2	Hamilton	1,500,000
3	Calgary	400,000
4	Langley	1,800,000

Average outbound transportation cost per shipment :-1050000

INFORMATION & ITS RELATED METRICS

- Companies should rely on **80/20 rule** in which companies should gather input from 20% of its customers that generate 80% of the income for the company.
- **Frequency of update :** Frequency of update is usually monthly or quarterly. Frequency of update increases during festival season or when rewards scheme is launched

SOURCING & ITS RELATED METRICS

Criterion for selecting suppliers for Tim Horton's :

1. All suppliers meet the initial investment requirements and are willing to commit to the Business full time
2. Willing to divest of businesses which are direct competition to the Tim Hortons business
3. Prior management experience, preferably in food service and/or restaurant operations
4. Strong communication skills and leadership qualities.

SOURCING & ITS RELATED METRICS

Supplier lead time : It is the time passed between the day an order is booked to the time an actual delivery is made.

Supplier lead time is calculated in days, hours or minutes.

Supplier lead time at Tim Horton's ?

- Order to be booked on TDL page online by Tuesday 14:00 hours.
- Supply is received by Thursday 12:00 noon. Total time elapsed between the order booked on Tuesday and an order received by Thursday is 46 hours.

SOURCING & ITS RELATED METRICS

Percentage of on time deliveries : Percentage of on time deliveries in supply chain is how many orders of the customers are processed on time and in full.

Tim Horton's On Time Delivery Window : 5 days early, 0 days late.

Tim Horton's ordered 10 cartons of milk and cream from dairy farmers of Canada and they were received in 3 batches of 3 cartons on 8th November, 3 cartons on 5th December, and 4 cartons on 8th December respectively. The supply window was 5th of December.

- Total cartons shipped = 10 cartons
- Total cartons delivered on time= 6 cartons
- % age of on time deliveries= 6/10= 60%

PRICING & ITS RELATED METRICS

The pricing at Tim Horton's is **fixed pricing.**

Pricing is the last step in the supply chain and it induces some fresh money in the supply chain.

- **Profit margin** = Net profits (or income)/Net Sales (or revenue)

  Net profit=114,955 ; Net Sales= 825,353

  Profit Margin=114,955/825,353= 0.1392798

- **Days sales outstanding** = (Account receivable/Annual revenue)/Number of days in a year

  Accounts receivable=180,102 $; Annual revenue= 825,353$

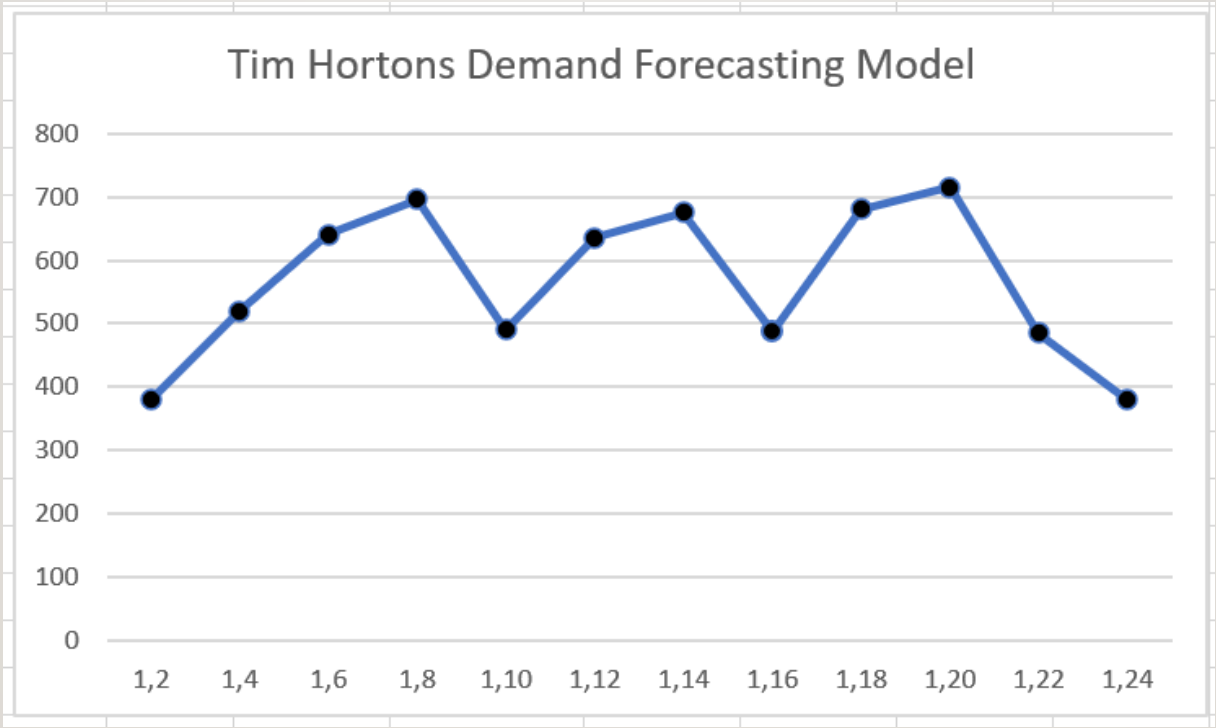
  Days sales outstanding=(180,102/825,353)/365 =79.64 days

DEMAND FORECASTING FOR TIM HORTONS

- Considered Adaptive Forecasting method.
- The table shows the Sales data of Tim Hortons per day operating for 22 hours.
- The data is split with a time interval of 2 hours between each period.
- Sales during hours of **5:00 - 7:00, 11:00 - 13:00 and 18:00 - 20:00 hours** are considerably higher on all days as recorded.

Period t	Day, Hrs	Demand D_t
1	1,2	380
2	1,4	520
3	1,6	640
4	1,8	696
5	1,10	490
6	1,12	636
7	1,14	675
8	1,16	487
9	1,18	680
10	1,20	715
11	1,22	485
12	1,24	380

DEMAND FORECASTING CONT.



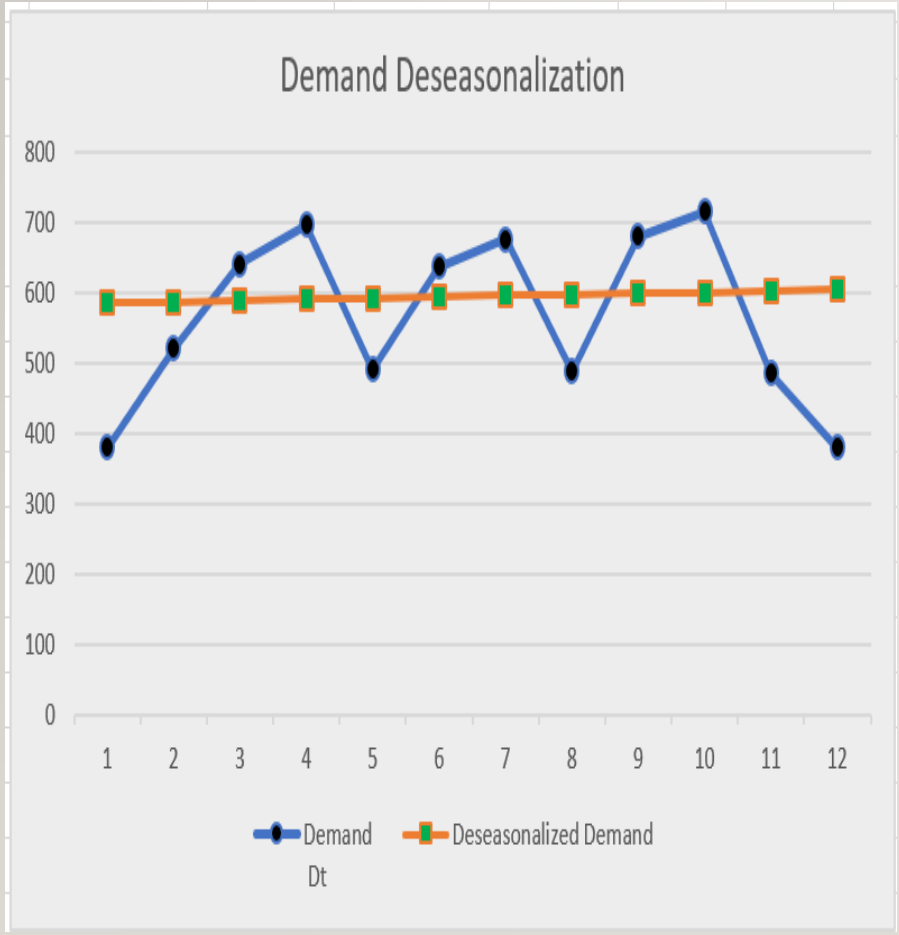
DE-SEASONALIZED DEMAND & LINE EQUATION CALCULATIONS

Period t	Day, Hrs	Demand D_t	Deseasonalized Demand
1	1,2	380	
2	1,4	520	513
3	1,6	640	619
4	1,8	696	609
5	1,10	490	607
6	1,12	636	600
7	1,14	675	599
8	1,16	487	614
9	1,18	680	627
10	1,20	715	627
11	1,22	485	527
12	1,24	380	

X-variable (T)	Intercept (L)
1.747475	582.8747475

FUNCTION : {=LINEST(B12:B19,C12:C19,TRUE,FALSE)}

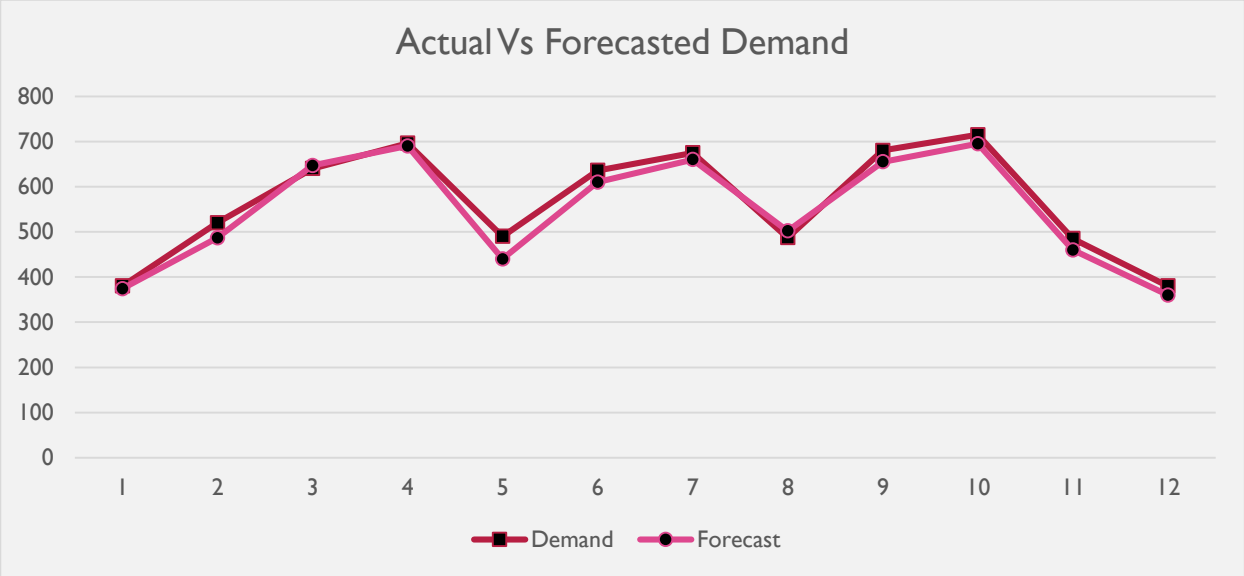
DE-SEASONALIZED DEMAND CONT.



Period t	Demand D_t	Deseasonalized Demand	Seasonal Factor
1	380	584.55	0.65
2	520	586.3	0.89
3	640	588.05	1.09
4	696	589.8	1.18
5	490	591.55	0.83
6	636	593.3	1.07
7	675	595.05	1.13
8	487	596.8	0.82
9	680	598.55	1.14
10	715	600.3	1.19
11	485	602.05	0.81
12	380	603.8	0.63

DE-SEASONALIZED DEMAND CONT.

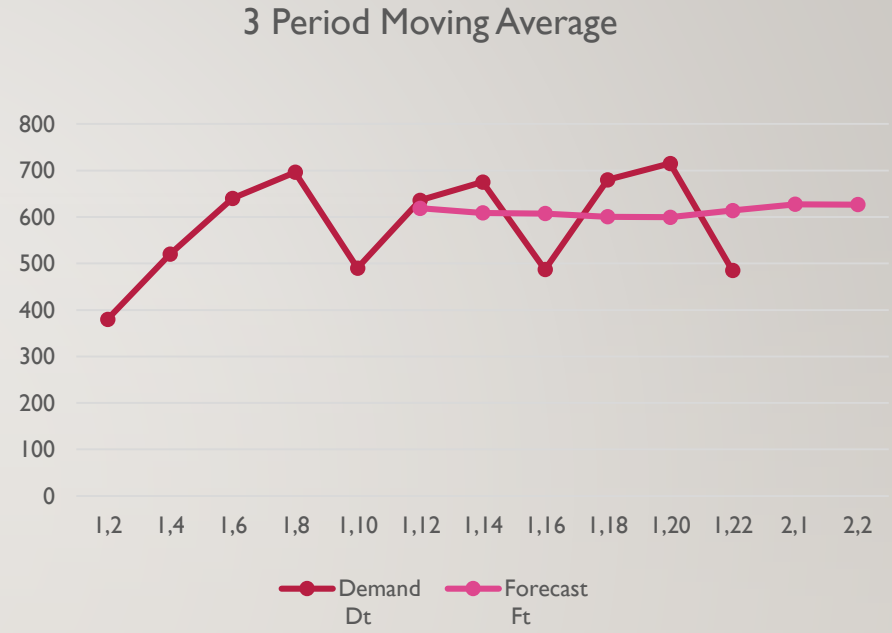
Period t	Demand D_t	Deseasonalized Demand	Seasonal Factor	Estimate S_i	Forecast
1	380	584.55	0.65	0.64	374
2	520	586.3	0.89	0.83	487
3	640	588.05	1.09	1.19	700
4	696	589.8	1.18	1.34	790
5	490	591.55	0.83		379
6	636	593.3	1.07		492
7	675	595.05	1.13		708
8	487	596.8	0.82		800
9	680	598.55	1.14		383
10	715	600.3	1.19		498
11	485	602.05	0.81		716
12	380	603.8	0.63		809



Period	Forecast
2,0	387
2,2	510
2,4	632
2,6	690

3-Period Moving Average

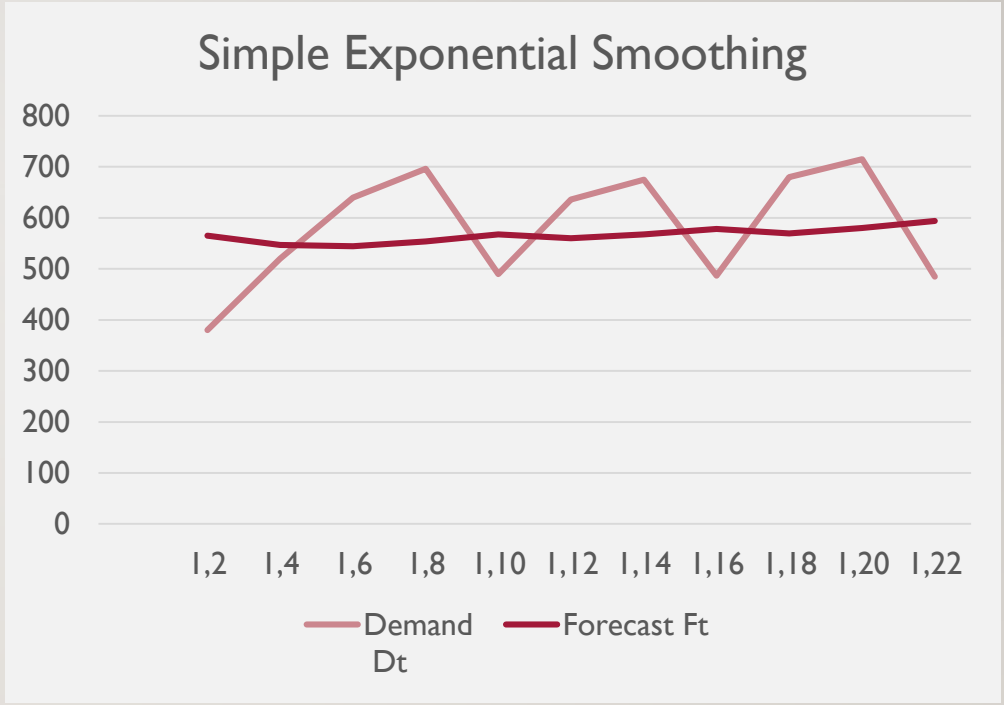
Period t	Day, Hrs	Demand D_t	Level L_t	Forecast F_t	Error E_t	Absolute Error A_t	Mean Squared Error MSE_t	MAD_t	% Error	$MAPE_t$	TS_t
1	1,2	380									
2	1,4	520									
3	1,6	640									
4	1,8	696									
5	1,10	490	618.6667		-490	490	48017	245	100	100	-2
6	1,12	636	608.6667	618.6667	-17.3333	17.33333333	40063.74	169.1111	2.725367	51.36268	-3
7	1,14	675	607.3333	608.6667	-66.3333	66.33333333	34968.51	143.4167	9.82716	37.51751	-4
8	1,16	487	600.3333	607.3333	120.3333	120.3333333	32407.08	138.8	24.7091	34.31541	-3.26609
9	1,18	680	599.3333	600.3333	-79.6667	79.66666667	29511.16	128.9444	11.71569	29.79546	-4.13356
10	1,20	715	614	599.3333	-115.667	115.6666667	27897.62	127.0476	16.17716	27.52575	-5.1057
11	1,22	485	627.3333	614	129	129	26874.02	127.2917	26.59794	27.3932	-4.08249
12	2,1		626.6667	627.3333							
	2,2			626.6667							
	2,3										



Period	Forecast
2,0	627.333
2,2	626.6667
2,4	626.6667
2,6	626.6667

Demand Forecasting using Simple Exponential Smoothing

Period t	*Day, Hrs*	Demand D_t	Level L_t	Forecast F_t	Error E_t	Absolute Error A_t	Mean Squared Error MSE_t	MAD_t	% Error	$MAPE_t$	TS_t
0			565.3333								
1	1,2	380	546.8	565.3333	185.3333	185.3333	34348.44	185.3333	148.7719	148.7719	1
2	1,4	520	544.12	546.8	26.8	26.8	17533.34	106.0667	105.1538	126.9629	2
3	1,6	640	553.708	544.12	-95.88	95.88	14753.22	102.6711	85.01875	112.9815	1.132289
4	1,8	696	567.9372	553.708	-142.292	142.292	16126.67	112.5763	79.55575	104.6251	-0.2313
5	1,10	490	560.1435	567.9372	77.9372	77.9372	14116.18	105.6485	115.9056	106.8812	0.491238
6	1,12	636	567.7291	560.1435	-75.8565	75.85652	12722.52	100.6832	88.07287	103.7464	-0.23795
7	1,14	675	578.4562	567.7291	-107.271	107.2709	12548.88	101.6243	84.10802	100.941	-1.29131
8	1,16	487	569.3106	578.4562	91.45622	91.45622	12025.8	100.3533	118.7795	103.1708	-0.39633
9	1,18	680	580.3795	569.3106	-110.689	110.6894	12050.95	101.5017	83.72215	101.0098	-1.48236
10	1,20	715	593.8416	580.3795	-134.62	134.6205	12658.12	104.8136	81.17196	99.02603	-2.7199
11	1,22	485	582.9574	593.8416	108.8416	108.8416	12584.33	105.1798	122.4416	101.1547	-1.67562
12	1,24	380	562.6617	582.9574	202.9574	202.9574	14968.28	113.3279	153.4098	105.5093	0.235745
				562.6617			122.3449				

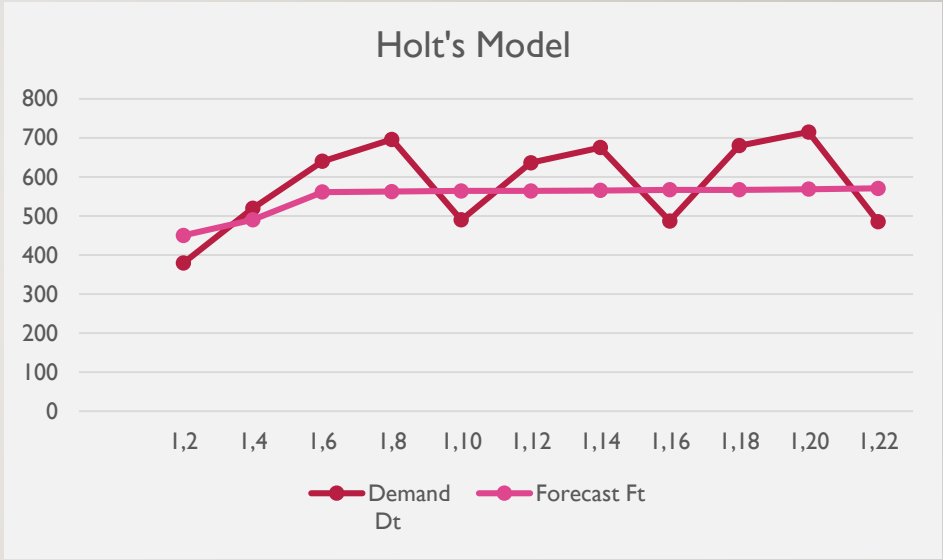


α	0.1

Period	Forecast
2,2	582.6617
2,4	562.6617
2,6	562.6617
2,8	562.6617

Demand Forecasting using Holt's Model

Period t	Day, Hrs	Demand D_t	Level L_t	Trend T_t	Forecast F_t	Error E_t	Absolute Error A_t	Mean Squared Error MSE_t	MAD_t	% Error	$MAPE_t$	TS_t
0			561.697	0.56								
1	1,2	380	560.4344	0.523549	450.172	70.172	70.172	4924.11	70.172	18.46632	18.46632	1
2	1,4	520	560.5484	0.515357	490.453	-29.547	29.547	2898.567	49.8595	5.682115	12.07422	0.81479
3	1,6	640	561.8531	0.531144	561.0638	-78.9362	78.93624	4009.355	59.55175	12.33379	12.16074	-0.64333
4	1,8	696	563.7204	0.557867	562.3843	-133.616	133.6157	7470.308	78.06775	19.19766	13.91997	-2.20228
5	1,10	490	563.5355	0.543012	564.2783	74.27829	74.27829	7079.699	77.30985	15.15883	14.16774	-1.26308
6	1,12	636	564.7977	0.557396	564.0785	-71.9215	71.92148	6761.866	76.41179	11.30841	13.69119	-2.21916
7	1,14	675	566.4516	0.579325	565.3551	-109.645	109.6449	7513.313	81.15938	16.24368	14.05583	-3.44033
8	1,16	487	566.2306	0.563319	567.0309	80.0309	80.0309	7374.767	81.01832	16.43345	14.35303	-2.45851
9	1,18	680	567.926	0.58596	566.7939	-113.206	113.2061	7979.306	84.59474	16.64795	14.60802	-3.69279
10	1,20	715	569.9768	0.615258	568.5119	-146.488	146.4881	9327.251	90.78407	20.48784	15.19601	-5.05461
11	1,22	485	569.7361	0.598139	570.5921	85.59207	85.59207	9145.319	90.31207	17.64785	15.4189	-4.13329
12	2,2	540	570.0309	0.592072	570.3343	30.33429	30.33429	8459.89	85.31392	5.617461	14.60211	-4.01988



α	0.01
β	0.02

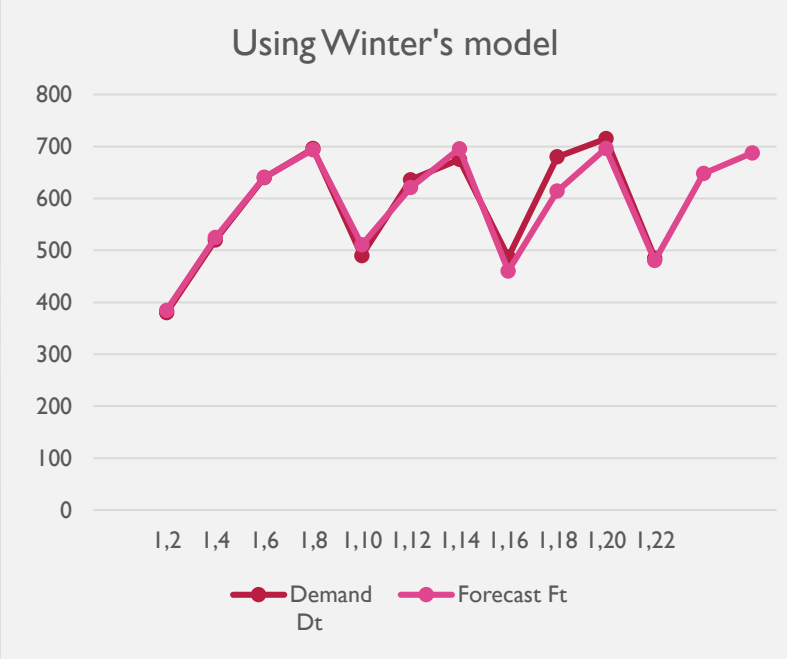
Period	Forecast
2,2	570.3343
2,4	570.623
2,6	571.2151
2,8	571.8072

De-Seasonalized Demand

Period t	*Day, Hrs*	Demand D_t	Deseasonalized Demand (Eqn 7.2)	Deseasonalized Demand (Eqn 7.3)	Seasonal Factor (Eqn 7.5)	Estimate S_i (Eqn 7.6)
1	1,2	380		490.64	0.774499	0.914182155
2	1,4	520		510.86	1.017891	1.085754617
3	1,6	640	572.75	550.92	1.161693	1.027189963
4	1,8	696	601	565.63	1.230486	0.887077326
5	1,10	490	619.875	580.82	0.843635	
6	1,12	636	598.125	599.84	1.060283	
7	1,14	675	595.75	601.48	1.122232	
8	1,16	487	629.375	603.12	0.807468	
9	1,18	680	615.5	604.76	1.124413	
10	1,20	715	578.375	606.4	1.17909	
11	1,22	485		608.04	0.797645	
12	1,24	380		609.68	0.623278	

Demand Forecast using Winter's Model

Period t	Day, Hrs	Demand D_t	Level L_t	Trend T_t	Seasonal Factor S_t	Forecast F_t	Error E_t	Absolute Error A_t	Mean Squared Error MSE_t	MAD_t	% Error	$MAPE_t$	TS_t
0			590	1.64									
1	1,2	380	588.4789	1.007785	0.65	384.566	4.566	4.566	20.84836	4.566	1.201579	1.201579	1
2	1,4	520	587.139	0.538251	0.89	524.6432	4.64317	4.64317	21.20369	4.604585	0.892917	1.047248	2
3	1,6	640	587.4427	0.491331	1.09	640.5682	0.568244	0.568244	14.24343	3.259138	0.088788	0.727761	3
4	1,8	696	588.7874	0.662015	1.18	693.7621	-2.23785	2.237852	11.93457	3.003817	0.321531	0.626204	2.509994
5	1,10	490	572.3745	-2.75297	0.888478	510.6345	20.6345	20.6345	94.70417	6.529953	4.211122	1.343187	4.314589
6	1,12	636	575.9055	-1.49618	1.089814	620.7814	-15.2186	15.2186	117.5211	7.97806	2.392861	1.518133	1.623887
7	1,14	675	573.1809	-1.74187	1.180732	695.692	20.692	20.692	161.8979	9.794337	3.065481	1.739183	3.4354
8	1,16	487	564.1377	-3.20213	0.877139	460.309	-26.691	26.691	230.7119	11.90642	5.480698	2.206872	0.584262
9	1,18	680	587.992	2.209146	1.094901	614.1687	-65.8313	65.83127	686.6056	17.89807	9.681068	3.037338	-3.28945
10	1,20	715	597.3612	3.641166	1.179649	696.2302	-18.7698	18.76979	653.1755	17.98524	2.625145	2.996119	-4.31713
11	1,22	485	580.7567	-0.40796	0.872283	480.409	-4.591	4.591	595.712	16.76758	0.946598	2.809799	-4.90444
12	2,2	540	536.8454	-9.10863	1.116453	647.9321							
13	2,4				1.185698	687.6345							



α	0.45
β	0.2
γ	0.35

Period	Forecast
2,0	647.9321
2,2	687.6345
2,4	687.1508
2,6	690.1439

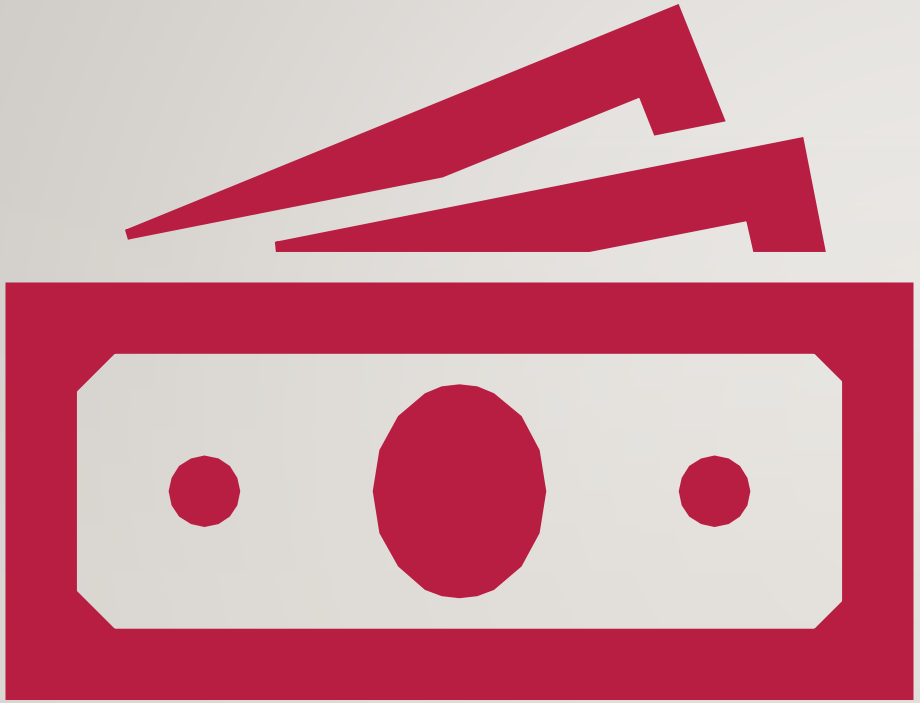
ANALYSIS OF ERROR ESTIMATES

ERROR ESTIMATES				
Forecasting Method	MAD	MAPE(%)	TS Range	
			Min	Max
Three-period moving average	127.29	27.39	-5.1	-2
Simple ecponential smoothing	113.32	105.5	-2.7	2
Holt's model	85.31	14.6	-5.05	1
Winter's model	16.76	2.8	-4.9	4.31

CYCLE INVENTORY

Product	Avg. Demand / Day	Weekly Lot sizes
Bagels	160	1120
Donuts	400	2800
Muffns	180	1260
Timbits	1200	8400
Crossiant	180	1260

INVENTORY PROFILE



JOINT ORDERS OF ALL PRODUCT

Common Order Cost(S) = $1000

Product specific cost = $100

Total Order Cost = $1000+5*($100) = $1500

Holding cost(h)=0.3

Material Costs for all products :

Bagel = $0.75

Donuts = $0.60

Muffins = $1

Tim bits = $0.15

Croissant = $1.20

JOINT ORDER OF ALL PRODUCTS CONTD.

After calculation we got order frequency (n)=0.8094

Q(bagel)=Demand(bagel)/order frequency=1120/0.8094=1383

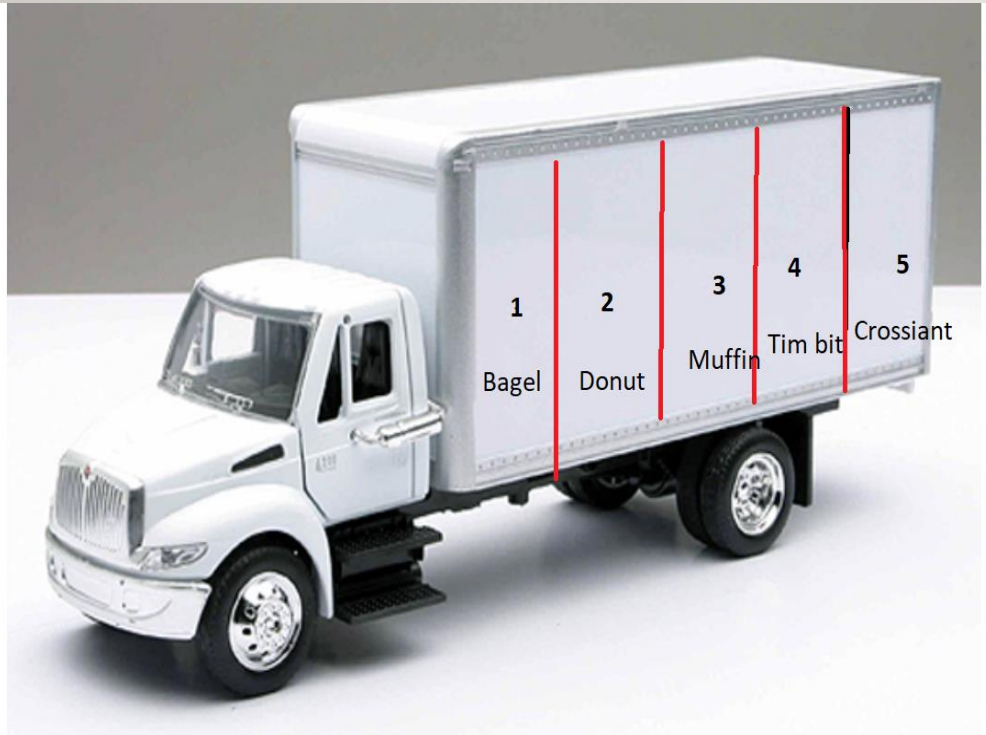
Q (Donut)= Demand(Donut)/order frequency=2800/0.8094=3459

Q(Muffins)= Demand(Muffins)/order frequency=1260/0.8094=1556

Q(Tim bits)= Demand(Tim bits)/order frequency=8400/0.8094=10378

Q(Crosiiant)= Demand(Crosiiant)/order frequency=1260/0.8094=1556

JOINT ORDER OF ALL PRODUCTS



	Bagel	Donut	Mufins	Timbits	Crossiant
Demand per week	1120	2800	1260	8400	1260
Order Frequency per week	0.8094	0.8094	0.8094	0.8094	0.8094
Optimal order Size	1383	3459	1556	10378	1556
Holding Cost weekly	155	311	233	233	800

Weekly order Cost= n*S = 0.8094*1500 = $1214

Total Weekly Cost = $2946

CONCLUSION

Through this project, we have learnt to apply the required forecasting model in order to improve the Supply Chain Performance.

Hence, by making accurate forecasts, the home-treats products can be baked in the required quantities without leading to shortages or excessive production leading to wastage.

Therefore, we can reduce the wastage of products in Tim Hortons restaurants benefitting the organization, the environment and the customers!


Tim Hortons
coffee·donuts·espresso·sandwiches·latte·bagels·smoothies·coffee·donuts

THANK YOU

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