Matt Alfano & Brittany Masi

Frito Lay Replenishment Manager:

Jeff Arndt

Corporate Structure

PEPSICO

PepsiCo Americas Foods

- *Frito-Lay North America*
- Quaker
- Sabritas
- Gamesa
- Latin American food businesses
- Power of One retail sales teams

PepsiCo Americas Beverages

- Pepsi-Cola North America
- Gatorade
- Tropicana
- Latin American beverage businesses
- North America foodservice

PepsiCo International

Our food, snack and beverage businesses in:

- U.K.
- Europe
- Asia
- Middle East
- Africa

Frito-Lay North America represents 37% of PepsiCo's profit and about 29% of its revenues. *

Frito-Lay North America

- Convenient foods leader

- $11 billion in annual sales

- Division of PepsiCo

- 48,000+ employees

- Headquartered in Plano, TX

- 70+ year history
  - 30+ plants and 200 distribution centers across the U.S. and Canada.
  - One of the largest private fleets in North America

Brands

Category Leader

#1 Potato Chips

#1 Corn Chips

#1 Extruded Snack

#1 Tortilla Chips

#2 Pretzels

#1 Premium Meats

#1 Dips/Salsas

#1 Branded Nuts

#1 Pita Chips

Background & Problem Situations

Out of Stock (OOS) issues due to:

- Little or no control over RSRs (route sales rep.)

- Outdated OOS Tools and Server

- Unknown appropriate delivery frequencies

- Unknown Inventory levels needed per club, per SKU

Goals & General Approach

- Create a single, user-friendly database/server to make sales information and reports more readily and easily available

- Update OOS Analysis Tools

Modeling tools used for accomplishing goals and fixing problems:

- Excel

- Smoothie

- SAS

- LES

Sample Sales Data

				200801 Total Units Sold	200802 Total Units Sold	200803 Total Units Sold	200804 Total Units Sold	200805 Total Units Sold	200806 Total Units Sold
Club Nbr	Club Name	City	State	WK 1	WK 2	WK 3	WK 4	WK 5	WK 6
4702	FRIENDSWOOD, TX	FRIENDSWOOD	TX	51	19	56	108	116	90
4703	ALBUQUERQUE, NM	ALBUQUERQUE	NM	19	28	35	29	24	30
4704	FRESNO, CA	FRESNO	CA	35	35	42	13	17	54
4707	OVERLAND PARK, KS	OVERLAND PARK	KS	30	39	49	43	53	47
4709	CORONA, CA	CORONA	CA	28	36	29	34	29	42
4710	CHESAPEAKE, VA	CHESAPEAKE	VA	35	31	55	40	47	34
4711	VIRGINIA BEACH, VA	VIRGINIA BEACH	VA	33	43	52	66	66	54
4712	HOUSTON(MEM), TX	HOUSTON(MEM)	TX	35	33	41	38	33	33
4713	SHENANDOAH, TX	SHENANDOAH	TX	65	60	49	55	63	47
4718	SOUTH JORDAN, UT	SOUTH JORDAN	UT	0	0	0	0	0	0
4720	AUSTIN, TX	AUSTIN	TX	68	58	45	40	61	53
4721	HOUSTON (WBROOK), TX	HOUSTON	TX	22	16	12	18	19	21
4722	WILLIAMSTOWN, NJ	WILLIAMSTOWN	NJ	27	35	18	30	26	25
4724	HOOVER, AL	HOOVER	AL	44	48	39	37	47	52
4729	STERLING, VA	STERLING	VA	27	40	28	33	34	34
4730	WEST JORDAN, UT	WEST JORDAN	UT	0	6	46	34	25	12

Report Mon Mar 29 14:51:22 2010

Report Options

Requested 221136141: (US) 2010 03 29, 16:08

Report Columns: Club Nbr, Club Name, City, State, Time Across Data Across (Requires a selection from below), WM Week, Total Units Sold

SWC# (Speed Number) Is One Of 90930 And

Selections Include By Fuzzy Dates --> Time Range 1 Last Year Totals, Time Range 1 Year Before Last Totals, Time Range 1 TY Fiscal Year to Date

Selections Include ALL OPERATIONS CORPORATE --> INVENTORY MANAGEMENT --> 151 ALL OPEN CLUBS

Notes \ SpyReport \ Seasonal adjustment \ Seasonal Adjustment Chart \ LES mode \ SA Forecast Chart \ RSForecast Chart \ Forecast \ Errors \ Texas Clubs \ Dales Clubs

Seasonal Adjustment

Club Number: 6428 MEDFORD, NY

=VLOOKUP($C$2,SpyReport!A:D,2,FALSE)

Drop down bar with all clubs

=4*I7/$I$11

	A	B	C	D	E	F	G	H	I	J
	Date	Original	Trend-Cycle	Ratio	Seasonal	Seasonally	Irregular		Unnormalized	Normalized
	Weeks	Data	(Ctr-Mov-Avg)	(Seasonality)	Index	Adjusted Data			Seas. Index	Seas. Index
7	1	31			101.67%	30.491			99.874%	100.9162%
8	2	27			106.61%	25.325			89.865%	90.8027%
9	3	13	22.750	57.143%	100.92%	12.882	56.624%		100.618%	101.6681%
10		25		60.094%	90.80%	17.621	66.181%		105.511%	106.6129%
11		50		118.084%	101.67%	38.360	117.130%		395.867%	400.0000%
12		25			106.61%	46.899	128.051%			
13		25			100.92%	38.64				
14		00		61.765%	90.80%	23.12				
15	9	30	32.500	92.308%	101.67%	29.508	90.793%			
16	10	42	32.375	129.730%	106.61%	39.395	121.683%			
17	11	35	32.125	108.949%	100.92%	34.682	107.960%			
18	12	24	31.25	75.889%	90.80%	26.431	83.576%			
19	13	25		88%	101.67%	24.590	74.515%			
20	14	43		55%	106.61%	40.333	114.015%			
21	15	45		00%	100.92%	44.591	118.910%			
22	16	33		39%	90.80%	36.343	98.223%			
23	17	33		07%	101.67%	32.459	93.743%			
24	18	31		1%	106.61%	29.077	84.897%			
25	19	38	34.000	111.765%	100.92%	37.655	110.750%			
				108.029%	90.80%	40.748	118.971%			
				81.203%	101.67%	26.557	79.871%			
28	22	39	27.750	140.541%	106.61%	36.581	131.823%			
29	23	22	23.500	93.617%	100.92%	21.800	92.767%			
111	105	42	68.167	61.614%	101.67%	41.311	60.603%			
112	106	59	53.000	111.321%	106.61%	55.340	104.416%	45		
113	107	40	45.750	87.432%	100.92%	39.637	86.638%	46	6	6
114	108	37	41.917	88.270%	90.80%	40.748	97.211%	46	9	9
115	109	42	39.583	106.105%	101.67%	41.311	104.364%	45	3	3
116	110	48	43.667	109.924%	106.61%	45.023	103.105%	45	-3	3
117	111	67	54.917	122.003%	100.92%	66.392	120.895%	46	-21	21
118	112	51	57.167	89.213%	90.80%	56.166	98.249%	48	-3	3
119	113	52	54.083	96.148%	101.67%	51.147	94.570%	48	-4	4
120	114	22	39.333	55.932%	106.61%	20.635	52.463%	49	27	27
121								46	0	10
122		46	Average:						1512	

Row 112 (Forecast/Difference/Abs): Forecast 45, Difference -14, Abs 14

Header for H/I/J at rows 111–112: Forecast | Difference | Abs

=VLOOKUP($C$2,SpyReport!A:DN,VALUE(A7)+4,FALSE)

=B10/C10

=B11/E11

=AVERAGE(D9,D13,D17,D21,D25,D29,D33,D37,D41,D45,D49,D53,D57,D61,D65,D69,D73,D77,D81,D85,D89,D93,D97,D101,D105,D109)

=(AVERAGE(B15:B18)+AVERAGE(B16:B19))/2

Cut out data temporarily

=H112-B112

=SUMPRODUCT(I112:I120,I112:I120)

Average:

$y = 2E-11x^6 + 2E-07x^5 - 4E-05x^4 + 0.0045x^3 - 0.1875x^2 + 2.7124x + 21.551$

$R^2 = 0.3769$

Legend:
- Original data
- Moving average
- Seasonally adjusted
- Poly. (Original data)

Linear Exponential Smoothing (LES)

	A	B	C	D	E	F	G	H	I	J	K	L
1	LES Forecast				Unnormalized	Normalized				Auto(1)=	-0.04	
2					Seas. Index	Seas. Index				Auto(2)=	-0.42	
3					99.874%	100.5201%				Auto(3)=	-0.13	
4		Alpha	RMSE		89.865%	90.4463%				Auto(4)=	0.07	
5		0.4	15.23012732		102.178%	102.8393%				Auto(5)=	0.05	
6					105.511%	106.1944%						
7					397.427%	400.0000%						
8												
9												
10												
11	Date	Original	Centered	Ratio	Seasonal	Seasonally	LES	LES	Reseasonalized	Confidence Interval		
12	Weeks	Data	Moving Average		Index	Adjusted Data	Forecast	Error	Forecast	Low	High	
13	1	31			102.84%	30.1	30.1	0.0	31.0	0	61	
14	2	27			106.19%	25.4	30.1	-4.7	32.0	-5		
15	3	13	22.8	57.14%	100.52%	2.9	26.4	-13.4	26.5	-18	43	
16	4	16	26.	60.09%	90.45%		14.9	2.8	13.4		48	
17	5	39	32.		102.84%	37.9	14.2	23.7	14.6	7	68	
18	6				106.19%	47.1	30.7	16.4	32.6	17	78	
19	7			07.96%	100.52%	38.8	45.2	-6		8	69	
20	8			1.76%	90.45%	23.2	44.0	-2		-7	54	
21	9			2.31%	102.84%	29.2	30.3	1.1	31.2	-1	60	
22	10			29.73%	106.19%	39.6	29				70	
23	11	35	32.1	108.95%	100.52%	34.8	36				65	
24	12	24	31.6	75.89%	90.45%	26.5	36				57	
25	13	25	33.0	75.76%	102.84%	24.3	29				55	
26	14	43	35.4	121.55%	106.19%	40.5	24.	16.0	26.0	10	71	
27	15	45	37.5	120.00%	100.52%	44.8	35.7	9.0	35.9	14	75	
28	16	33	37.0	89.19%	90.45%	36.5	43.9	-7.4	39.7	6	67	
29	17	33	34.6	95.31%	102.84%	32.1	40.4	-8.3	41.5	2	63	
30	18	31	34.3	90.51%	106.19%	29.2	35.0	-5.8	37.2	-1	60	
31	19	38	34.0	111.76%	100.52%	37.8	30.3	7.6	30.4	7	68	
32	20	37	34.3	108.03%	90.45%	40.9	35.3	5.6	31.9	10	71	
33	21	27	33.3	81.20%	102.84%	26.3	40.0	-13.7	41.1	-4	57	

Callouts:

- =E3*4/$E$7
- =SQRT(VAR(H15:H117) +AVERAGE(H15:H117)^2)
- =F13-2*
- =F13+2
- =B14/E14
- =B15/C15
- =G13*E13
- =(AVERAGE (B13:B16)+AVERAGE (B14:B17))/2
- =F14-G14
- =2*F17-F16-2*(1-Alpha) *H17+((1-Alpha)^2)*H16
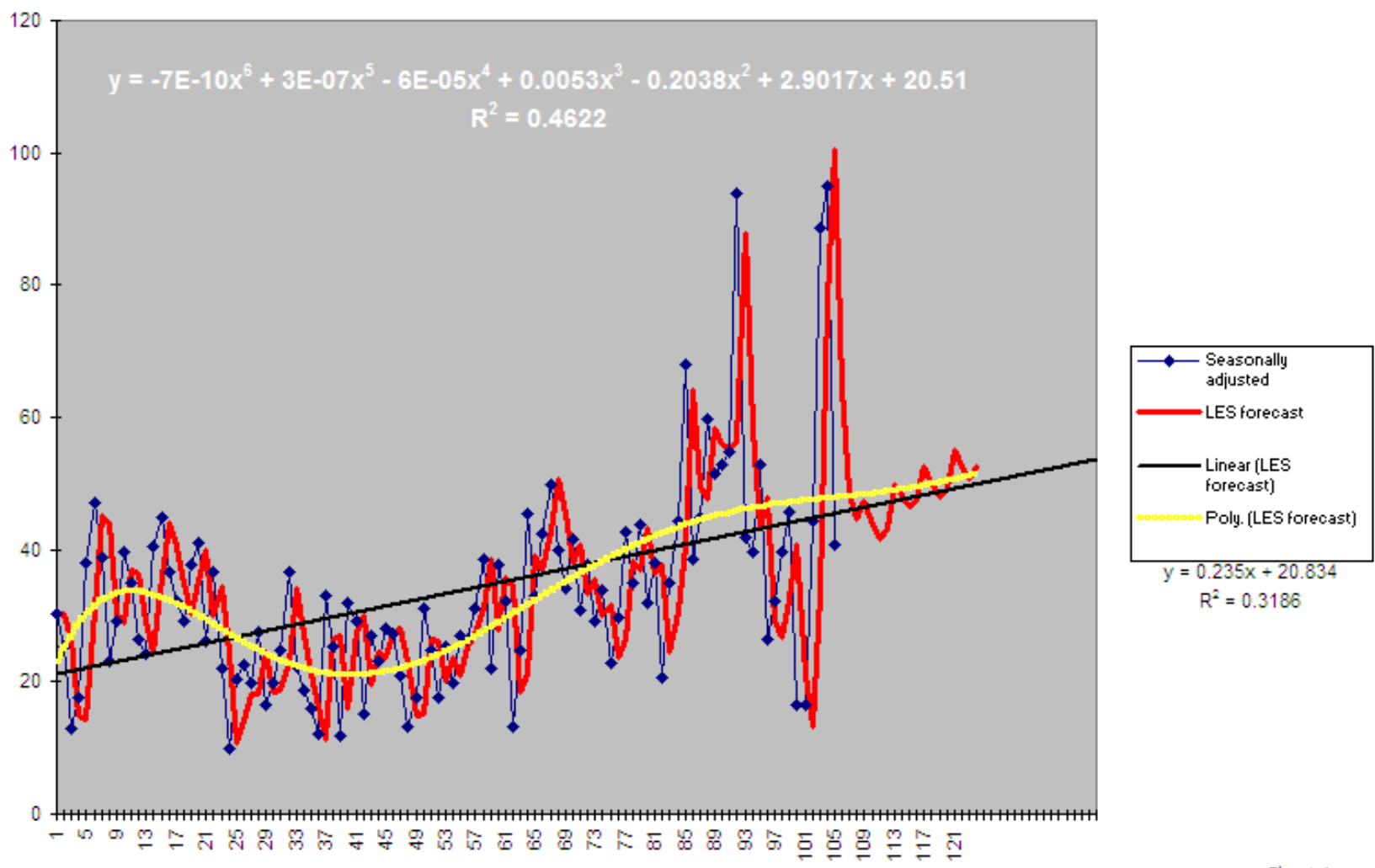
$$y = -7E-10x^6 + 3E-07x^5 - 6E-05x^4 + 0.0053x^3 - 0.2038x^2 + 2.9017x + 20.51$$

$$R^2 = 0.4622$$

Legend:
- Seasonally adjusted
- LES forecast
- Linear (LES forecast)
- Poly. (LES forecast)

$$y = 0.235x + 20.834$$
$$R^2 = 0.3186$$

$$y = 2E\text{-}11x^6 + 2E\text{-}07x^5 - 4E\text{-}05x^4 + 0.0045x^3 - 0.1875x^2 + 2.7124x + 21.551$$
$$R^2 = 0.3769$$

Original series
Reseasonalized
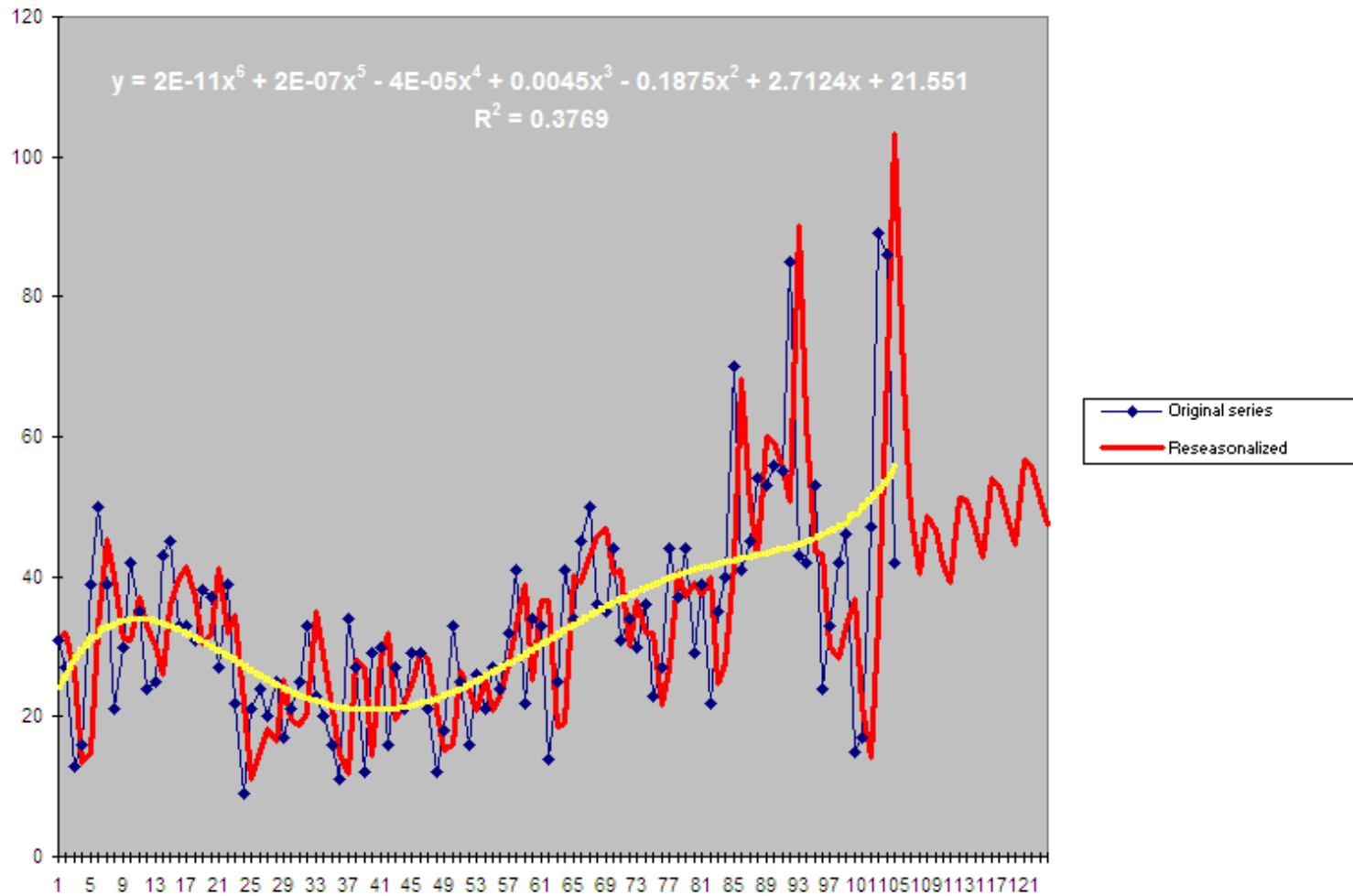
Chart Area
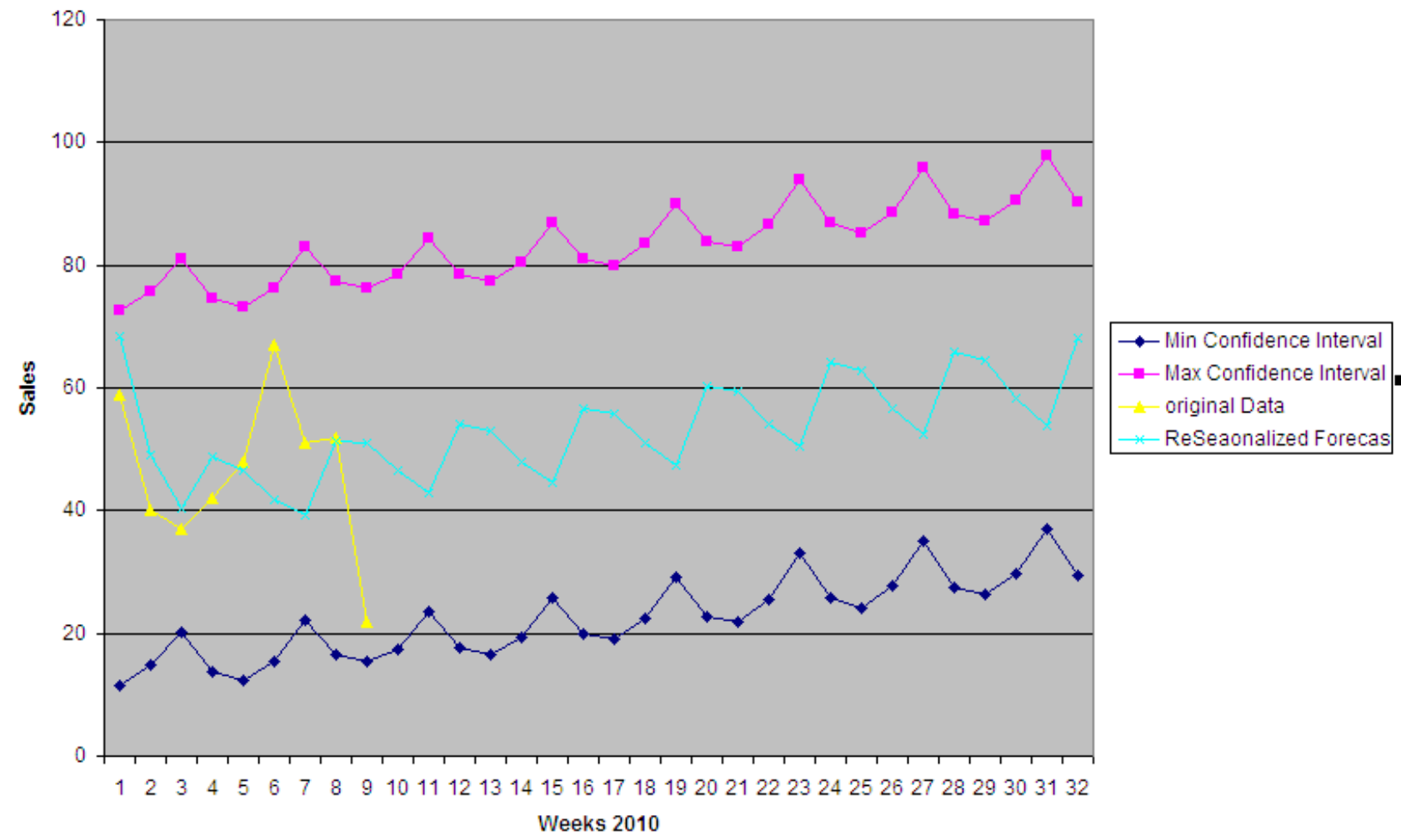
Forecast

Errors (seasonally adjusted)
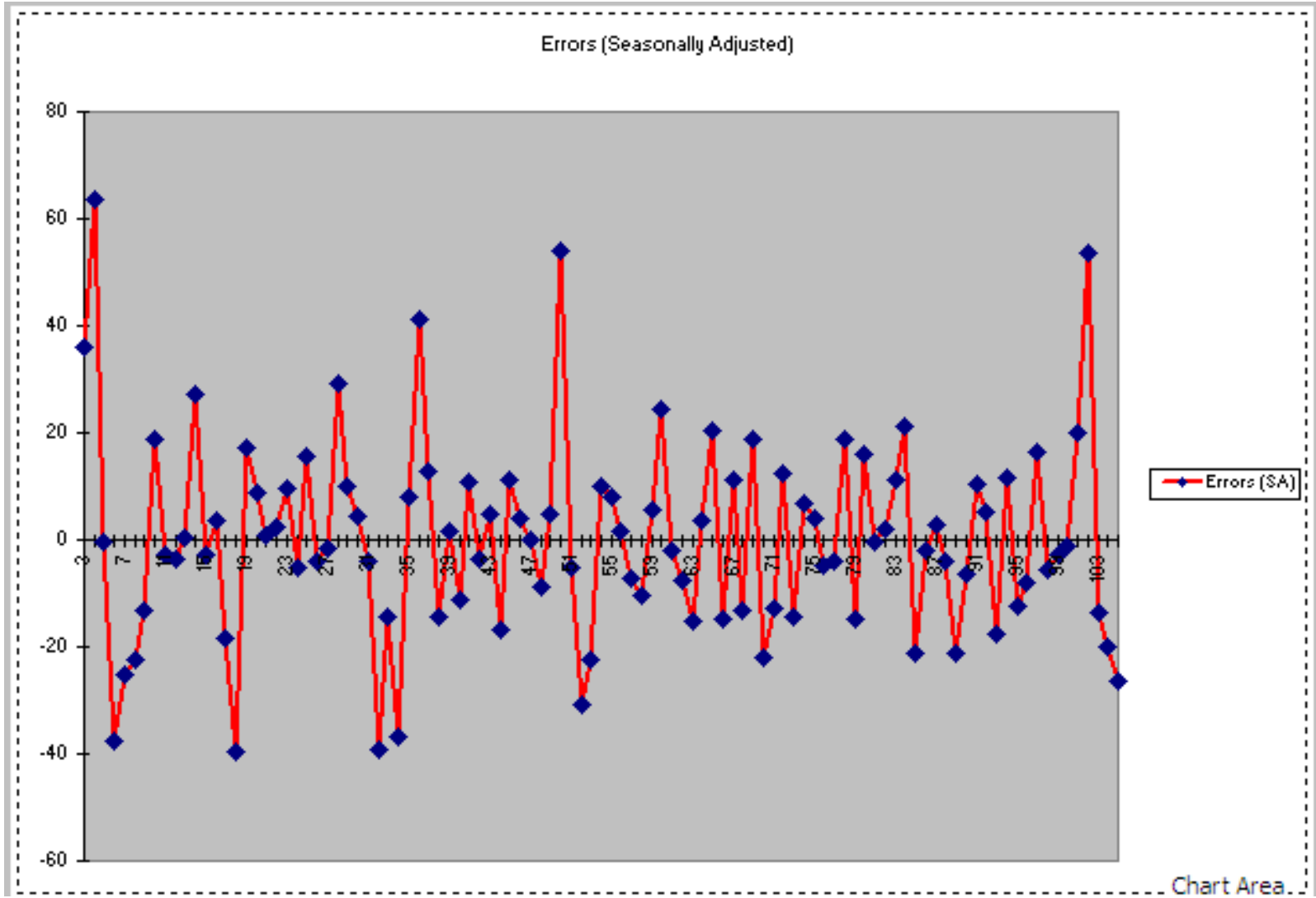
Analysis Summary

- We created multiple tools for analyzing sales data and creating forecasts for every Sam's Club nationwide

- These forecasts analyze two high volume and high demand products and give:
    - Seasonal adjustments along with LES (linear exponential smoothing) models
    - two week future forecasts with confidence intervals to measure the accuracy of those forecasts
    - centered moving averages, seasonal indices, root mean squared errors, and ratio to moving averages

Managerial Interpretation

Sam's Club representatives, RSRs and RSMs (regional sales managers) will be able to access needed, time sensitive sales information and generate reports and forecasts more easily.

Appropriate inventory levels per Club, per SKU can be established, along with proper delivery frequencies.

This will allow Frito Lay to avoid the hassle of OOS fines and gain a bit more control over the information gathering process, which is crucial when it comes to forecasting sales and maintaining moving inventory.

Conclusions & Critiques

- **User Friendly!!!**

- **Update your software!!!**

- **Keep sales records of at least 5 previous years (currently 3) for more accurate forecasts and analysis**

- **Replace/change minimum inventory levels for appropriate SKUs (currently 11 units for every product)**