FROSTY GENERAL BEER GAME MODEL

RME GRG NonLinear

RETAILE	incoming orders	expected incoming orders	actual orders	disturb-ance	model orders	error term	squared errors	effective inventory	Stock	Supply line
WEEK	IO	eIO	AO	ε	O_t	(AO-Ot)	$(AO-Ot)^2$	EI	S_t	SL_t
0	0	0								
1	4	0.00	4	1.573222	6.641397	-2.641397	6.97697691	12	12	12
2	4	0.00	4	0.143138	5.215409	-1.215409	1.47721844	12	12	12
3	4	0.01	4	-0.265891	4.810471	-0.810471	0.65686399	12	12	12
4	4	0.01	6	-1.302723	3.777726	2.2222735	4.93849964	12	12	12
5	8	0.02	10	-0.887567	6.128175	3.8718249	14.9910277	8	8	14
6	8	0.02	10	2.019859	10.563	-0.563	0.31696905	4	4	20
7	8	0.03	10	-2.486304	7.584229	2.4157712	5.83596049	0	0	28
8	8	0.04	10	0.662692	10.3294	-0.329397	0.10850268	-2	0	30
9	8	0.05	8	-0.465443	9.209412	-1.209412	1.46267714	0	0	30
10	8	0.06	8	0.347901	9.168288	-1.168288	1.36489695	2	2	28
11	8	0.07	8	-1.811399	6.154512	1.8454877	3.40582477	4	4	26
12	8	0.07	8	0.665664	9.933813	-1.933813	3.73885867	1	1	29
13	8	0.08	8	-0.29904	8.996344	-0.996344	0.99270097	-4	0	34
14	8	0.09	8	-1.425655	7.362856	0.6371442	0.40595272	-9	0	39
15	8	0.10	8	-1.163101	8.457478	-0.457478	0.20928645	-1	0	31
16	8	0.11	8	0.152449	9.163142	-1.163142	1.35289978	-7	0	37
17	8	0.11	8	-1.471088	7.135723	0.8642767	0.74697425	-11	0	41
18	8	0.12	8	-0.462005	8.854515	-0.854515	0.73019616	1	1	29
19	8	0.13	8	0.930074	8.098138	-0.098138	0.00963113	6	6	24
20	8	0.14	8	-2.489204	4.686918	3.3130817	10.9765104	6	6	24
21	8	0.15	8	0.621107	7.80528	0.1947203	0.03791599	6	6	24
22	8	0.15	8	-0.505693	6.686521	1.3134791	1.72522735	6	6	24
23	8	0.16	8	-0.475306	6.724942	1.2750584	1.62577397	6	6	24
24	8	0.17	7	-0.070656	7.137616	-0.137616	0.01893829	6	6	24
25	8	0.18	7	1.144954	8.464239	-1.464239	2.14399599	6	6	23
26	8	0.19	8	1.124921	8.555211	-0.555211	0.30825945	6	6	22
27	8	0.19	7	0.106732	7.545022	-0.545022	0.29704947	6	6	22
28	8	0.20	7	0.455909	8.436492	-1.436492	2.06351028	5	5	22
29	8	0.21	7	0.347901	8.870769	-1.870769	3.49977676	4	4	22
30	8	0.22	8	-1.811399	6.822441	1.1775586	1.38664424	4	4	21
31	8	0.23	8	0.665664	9.738777	-1.738777	3.02334428	3	3	22
32	8	0.23	8	-0.29904	9.213336	-1.213336	1.47218405	2	2	23
33	8	0.24	8	-1.425655	8.525977	-0.525977	0.27665172	1	1	24
34	8	0.25	8	-1.163101	8.796474	-0.796474	0.63437059	1	1	24
35	8	0.26	8	0.152449	10.11996	-2.119959	4.49422554	1	1	24
36	9	0.27	16	0.343495	10.31893	5.6810672	32.2746248	1	1	24
37	10	0.27	12	-0.2939	8.879838	3.3201619	11.0234748	-6	0	39
38	11	0.28	8	-0.062909	7.787829	0.2121714	0.04501671	-13	0	50
39	12	0.30	8	0.601545	8.669246	-0.669246	0.44789	-11	0	48
40	13	0.31	8	0.761278	9.561936	-1.561936	2.43964498	-4	0	41
	mean of the disturbance			-0.261875		-0.191823	mean of the standard errors			
	std dev of the disturbance			1.102956						

Σ (AO-Ot)2	129.9369	constraints		
θ	0.00	>=0	<=1	
αs	0.53	>=0	<=1	
β	0.19	>=0	<=1	
S'	23.80	>=0	<=100	INT

GRG NonLinear

Incoming Orders:
IO = COR
Expected Incoming Orders:
$eIO = \theta * IO_{(t-1)} + (1-\theta) * eIO_{(t-1)}$
Actual Orders:
AO = ROP
Disturbance:
normally distributed white noise
mean = 0
std dev = 1
Model Orders:
$Ot = MAX(0, eIO + \alpha s(s' - S_t - \beta SL_t) + \varepsilon$
Error Term:
$AO - O_t$
Squared errors:
$(AO - O_t)^2$
Effective Inventory:
EI = REI
Stock:
St = MAX(0,EI)
Supply Line:
SLt = RSL = RSD1+RSD2+WIO+WBL

FROSTY GENERAL BEER GAME MODEL

WME - GRG NonLinear

WHOLES	incoming orders	expected incoming orders	actual orders	disturb-ance	model orders	error term	squared errors	effective inventory	Stock	Supply line
WEEK	IO	eIO	AO	ε	O_t	(AO-Ot)	$(AO-Ot)^2$	EI	S_t	SL_t
0	4	0								
1	4	0	4	0.29474	8.197245	-4.197245	17.6168626	12	12	12
2	4	0	4	-1.995166	5.907338	-1.907338	3.63793868	12	12	12
3	4	0	5	0.615569	8.518074	-3.518074	12.3768423	12	12	12
4	4	0	5	0.662012	8.507534	-3.507534	12.302795	12	12	13
5	6	0	10	-0.595523	7.193017	2.8069835	7.87915618	12	12	14
6	10	0	15	0.074865	9.521509	5.4784911	30.0138652	10	10	20
7	10	0	30	-0.777759	13.09906	16.900942	285.641839	5	5	30
8	10	0	30	0.29474	17.74699	12.253009	150.136227	0	0	55
9	10	0	25	-1.995166	14.31743	10.682568	114.117264	0	0	75
10	8	0	20	0.615569	15.78851	4.2114855	17.7386099	-5	0	95
11	8	0	25	-0.254267	13.94997	11.050027	122.103091	-10	0	112
12	8	0	20	-0.602145	12.34848	7.6515222	58.545792	-15	0	134
13	8	0	10	1.810805	14.5335	-4.533497	20.5525976	-7	0	138
14	8	0	5	0.068255	12.33509	-7.335085	53.8034779	-13	0	146
15	8	0	8	-0.159839	12.05001	-4.050009	16.4025768	-17	0	147
16	8	0	8	-0.704131	12.18951	-4.189509	17.5519879	-5	0	135
17	8	0	1	-0.620273	5.957158	-4.957158	24.5734173	7	7	123
18	8	0	0	1.508999	0	0	0	99	99	24
19	8	0	0	-0.103603	0	0	0	106	106	9
20	8	0	0	-0.38329	0	0	0	106	106	1
21	8	0	0	-0.995666	0	0	0	99	99	0
22	8	0	0	0.291357	0	0	0	91	91	0
23	8	0	0	-0.961874	0	0	0	83	83	0
24	8	0	1	-0.557005	0	1	1	75	75	0
25	7	0	0	-0.678952	0	0	0	67	67	1
26	7	0	0	0.055431	0	0	0	60	60	1
27	8	0	0	1.0215	0	0	0	53	53	1
28	7	0	0	-0.254267	0	0	0	46	46	0
29	7	0	0	-0.602145	0	0	0	39	39	0
30	7	0	0	1.810805	0	0	0	32	32	0
31	8	0	0	0.068255	0	0	0	25	25	0
32	8	0	1	-0.159839	3.426458	-2.426458	5.88769847	17	17	0
33	8	0	10	-0.704131	10.82518	-0.825183	0.68092708	9	9	1
34	8	0	15	-0.620273	18.33921	-3.339214	11.1503494	1	1	11
35	8	0	16	1.508999	20.61375	-4.613747	21.286657	-7	0	26
36	8	0	9	-0.103603	18.14641	-9.146405	83.6567253	-14	0	41
37	16	0	25	-1.334261	16.97273	8.0272701	64.4370857	-12	0	40
38	12	0	10	-0.097859	17.6393	-7.639305	58.3589764	-13	0	50
39	8	0	10	-0.965457	17.1136	-7.113603	50.6033484	-9	0	44
40	8	0	12	-0.259143	17.76293	-5.762935	33.211417	-8	0	45
	mean of the disturbance			-0.086383		0.6467136	mean of the standard errors			
	std dev of the disturbance			0.904242						

Σ (AO-Ot)2	1295.286		constraints		
θ	0.00		>=0	<=1	
αs	1.00		>=0	<=1	
β	0.06		>=0	<=1	
S'	20.59		>=0	<=100	INT

Standard GRG NonLinear

Incoming Orders:
IO = WIO
Expected Incoming Orders:
$eIO = \theta * IO_{(t-1)} + (1-\theta) * eIO_{(t-1)}$
Actual Orders:
AO = WOP
Disturbance:
normally distributed white noise
mean = 0
std dev = 1
Model Orders:
$Ot = MAX(0, eIO + \alpha s(s' - S_t - \beta SL_t) + \varepsilon$
Error Term:
$AO - O_t$
Squared errors:
$(AO - O_t)^2$
Effective Inventory:
EI = MWEI
Stock:
St = MAX(0,EI)
Supply Line:
SLt = WSL = WSD1+WSD2+DIO+DBL

FROSTY GENERAL BEER GAME MODEL

DME - GRG NonLinear

DISTRIB	incoming orders	expected incoming orders	actual orders	disturb-ance	model orders	error term	squared errors	effective inventory	Stock	Supply line
WEEK	IO	eIO	AO	ε	O_t	(AO-Ot)	$(AO-Ot)^2$	EI	S_t	SL_t
0	4	0								
1	4	4	4	0.882621	4.012795	-0.012795	0.00016372	12	12	12
2	4	4	4	0.253313	3.383488	0.6165122	0.38008732	12	12	12
3	4	4	3	-0.956715	2.17346	0.8265402	0.68316868	12	12	12
4	5	4	2	-1.438911	1.741984	0.258016	0.06657226	12	12	11
5	5	5	3	0.726035	5.422186	-2.422186	5.86698654	11	11	9
6	10	5	3	0.147248	5.307935	-2.307935	5.32656403	10	10	8
7	15	10	25	-1.308093	11.7493	13.250699	175.581018	3	3	8
8	30	15	5	0.960593	19.09286	-14.09286	198.608736	-10	0	31
9	30	30	50	0.706649	33.73748	16.262523	264.46966	-37	0	33
10	25	30	50	-0.492363	30.1546	19.845399	393.839859	-64	0	80
11	20	25	15	0.733149	24.65562	-9.655616	93.2309286	-73	0	114
12	25	20	25	-0.046967	18.21613	6.7838653	46.0208283	-91	0	127
13	20	25	25	1.168338	23.38631	1.6336915	2.6689478	-112	0	148
14	10	20	15	-1.231344	15.71302	-0.713024	0.50840389	-112	0	153
15	5	10	1	-0.553654	6.644317	-5.644317	31.8583139	-102	0	148
16	8	5	0	0.832775	8.052074	-8.052074	64.8358994	-7	0	49
17	8	8	5	-0.314556	4.129845	0.870155	0.75716976	18	18	16
18	1	8	2	-0.403842	1.651057	0.3489428	0.12176105	25	25	6
19	0	1	1	0.250987	0	1	1	25	25	7
20	0	0	0	-0.741959	0	0	0	25	25	8
21	0	0	0	1.774026	0	0	0	30	30	3
22	0	0	0	1.867569	0	0	0	32	32	1
23	0	0	5	-0.794756	0	5	25	33	33	0
24	0	0	5	0.278718	0	5	25	33	33	5
25	1	0	2	0.618845	0	2	4	33	33	10
26	0	1	1	-0.943538	0	1	1	32	32	12
27	0	0	0	-0.760079	0	0	0	37	37	8
28	0	0	0	-0.968472	0	0	0	42	42	3
29	0	0	0	0.213999	0	0	0	44	44	1
30	0	0	2	-0.545097	0	2	4	45	45	0
31	0	0	2	1.87288	0	2	4	45	45	2
32	0	0	2	1.257188	0	2	4	45	45	4
33	1	0	10	-1.131997	0	10	100	45	45	6
34	10	1	5	0.832775	0	5	25	46	46	14
35	15	10	5	-0.314556	0	5	25	38	38	17
36	16	15	10	-0.403842	7.94097	2.0590296	4.23960308	25	25	20
37	9	16	8	0.250987	12.07869	-4.078691	16.6357211	19	19	20
38	25	9	5	-0.741959	5.588845	-0.588845	0.34673807	15	15	23
39	10	25	20	1.774026	30.31206	-10.31206	106.338556	-5	0	23
40	10	10	10	1.867569	14.8984	-4.898396	23.9942848	-5	0	33
	mean of the disturbance			0.069452		1.651301	mean of the standard errors			
	std dev of the disturbance			0.947431						

Σ (AO-Ot)2	1654.38		constraints		
θ	1.00		>=0	<=1	
αs	0.41		>=0	<=1	
β	0.12		>=0	<=1	
S'	11.37		>=0	<=100	INT
	GRG NonLinear				

Incoming Orders:
IO = DIO
Expected Incoming Orders:
$eIO = \theta^* IO_{(t-1)} + (1-\theta)^* eIO_{(t-1)}$
Actual Orders:
AO = DOP
Disturbance:
normally distributed white noise
mean = 0
std dev = 1
Model Orders:
$Ot = MAX(0, eIO + \alpha s(s' - S_t - \beta SL_t) + \varepsilon$
Error Term:
$AO - O_t$
Squared errors:
$(AO - O_t)^2$
Effective Inventory:
EI = MDEI
Stock:
St = MAX(0,EI)
Supply Line:
SLt = DSL = DSD1+DSD2+FIO+FBL

FROSTY GENERAL BEER GAME MODEL

FME - GRG NonLinear

FACTORY	incoming orders	expected incoming orders	actual orders	disturb-ance	model orders	error term	squared errors	effective inventory	Stock	Supply line
WEEK	IO	eIO	AO	ε	O_t	(AO-Ot)	$(AO-Ot)^2$	EI	S_t	SL_t
0	4	0								
1	4	4	4	-0.580459	12.63568	-8.63568	74.5749654	12	12	8
2	4	4	4	0.546459	13.7626	-9.762598	95.3083211	12	12	8
3	4	4	4	-0.588874	12.62747	-8.627465	74.4331555	12	12	8
4	3	4	4	0.538122	13.75426	-9.754261	95.1456008	12	12	8
5	2	3	3	0.730311	11.94645	-8.94645	80.0389679	13	13	8
6	3	2	0	-0.979157	7.236982	-7.236982	52.3739124	15	15	7
7	3	3	2	0.114577	8.330716	-6.330716	40.0779667	16	16	3
8	25	3	4	-0.326013	7.890126	-3.890126	15.1330778	16	16	2
9	5	25	20	0.168323	46.38446	-26.38446	696.139853	-9	0	6
10	50	5	20	-1.257141	24.959	-4.958998	24.5916587	-12	0	24
11	50	50	100	-0.413206	70.80293	29.197067	852.46874	-58	0	40
12	15	50	50	1.600101	72.81624	-22.81624	520.580823	-88	0	120
13	25	15	50	-0.132641	36.0835	13.916502	193.669034	-83	0	150
14	25	25	100	1.512869	47.72901	52.270992	2732.25662	-8	0	100
15	15	25	50	-1.175556	28.04068	21.959417	482.215975	17	17	150
16	1	15	10	0.341236	0	10	100	52	52	150
17	0	1	10	1.277616	0	10	100	151	151	60
18	5	0	20	-0.580459	0	20	400	201	201	20
19	2	5	10	-1.534645	0	10	100	206	206	30
20	1	2	1	-0.925506	0	1	1	214	214	30
21	0	1	10	-0.890451	0	10	100	233	233	11
22	0	0	10	-1.029273	0	10	100	243	243	11
23	0	0	10	2.134929	0	10	100	244	244	20
24	5	0	10	1.215599	0	10	100	254	254	20
25	5	5	10	0.440687	0	10	100	259	259	20
26	2	5	10	-0.172678	0	10	100	264	264	20
27	1	2	10	1.859185	0	10	100	272	272	20
28	0	1	10	0.239213	0	10	100	281	281	20
29	0	0	10	-0.242467	0	10	100	291	291	20
30	0	0	10	-0.171527	0	10	100	301	301	20
31	2	0	10	0.289873	0	10	100	311	311	20
32	2	2	10	-0.570614	0	10	100	319	319	20
33	2	2	10	0.615973	0	10	100	327	327	20
34	10	2	10	0.270312	0	10	100	335	335	20
35	5	10	10	0.99916	0	10	100	335	335	20
36	5	5	10	-0.924527	0	10	100	340	340	20
37	10	5	10	-0.43487	0	10	100	345	345	20
38	8	10	10	-1.523824	0	10	100	345	345	20
39	5	8	10	0.20415	0	10	100	347	347	20
40	20	5	10	-0.329026	0	10	100	352	352	20
	mean of the disturbance			0.094968		5.7428571	mean of the standard errors			
	std dev of the disturbance			0.930958						

Σ (AO-Ot)2	8730.009		constraints		
θ	1.00		>=0	<=1	
αs	1.00		>=0	<=1	
β	0.00		>=0	<=1	
S'	21.22		>=0	<=100	INT

GRG NonLinear

Incoming Orders:

IO = FIO

Expected Incoming Orders:

$eIO = \theta * IO_{(t-1)} + (1-\theta) * eIO_{(t-1)}$

Actual Orders:

AO = FPR

Disturbance:

normally distributed white noise

mean = 0

std dev = 1

Model Orders:

$Ot = MAX(0, eIO + \alpha s(s' - S_t - \beta SL_t) + \varepsilon$

Error Term:

$AO - O_t$

Squared errors:

$(AO - O_t)^2$

Effective Inventory:

EI = MFEI

Stock:

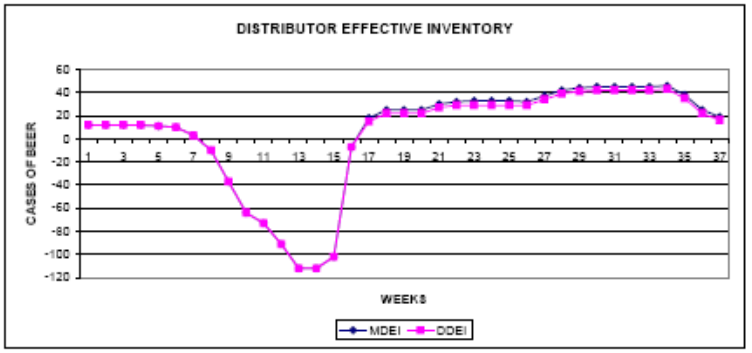
St = MAX(0,EI)

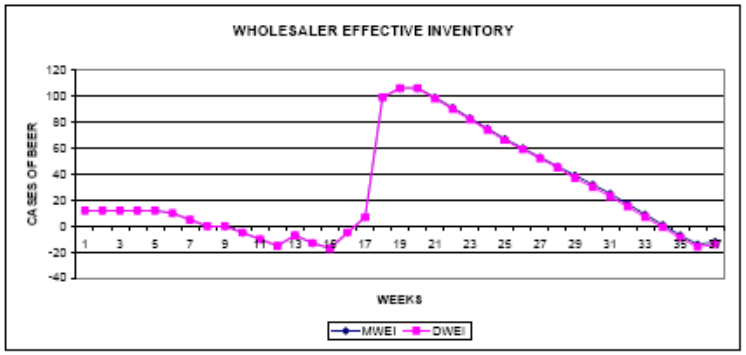
Supply Line:

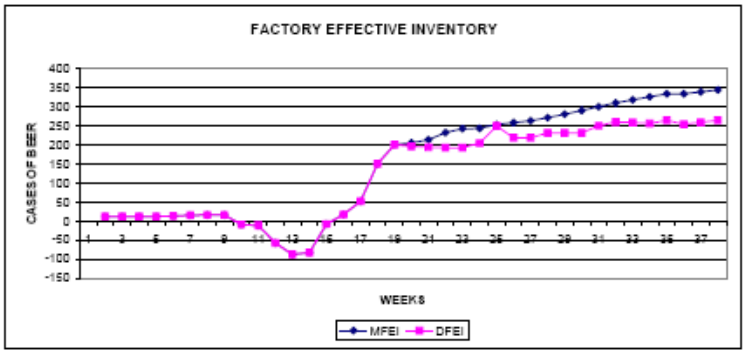
$SLt = FSL = FPD1 + FPD2$

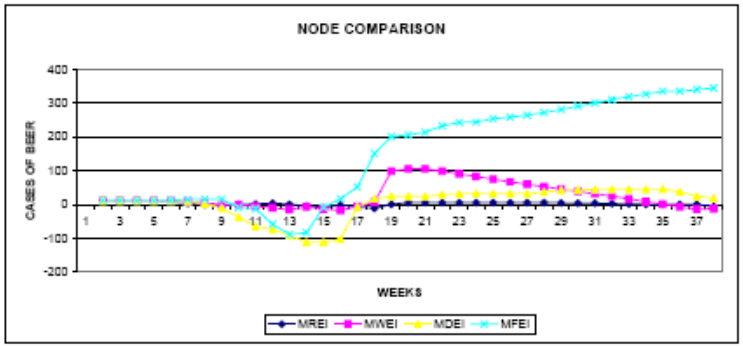
FROSTY GENERAL BEER GAME MODEL

MODEL CHARTS



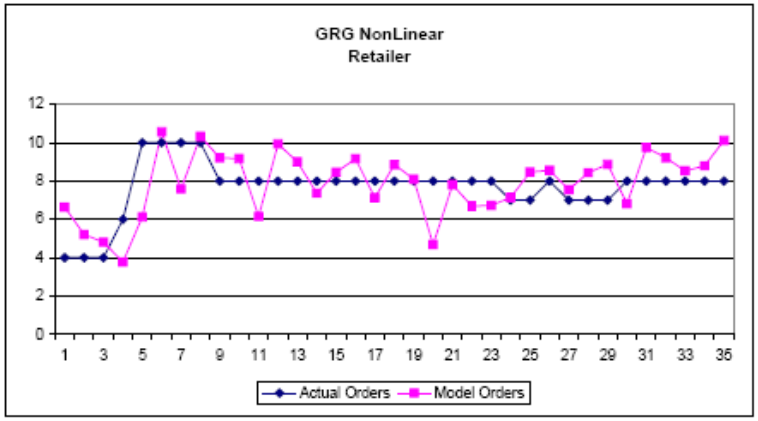


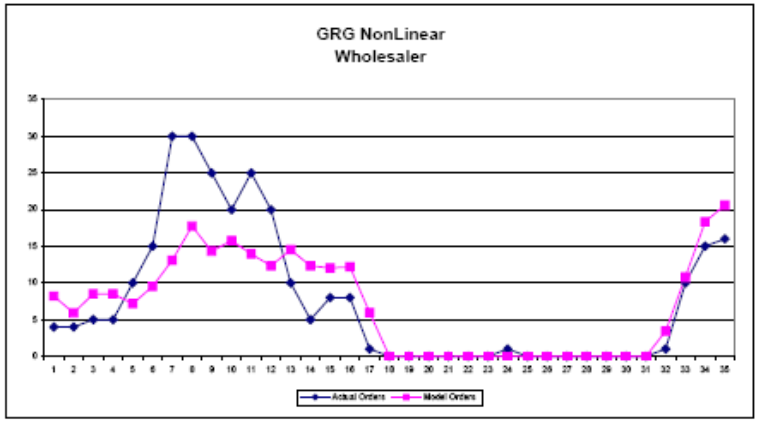


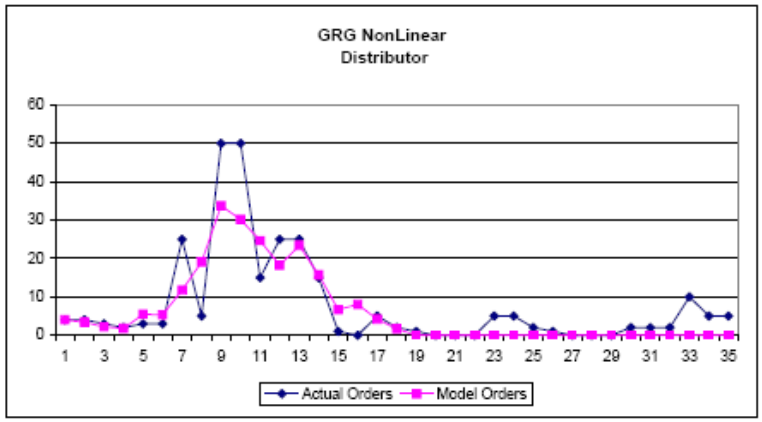


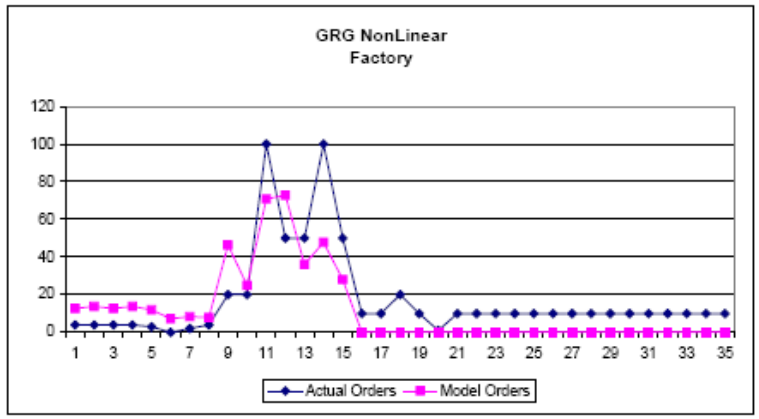
FROSTY GENERAL BEER GAME MODEL

ORDER CHARTS









FROSTY GENERAL BEER GAME MODEL MODEL WORKSHEET

	STEP 1 Receive The Inventory and Advance the shipping Delays								STEP 2 Look at the incoming orders and fill orders all incoming orders + backlog							
	FROSTY Team Costs	NO IT $ 5,571.50							FROSTY Costs	Retailer $ 140.00	NO IT					
WEEK	COR	RINV1	RSD1	RSD2	RBL	RSR	RINV2	MREI	*DREI*	RCOSTS	ROP	WIO	RSL		WINV1	WSD1
0	0	12	4	4	0	4	12			0	4	4			12	4
1	4	16	4	4	0	4	12	12	*12*	6	4	4	12		16	4
2	4	16	4	4	0	4	12	12	*12*	12	4	4	12		16	4
3	4	16	4	4	0	4	12	12	*12*	18	4	4	12		16	4
4	4	16	4	4	0	4	12	12	*12*	24	6	4	12		16	4
5	8	16	4	4	0	8	8	8	*8*	28	10	6	14		16	4
6	8	12	4	6	0	8	4	4	*4*	30	10	10	20		16	5
7	8	8	6	10	0	8	0	0	*0*	30	10	10	26		15	5
8	8	6	10	10	2	6	0	-2	*0*	32	10	10	30		10	10
9	8	10	10	10	0	10	0	0	*0*	32	8	10	30		10	5
10	8	10	10	5	0	8	2	2	*2*	33	8	8	28		5	3
11	8	12	5	3	0	8	4	4	*4*	35	8	8	26		3	3
12	8	9	3	3	0	8	1	1	*1*	35.5	8	8	29		3	16
13	8	4	3	16	4	4	0	-4	*-4*	39.5	8	8	34		16	2
14	8	3	16	2	9	3	0	-9	*-9*	48.5	8	8	39		2	4
15	8	16	2	4	1	16	0	-1	*-1*	49.5	8	8	31		4	20
16	8	2	4	20	7	2	0	-7	*-7*	56.5	8	8	37		20	20
17	8	4	20	13	11	4	0	-11	*-11*	67.5	8	8	41		20	100
18	8	20	13	8	0	19	1	1	*1*	68	8	8	29		107	15
19	8	14	8	8	0	8	6	6	*6*	71	8	8	24		114	8
20	8	14	8	8	0	8	6	6	*6*	74	8	8	24		114	1
21	8	14	8	8	0	8	6	6	*6*	77	8	8	24		107	0
22	8	14	8	8	0	8	6	6	*6*	80	8	8	24		99	0
23	8	14	8	8	0	8	6	6	*6*	83	8	8	24		91	0
24	8	14	8	8	0	8	6	6	*7*	86	7	8	24		83	0
25	8	14	8	8	0	8	6	6	*7*	89	7	7	23		75	0
26	8	14	8	7	0	8	6	6	*7*	92	8	7	22		67	0
27	8	14	7	7	0	8	6	6	*7*	95	7	8	22		60	1
28	8	13	7	8	0	8	5	5	*6*	97.5	7	7	22		54	0
29	8	12	8	7	0	8	4	4	*5*	99.5	7	7	22		46	0
30	8	12	7	7	0	8	4	4	*5*	101.5	8	7	21		39	0
31	8	11	7	7	0	8	3	3	*5*	103	8	8	22		32	0
32	8	10	7	8	0	8	2	2	*4*	104	8	8	23		25	0
33	8	9	8	8	0	8	1	1	*3*	104.5	8	8	24		17	0
34	8	9	8	8	0	8	1	1	*3*	105	8	8	24		9	0
35	8	9	8	1	0	8	1	1	*3*	105.5	8	8	24		1	1
36	8	9	1	1	0	8	1	1	*2*	106	16	8	24		1	10
37	8	2	1	10	6	2	0	-6	*-6*	112	12	16	39		10	15
38	8	1	10	15	13	1	0	-13	*-13*	125	8	12	50		15	16
39	8	10	15	16	11	10	0	-11	*-11*	136	8	8	48		16	9
40	8	15	16	9	4	15	0	-4	*-4*	140	8	8	41		9	20

FROSTY GENERAL BEER GAME MODEL

MODEL WORKSHEET

STEP 3
Record your inventory or backlog

STEP 4
Advance the order slips and the brewery Brews

					FROSTY Costs	Wholesaler $ 680.00		NO IT								FROSTY Costs
WEEK	WSD2	WBL	WINV2	MWEI	*DWEI*	WCOSTS	WOP	DIO	WSL		DINV1	DSD1	DSD2	DBL	DINV2	MDEI	*DDEI*
0	4	0	12			0	4	4			12	4	4	0	12		
1	4	0	12	12	*12*	6	4	4	12		16	4	4	0	12	12	*12*
2	4	0	12	12	*12*	12	4	4	12		16	4	4	0	12	12	*12*
3	4	0	12	12	*12*	18	5	4	12		16	4	4	0	12	12	*12*
4	4	0	12	12	*12*	24	5	5	13		16	4	4	0	12	12	*12*
5	5	0	12	12	*12*	30	10	5	14		16	4	3	0	11	11	*11*
6	5	0	10	10	*10*	35	15	10	20		15	3	2	0	10	10	*10*
7	10	0	5	5	*5*	37.5	30	15	30		13	2	3	0	3	3	*3*
8	5	0	0	0	*0*	37.5	30	30	55		5	3	3	10	0	-10	*-10*
9	3	0	0	0	*0*	37.5	25	30	75		3	3	16	37	0	-37	*-37*
10	3	5	0	-5	*-5*	42.5	20	25	95		3	16	2	64	0	-64	*-64*
11	16	10	0	-10	*-10*	52.5	25	20	112		16	2	4	73	0	-73	*-73*
12	2	15	0	-15	*-15*	67.5	20	25	134		2	4	20	91	0	-91	*-91*
13	4	7	0	-7	*-7*	74.5	10	20	138		4	20	20	112	0	-112	*-112*
14	20	13	0	-13	*-13*	87.5	5	10	146		20	20	100	112	0	-112	*-112*
15	20	17	0	-17	*-17*	104.5	8	5	147		20	100	33	102	0	-102	*-102*
16	100	5	0	-5	*-5*	109.5	8	8	135		100	33	15	7	0	-7	*-7*
17	15	0	7	7	*7*	113	1	8	123		33	15	1	0	18	18	*15*
18	8	0	99	99	*99*	162.5	0	1	24		33	1	0	0	25	25	*22*
19	1	0	106	106	*106*	215.5	0	0	9		26	0	5	0	25	25	*22*
20	0	0	106	106	*106*	268.5	0	0	1		25	5	2	0	25	25	*22*
21	0	0	99	99	*98*	318	0	0	0		30	2	1	0	30	30	*27*
22	0	0	91	91	*90*	363.5	0	0	0		32	1	0	0	32	32	*29*
23	0	0	83	83	*82*	405	0	0	0		33	0	0	0	33	33	*29*
24	0	0	75	75	*74*	442.5	1	0	0		33	0	0	0	33	33	*29*
25	0	0	67	67	*66*	476	0	1	1		33	0	5	0	33	33	*29*
26	1	0	60	60	*59*	506	0	0	1		33	5	5	0	32	32	*29*
27	0	0	53	53	*52*	532.5	0	0	1		37	5	2	0	37	37	*34*
28	0	0	46	46	*45*	555.5	0	0	0		42	2	1	0	42	42	*39*
29	0	0	39	39	*37*	575	0	0	0		44	1	0	0	44	44	*41*
30	0	0	32	32	*30*	591	0	0	0		45	0	0	0	45	45	*42*
31	0	0	25	25	*23*	603.5	0	0	0		45	0	0	0	45	45	*42*
32	0	0	17	17	*15*	612	1	0	0		45	0	2	0	45	45	*42*
33	0	0	9	9	*7*	616.5	10	1	1		45	2	2	0	45	45	*42*
34	1	0	1	1	*-1*	617	15	10	11		47	2	2	0	46	46	*43*
35	10	7	0	-7	*-9*	624	16	15	26		48	2	10	0	38	38	*35*
36	15	14	0	-14	*-16*	638	9	16	41		40	10	5	0	25	25	*22*
37	16	12	0	-12	*-14*	650	25	9	40		35	5	5	0	19	19	*16*
38	9	13	0	-13	*-15*	663	10	25	50		24	5	10	0	15	15	*12*
39	20	9	0	-9	*-11*	672	10	10	44		20	10	8	5	0	-5	*-8*
40	10	8	0	-8	*-10*	680	12	10	45		10	8	5	5	0	-5	*-8*

FROSTY GENERAL BEER GAME MODEL

MODEL WORKSHEET

STEP 5
Place and record your orders

	Distributor		NO IT									FROSTY	Factory	NO IT		
	$ 1,020.00											Costs	$ 3,731.50			
WEEK	DCOSTS	DOP	FIO	DSL		FPD1	FPD2	FSD2	FBL	FINV2	MFEI	*DFEI*	FCOSTS	FPR	FSL	
0	0	4	4	12		12	4	4	0	12			0	4	8	
1	6	4	4	12		16	4	4	0	12	12	*12*	6	4	8	
2	12	4	4	12		16	4	4	0	12	12	*12*	12	4	8	
3	18	3	4	12		16	4	4	0	12	12	*12*	18	4	8	
4	24	2	3	11		16	4	4	0	12	12	*12*	24	4	8	
5	29.5	3	2	9		16	4	4	0	13	13	*13*	30.5	3	8	
6	34.5	3	3	8		17	4	3	0	15	15	*15*	38	0	7	
7	36	25	3	8		19	3	0	0	16	16	*16*	46	2	3	
8	46	5	25	31		19	0	2	0	16	16	*16*	54	4	2	
9	83	50	5	33		16	2	4	9	0	-9	*-9*	63	20	6	
10	147	50	50	80		2	4	20	12	0	-12	*-12*	75	20	24	
11	220	15	50	114		4	20	20	58	0	-58	*-58*	133	100	40	
12	311	25	15	127		20	20	100	88	0	-88	*-88*	221	50	120	
13	423	25	25	148		20	100	50	83	0	-83	*-83*	304	50	150	
14	535	15	25	153		100	50	50	8	0	-8	*-8*	312	100	100	
15	637	1	15	148		50	50	100	0	17	17	*17*	320.5	50	150	
16	644	0	1	49		67	100	50	0	52	52	*52*	346.5	10	150	
17	653	5	0	16		152	50	10	0	151	151	*151*	422	10	60	
18	665.5	2	5	6		201	10	10	0	201	201	*201*	522.5	20	20	
19	678	1	2	7		211	10	20	0	206	206	*196*	625.5	10	30	
20	690.5	0	1	8		216	20	10	0	214	214	*194*	732.5	1	30	
21	705.5	0	0	3		234	10	1	0	233	233	*193*	849	10	11	
22	721.5	0	0	1		243	1	10	0	243	243	*193*	970.5	10	11	
23	738	5	0	0		244	10	10	0	244	244	*205*	1092.5	10	20	
24	754.5	5	5	5		254	10	10	0	254	254	*250*	1219.5	10	20	
25	771	2	5	10		264	10	10	0	259	259	*219*	1349	10	20	
26	787	1	2	12		269	10	10	0	264	264	*219*	1481	10	20	
27	805.5	0	1	8		274	10	10	0	272	272	*232*	1617	10	20	
28	826.5	0	0	3		282	10	10	0	281	281	*232*	1757.5	10	20	
29	848.5	0	0	1		291	10	10	0	291	291	*232*	1903	10	20	
30	871	2	0	0		301	10	10	0	301	301	*251*	2053.5	10	20	
31	893.5	2	2	2		311	10	10	0	311	311	*261*	2209	10	20	
32	916	2	2	4		321	10	10	0	319	319	*259*	2368.5	10	20	
33	938.5	10	2	6		329	10	10	0	327	327	*257*	2532	10	20	
34	961.5	5	10	14		337	10	10	0	335	335	*265*	2699.5	10	20	
35	980.5	5	5	17		345	10	10	0	335	335	*255*	2867	10	20	
36	993	10	5	20		345	10	10	0	340	340	*260*	3037	10	20	
37	1002.5	8	10	20		350	10	10	0	345	345	*265*	3209.5	10	20	
38	1010	5	8	23		355	10	10	0	345	345	*265*	3382	10	20	
39	1015	20	5	23		355	10	10	0	347	347	*267*	3555.5	10	20	
40	1020	10	20	33		357	10	10	0	352	352	*272*	3731.5	10	20	

FROSTY GENERAL BEER GAME MODEL

MODEL DATA

FROSTY NO IT Week	ROR	REI	WOR	WEI	DOR	DEI	FOR	FEI
1	4	12	4	12	4	12	4	12
2	4	12	4	12	4	12	4	12
3	4	12	5	12	3	12	4	12
4	6	12	5	12	2	12	4	12
5	10	8	10	12	3	11	3	13
6	10	4	15	10	3	10	0	15
7	10	0	30	5	25	3	2	16
8	10	0	30	0	5	-10	4	16
9	8	0	25	0	50	-37	20	-9
10	8	2	20	-5	50	-64	20	-12
11	8	4	25	-10	15	-73	100	-58
12	8	1	20	-15	25	-91	50	-88
13	8	-4	10	-7	25	-112	50	-83
14	8	-9	5	-13	15	-112	100	-8
15	8	-1	8	-17	1	-102	50	17
16	8	-7	8	-5	0	-7	10	52
17	8	-11	1	7	5	15	10	151
18	8	1	0	99	2	22	20	201
19	8	6	0	106	1	22	10	196
20	8	6	0	106	0	22	1	194
21	8	6	0	98	0	27	10	193
22	8	6	0	90	0	29	10	193
23	8	6	0	82	5	29	10	205
24	7	7	1	74	5	29	10	250
25	7	7	0	66	2	29	10	219
26	8	7	0	59	1	29	10	219
27	7	7	0	52	0	34	10	232
28	7	6	0	45	0	39	10	232
29	7	5	0	37	0	41	10	232
30	8	5	0	30	2	42	10	251
31	8	5	0	23	2	42	10	261
32	8	4	1	15	2	42	10	259
33	8	3	10	7	10	42	10	257
34	8	3	15	-1	5	43	10	265
35	8	3	16	-9	5	35	10	255
36	16	2	9	-16	10	22	10	260
37	12	-6	25	-14	8	16	10	265
38	8	-13	10	-15	5	12	10	265
39	8	-11	10	-11	20	-8	10	267
40	8	-4	12	-10	10	-8	10	272

FROSTY 2 BEER GAME MODEL

RME GRG NonLinear

RETAILE	incoming orders	expected incoming orders	actual orders	disturb-anoe	model orders	error term	squared errors	effective inventory	Stock	Supply line
WEEK	IO	eIO	AO	ε	O_t	(AO-Ot)	$(AO-Ot)^2$	EI	S_t	SL_t
0	0	0								
1	4	0.00	4	3.128635	8.773356	-4.773356	22.7849241	12	12	12
2	4	1.42	4	-0.131065	6.939354	-2.939354	8.63979973	12	12	12
3	4	2.34	4	-0.886599	7.100789	-3.100789	9.6148908	12	12	12
4	4	2.93	4	0.430392	9.008377	-5.008377	25.0838426	12	12	12
5	8	3.31	8	0.334801	9.889813	-1.889813	3.57139254	8	8	12
6	8	4.98	10	-1.539928	10.12804	-0.128044	0.01639538	4	4	16
7	8	6.06	12	-1.482082	11.62623	0.3737672	0.13970195	0	0	22
8	8	6.75	16	0.615841	14.10964	1.8903638	3.57347516	-4	0	30
9	8	7.19	12	-2.056141	11.57675	0.4232481	0.17913899	-4	0	38
10	8	7.48	20	-0.820204	13.02316	6.9768382	48.6762706	-2	0	40
11	8	7.67	8	-0.224971	13.26653	-5.266534	27.7363798	-4	0	54
12	8	7.78	12	1.373855	14.98448	-2.984484	8.90714307	-4	0	54
13	8	7.86	16	-1.377584	12.23308	3.7669181	14.1896718	-2	0	56
14	8	7.91	8	-0.072654	13.20399	-5.20399	27.0815119	-4	0	66
15	8	7.94	20	0.082205	13.39068	6.609323	43.6831504	-4	0	66
16	8	7.96	20	-1.614646	11.33089	8.6691128	75.1535164	-2	0	76
17	8	7.98	23	0.63362	12.98729	10.012713	100.254422	2	2	84
18	8	7.98	12	-0.823421	11.03185	0.9681517	0.93731776	-4	0	105
19	8	7.99	10	-0.131065	11.65299	-1.652994	2.73238789	-2	0	107
20	8	7.99	0	-0.886599	9.238752	-9.238752	85.3545413	15	15	92
21	8	8.00	0	0.430392	8.9809	-8.9809	80.6585581	32	32	67
22	8	8.00	0	0.334801	8.971891	-8.971891	80.4948228	34	34	57
23	8	8.00	0	-1.539928	7.184224	-7.184224	51.6130734	36	36	47
24	8	8.00	0	-1.482082	3.226616	-3.226616	10.4110527	75	75	0
25	8	8.00	0	0.615841	8.518207	-8.518207	42.4870183	67	67	0
26	8	8.00	10	-2.056141	5.039752	4.9602482	24.6040625	59	59	0
27	8	8.00	12	-1.227862	6.678031	5.3219687	28.3233511	51	51	10
28	8	8.00	10	0.394406	9.033563	0.9664466	0.934019	43	43	22
29	8	8.00	10	-0.891254	8.557799	1.4422014	2.07994495	35	35	32
30	8	8.00	12	-0.846905	8.303872	3.6961275	13.6613585	37	37	32
31	8	8.00	12	0.079039	8.633206	3.3667937	11.3353001	41	41	32
32	8	8.00	12	0.649861	9.829039	3.1709608	10.0549926	43	43	34
33	8	8.00	12	-1.109608	6.694575	5.3054245	28.1475295	45	45	36
34	8	8.00	10	2.124806	9.332358	0.6676419	0.44574554	49	49	36
35	8	8.00	8	-0.893858	5.793748	2.2062516	4.86754815	53	53	34
36	9	8.00	6	0.590343	6.83469	-0.83469	0.69670695	57	57	30
37	10	8.36	6	0.844061	7.07776	-1.07776	1.16156831	61	61	24
38	11	8.94	10	-0.367534	6.306389	3.6936109	13.6427612	63	63	20
39	12	9.67	10	-1.101019	6.229034	3.7709663	14.2201868	63	63	22
40	13	10.50	10	0.520127	9.266299	0.7337005	0.53831648	57	57	30
	mean of the disturbance			-0.31048		-0.179252	mean of the standard errors			
	std dev of the disturbance			1.15431						

Σ (AO-Ot)2	928.6858		constraints		
θ	0.36		>=0	<=1	
αs	0.15		>=0	<=1	
β	0.26		>=0	<=1	
S'	52.94		>=0	<=100	INT
	GRG NonLinear				

Incoming Orders:
IO = COR
Expected Incoming Orders:
$eIO = \theta * IO_{(t-1)} + (1-\theta) * eIO_{(t-1)}$
Actual Orders:
AO = ROP
Disturbance:
normally distributed white noise
mean = 0
std dev = 1
Model Orders:
$Ot = MAX(0, eIO + \alpha s(s' - S_t - \beta SL_t) + \varepsilon$
Error Term:
$AO - O_t$
Squared errors:
$(AO - O_t)^2$
Effective Inventory:
EI = REI
Stock:
St = MAX(0,EI)
Supply Line:
SLt = RSL = RSD1+RSD2+WIO+WBL

FROSTY 2 BEER GAME MODEL

WME - GRG NonLinear

WHOLES	incoming orders	expected incoming orders	actual orders	disturb-ance	model orders	error term	squared errors	effective inventory	Stock	Supply line
WEEK	IO	eIO	AO	ε	O_t	(AO-Ot)	$(AO-Ot)^2$	EI	S_t	SL_t
0	4	0								
1	4	2.950041	4	-0.124672	4.742437	-0.742437	0.55121295	12	12	12
2	4	3.669399	4	-0.328992	5.357375	-1.357375	1.84246709	12	12	12
3	4	3.904955	4	-0.989459	4.932465	-0.932465	0.86949076	12	12	12
4	4	3.972676	4	0.319652	6.309296	-2.309296	5.33284877	12	12	12
5	4	3.992145	4	-1.704624	4.304489	-0.304489	0.09271364	12	12	12
6	8	3.997742	8	-1.588556	4.426154	3.5738457	12.7723733	12	12	12
7	10	6.849392	10	1.39333	10.7215	-0.721497	0.52055808	8	8	16
8	12	9.094232	12	-0.06865	12.19707	-0.197069	0.03883613	2	2	22
9	16	11.16462	14	-1.158642	13.38397	0.6160345	0.37949856	-6	0	30
10	12	14.60988	30	1.489176	19.45264	10.547364	111.246884	-14	0	36
11	20	12.75031	20	-2.735649	13.2889	6.7131014	45.0657306	-16	0	56
12	8	17.91579	16	-1.704624	19.42646	-3.426457	11.7406083	-30	0	70
13	12	10.85069	12	-1.588556	12.44488	-0.444885	0.19792239	-30	0	78
14	16	11.66958	12	1.39333	16.23753	-4.237532	17.9566808	-32	0	80
15	8	14.75505	20	-0.06865	17.86102	2.1389817	4.57524273	-36	0	80
16	20	9.942008	20	-1.158642	11.88477	8.1152284	65.8569317	-42	0	98
17	20	17.10843	20	1.489176	21.65834	-1.658339	2.75008819	-52	0	108
18	23	19.1687	20	-2.735649	19.51412	0.4858767	0.2360762	-47	0	103
19	12	21.89854	16	-1.704624	23.29532	-7.295323	53.2217437	-45	0	98
20	10	14.84573	20	-1.588556	16.33417	3.665825	13.438273	-47	0	104
21	0	11.3931	20	1.39333	15.82276	4.1772448	17.4493723	-47	0	114
22	0	3.275399	0	-0.06865	6.00654	-6.00654	36.078526	3	3	84
23	0	0.941644	0	-1.158642	0	0	0	47	47	40
24	0	0.270713	0	1.489176	0	0	0	87	87	20
25	0	0.077827	0	-2.735649	0	0	0	87	87	0
26	0	0.022375	0	-1.704624	0	0	0	87	87	0
27	10	0.006432	0	-1.588556	0	0	0	87	87	0
28	12	7.126952	5	1.39333	2.817316	2.1826842	4.76411021	77	77	0
29	10	10.59905	5	-0.06865	6.241326	-1.241326	1.54088956	65	65	5
30	10	10.17222	10	-1.158642	5.89936	4.1006402	16.8152498	55	55	10
31	12	10.04951	5	-0.496919	7.592891	-2.592891	6.72308458	45	45	20
32	12	11.43925	10	-0.717347	9.598841	0.4011594	0.16092883	38	38	20
33	12	11.83879	10	-0.068721	11.4633	-1.463301	2.14124852	31	31	25
34	12	11.95365	10	-0.337508	11.66387	-1.663866	2.76844891	28	28	26
35	10	11.98868	10	-0.847609	12.34944	-2.349439	5.51986524	18	18	34
36	8	10.57115	10	-0.102159	12.60298	-2.602977	6.77548759	10	10	42
37	6	8.739179	10	-0.645139	11.14351	-1.143506	1.3076063	2	2	52
38	6	6.787486	5	-1.273139	8.762177	-3.762177	14.1539755	-4	0	62
39	10	6.226394	10	-0.053618	9.420607	0.5793933	0.33569663	-5	0	62
40	10	8.915127	10	-1.277797	10.84855	-0.848555	0.72004478	-14	0	71
	mean of the disturbance			-0.566842		0.2220988	mean of the standard errors			
	std dev of the disturbance			1.278017						

Σ (AO-Ot)2	465.9407		constraints	
θ	0.71		>=0	<=1
αs	0.12		>=0	<=1
β	0.03		>=0	<=1
S'	29.28		>=0	<=100 INT

Standard GRG NonLinear

Incoming Orders:
IO = WIO

Expected Incoming Orders:
$eIO = \theta * IO_{(t-1)} + (1-\theta) * eIO_{(t-1)}$

Actual Orders:
AO = WOP

Disturbance:
normally distributed white noise
mean = 0
std dev = 1

Model Orders:
$Ot = MAX(0, eIO + \alpha s(s' - S_t - \beta SL_t) + \varepsilon$

Error Term:
$AO - O_t$

Squared errors:
$(AO - O_t)^2$

Effective Inventory:
EI = MWEI

Stock:
St = MAX(0,EI)

Supply Line:
SLt = WSL = WSD1+WSD2+DIO+DBL

FROSTY 2 BEER GAME MODEL

DME - GRG NonLinear

DISTRIB	incoming orders	expected incoming orders	actual orders	disturb-ance	model orders	error term	squared errors	effective inventory	Stock	Supply line
WEEK	IO	eIO	AO	ε	O_t	(AO-Ot)	$(AO-Ot)^2$	EI	S_t	SL_t
0	4	0								
1	4	4	4	1.270281	5.196964	-1.196964	1.43272277	12	12	12
2	4	4	4	-1.711121	2.215562	1.7844378	3.18421835	12	12	12
3	4	4	4	-0.395892	3.530792	0.4692081	0.22015624	12	12	12
4	4	4	4	1.32693	5.253613	-1.253613	1.57154634	12	12	12
5	4	4	4	-1.865965	2.060718	1.939282	3.76081455	12	12	12
6	4	4	4	0.577314	4.503998	-0.503998	0.25401383	12	12	12
7	8	4	8	-1.276169	2.650515	5.3494853	28.6169929	12	12	12
8	10	8	10	0.839963	8.766646	1.2333537	1.52116138	8	8	16
9	12	10	20	0.236195	10.16288	9.8371212	96.7689544	2	2	22
10	14	12	10	-0.65809	11.22583	-1.225826	1.50264885	-6	0	38
11	30	14	8	1.622762	15.50057	-7.500567	56.2585099	-12	0	40
12	20	30	50	-1.461364	28.42256	21.577448	465.58628	-32	0	38
13	16	20	30	-2.068375	17.69946	12.300544	151.303374	-40	0	76
14	12	16	20	1.459294	17.14159	2.8584108	8.17051216	-54	0	104
15	12	12	20	1.040969	12.69272	7.3072843	53.3964042	-56	0	114
16	20	12	10	1.049949	12.71697	-2.71697	7.3819244	-43	0	109
17	20	20	20	-1.15543	18.55741	1.4425866	2.08105613	-38	0	94
18	20	20	20	1.751003	21.4333	-1.433298	2.05434312	-48	0	104
19	20	20	20	-0.270065	19.38168	0.6183184	0.3823176	-58	0	114
20	16	20	12	-0.357337	19.38606	-7.386055	54.553815	-28	0	84
21	20	16	5	-1.608838	14.23231	-9.23231	85.2355467	0	0	52
22	20	20	0	1.909443	21.79641	-21.79641	475.083653	0	0	37
23	0	20	0	-0.163937	19.78413	-19.78413	391.4118	0	0	17
24	0	0	0	-0.397628	0	0	0	12	12	5
25	0	0	0	-1.081305	0	0	0	17	17	0
26	0	0	0	-0.148061	0	0	0	17	17	0
27	0	0	0	-1.135818	0	0	0	17	17	0
28	0	0	2	1.298071	1.244139	0.7558613	0.57132628	17	17	0
29	5	0	2	1.168903	1.110861	0.8891395	0.79056901	17	17	2
30	5	5	2	0.01205	4.963172	-2.963172	8.78038775	12	12	4
31	10	5	0	-0.579225	4.381062	-4.381062	19.1937038	7	7	6
32	5	10	0	2.346219	12.334	-12.334	152.127547	-1	0	4
33	10	5	5	-0.005124	4.988766	0.011234	0.0001262	-4	0	2
34	10	10	1	0.848157	10.83288	-9.832882	96.685577	-12	0	5
35	10	10	2	0.744667	10.72634	-8.726338	76.1489703	-22	0	6
36	10	10	10	-0.208343	9.769218	0.2307817	0.05326021	-32	0	8
37	10	10	1	0.299924	10.26021	-9.260211	85.7515047	-37	0	13
38	10	10	5	-1.069721	8.890566	-3.890566	15.1365056	-46	0	13
39	5	10	10	0.444627	10.39575	-0.395749	0.15661713	-54	0	16
40	10	5	0	-0.016477	4.934645	-4.934645	24.3507218	-49	0	16
	mean of the disturbance			0.090298		-1.254111	mean of the standard errors			
	std dev of the disturbance			1.210701						

Σ (AO-Ot)2	2371.48		constraints		
θ	1.00		>=0	<=1	
αs	0.00		>=0	<=1	
β	1.00		>=0	<=1	
S'	0.00		>=0	<=100	INT

GRG NonLinear

Incoming Orders:
IO = DIO

Expected Incoming Orders:
$eIO = \theta * IO_{(t-1)} + (1-\theta) * eIO_{(t-1)}$

Actual Orders:
AO = DOP

Disturbance:
normally distributed white noise
mean = 0
std dev = 1

Model Orders:
$Ot = MAX(0, eIO + \alpha s(s' - S_t - \beta SL_t) + \varepsilon$

Error Term:
$AO - O_t$

Squared errors:
$(AO - O_t)^2$

Effective Inventory:
EI = MDEI

Stock:
St = MAX(0,EI)

Supply Line:
SLt = DSL = DSD1+DSD2+FIO+FBL

FROSTY 2 BEER GAME MODEL

FME - GRG NonLinear

FACTORY	incoming orders	expected incoming orders	actual orders	disturb-ance	model orders	error term	squared errors	effective inventory	Stock	Supply line
WEEK	IO	eIO	AO	ε	O_t	(AO-Ot)	$(AO-Ot)^2$	EI	S_t	SL_t
0	4	0						12	12	8
1	4	1.087405	4	0.493457	5.856322	-1.856322	3.44592971	12	12	8
2	4	1.879198	4	-0.295486	5.859171	-1.859171	3.45651502	12	12	8
3	4	2.455741	4	0.002956	6.734156	-2.734156	7.47560788	12	12	8
4	4	2.87565	4	0.467269	7.618277	-3.618277	13.0919314	12	12	8
5	4	3.181233	4	-1.516595	5.940097	-1.940097	3.76397447	12	12	8
6	4	3.403816	8	1.298504	8.977778	-0.977778	0.95605032	12	12	8
7	4	3.565889	4	-1.825272	6.016076	-2.016076	4.0645613	12	12	12
8	8	3.683903	6	-0.908561	7.050801	-1.050801	1.10418184	12	12	12
9	10	4.85724	2	0.328322	9.461021	-7.461021	55.6668335	12	12	10
10	20	6.255306	10	-0.73658	14.63858	-4.638585	21.51647	6	6	8
11	10	9.991819	25	-0.519157	23.43692	1.5630778	2.44321232	-8	0	12
12	8	9.994043	25	2.364336	26.32264	-1.322639	1.74937516	-16	0	35
13	50	9.45196	10	0.150398	23.56662	-13.56662	184.053138	-14	0	50
14	30	20.475	10	-0.83615	33.60311	-23.60311	557.106774	-39	0	35
15	20	23.06438	50	-0.085478	36.94317	13.056835	170.480929	-44	0	20
16	20	22.23133	70	1.41791	37.6135	32.386503	1048.88559	-54	0	60
17	10	21.62474	25	-1.525669	34.06333	-9.063329	82.1439175	-64	0	120
18	20	18.46454	50	0.305114	32.73391	17.266089	298.117823	-24	0	95
19	20	18.88195	20	-0.760989	11.09282	8.9071775	79.3378107	26	26	75
20	20	19.1859	10	-0.65119	7.469563	2.5304371	6.40311168	31	31	70
21	12	19.40721	0	-1.583767	0	0	0	61	61	30
22	5	17.39365	0	-0.227635	0	0	0	69	69	10
23	0	14.02435	0	0.163631	0	0	0	74	74	0
24	0	10.21181	0	0.332084	0	0	0	74	74	0
25	0	7.435716	0	-1.104702	0	0	0	74	74	0
26	0	5.414307	0	0.167632	0	0	0	74	74	0
27	0	3.94242	0	-0.549128	0	0	0	74	74	0
28	0	2.870868	0	1.432333	0	0	0	74	74	0
29	2	2.090273	0	-1.416941	0	0	0	74	74	0
30	2	2.065732	0	-0.787144	0	0	0	72	72	0
31	2	2.047863	0	1.254596	0	0	0	70	70	0
32	0	2.034851	0	-0.387434	0	0	0	68	68	0
33	0	1.481674	0	1.135421	0	0	0	68	68	0
34	5	1.078879	0	0.173234	0	0	0	68	68	0
35	1	2.144841	0	-0.085209	0	0	0	63	63	0
36	2	1.833614	0	0.632475	0	0	0	62	62	0
37	10	1.878847	0	-0.662381	0	0	0	60	60	0
38	1	4.086593	0	-0.950755	0	0	0	50	50	0
39	5	3.247499	0	0.227047	0	0	0	49	49	0
40	10	3.723918	0	1.208796	0	0	0	44	44	0
	mean of the disturbance			-0.123311		6.118E-05	mean of the standard errors			
	std dev of the disturbance			0.982349						

Σ (AO-Ot)2	2545.264		constraints	
θ	0.27		>=0	<=1	
αs	0.81		>=0	<=1	
β	0.00		>=0	<=1	
S'	17.30		>=0	<=100	INT

GRG NonLinear

Incoming Orders:

IO = FIO

Expected Incoming Orders:

$eIO = \theta * IO_{(t-1)} + (1-\theta) * eIO_{(t-1)}$

Actual Orders:

AO = FPR

Disturbance:

normally distributed white noise

mean = 0

std dev = 1

Model Orders:

$Ot = MAX(0, eIO + \alpha s(s' - S_t - \beta SL_t) + \varepsilon$

Error Term:

$AO - O_t$

Squared errors:

$(AO - O_t)^2$

Effective Inventory:

EI = MFEI

Stock:

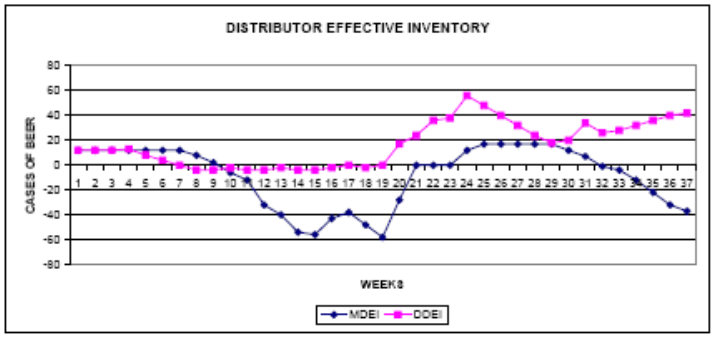
St = MAX(0,EI)

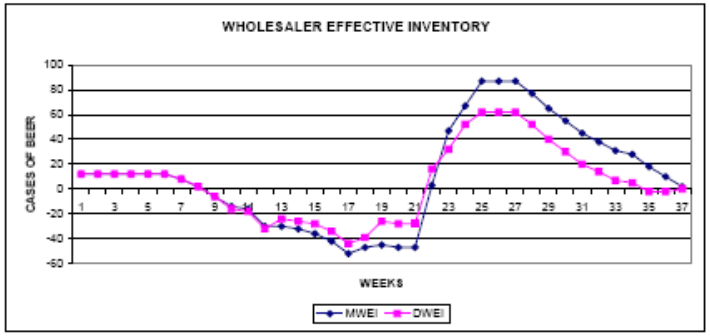
Supply Line:

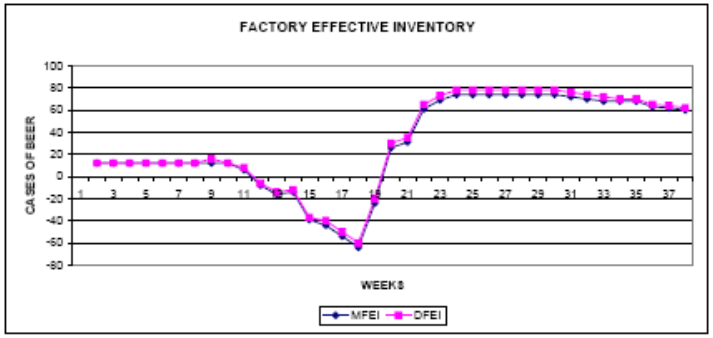
SLt = FSL = FPD1+FPD2

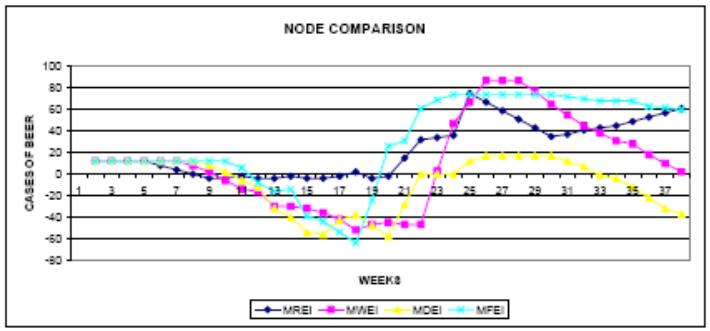
FROSTY 2 BEER GAME MODEL

MODEL CHARTS



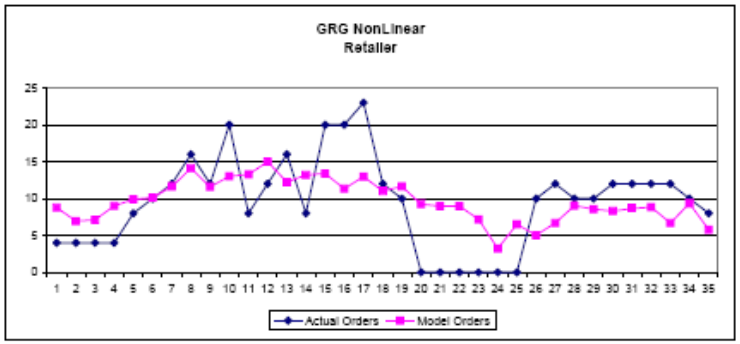


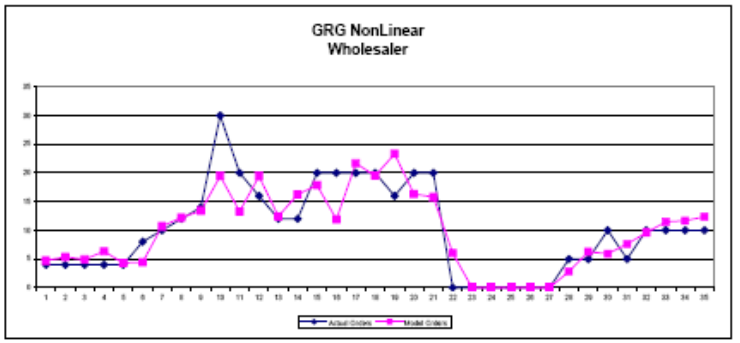


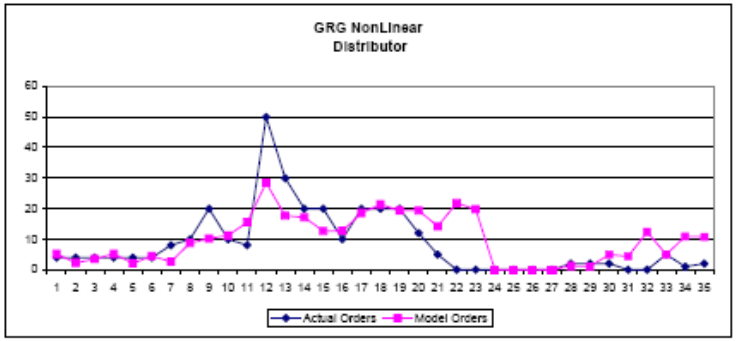


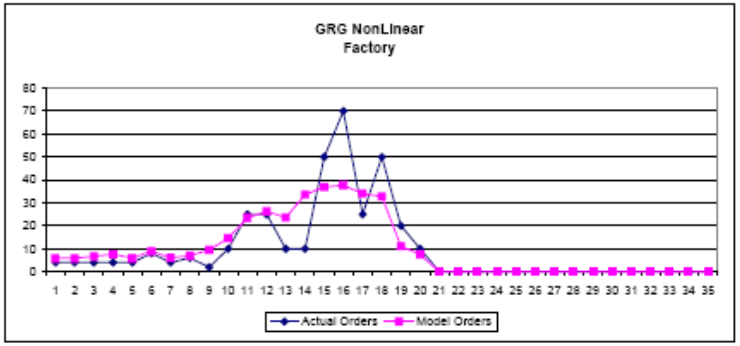
FROSTY 2 BEER GAME MODEL

ORDER CHARTS









FROSTY 2 BEER GAME MODEL

MODEL WORKSHEET

STEP 1
Receive The Inventory and Advance the shipping Delays

STEP 2
Look at the incoming orders and fill orders
all incoming orders + backlog

	FROSTY FDA Team Costs	IT $ 3,243.00							FROSTY FDA Costs	Retailer $ 575.00	IT					
WEEK	COR	RINV1	RSD1	RSD2	RBL	RSR	RINV2	MREI	*DREI*	RCOSTS	ROP	WIO	RSL		WINV1	WSD1
0	0	12	4	4	0	4	12			0	4	4			12	4
1	4	16	4	4	0	4	12	12	*12*	6	4	4	12		16	4
2	4	16	4	4	0	4	12	12	*12*	12	4	4	12		16	4
3	4	16	4	4	0	4	12	12	*12*	18	4	4	12		16	4
4	4	16	4	4	0	4	12	12	*13*	24	4	4	12		16	4
5	8	16	4	4	0	8	8	8	*8*	28	8	4	12		16	4
6	8	12	4	4	0	8	4	4	*4*	30	10	8	16		16	4
7	8	8	4	8	0	8	0	0	*0*	30	12	10	22		16	4
8	8	4	8	10	4	4	0	-4	*-4*	34	16	12	30		12	4
9	8	8	10	6	4	8	0	-4	*-4*	38	12	16	38		6	8
10	8	10	6	8	2	10	0	-2	*-2*	40	20	12	40		8	10
11	8	6	8	10	4	6	0	-4	*-4*	44	8	20	54		10	6
12	8	8	10	6	4	8	0	-4	*-4*	48	12	8	54		6	8
13	8	10	6	8	2	10	0	-2	*-2*	50	16	12	56		8	10
14	8	6	8	10	4	6	0	-4	*-4*	54	8	16	66		10	12
15	8	8	10	12	4	8	0	-4	*-4*	58	20	8	66		12	2
16	8	10	12	2	2	10	0	-2	*-2*	60	20	20	76		2	10
17	8	12	2	10	0	10	2	2	*0*	61	23	20	84		10	25
18	8	4	10	25	4	4	0	-4	*-2*	65	12	23	105		25	25
19	8	10	25	25	2	10	0	-2	*0*	67	10	12	107		25	10
20	8	25	25	10	0	10	15	15	*17*	74.5	0	10	92		10	10
21	8	40	10	10	0	8	32	32	*24*	90.5	0	0	67		10	50
22	8	42	10	47	0	8	34	34	*36*	107.5	0	0	57		50	44
23	8	44	47	0	0	8	36	36	*38*	125.5	0	0	47		47	20
24	8	83	0	0	0	8	75	75	*56*	163	0	0	0		67	20
25	8	75	0	0	0	8	67	67	*48*	196.5	0	0	0		87	0
26	8	67	0	0	0	8	59	59	*40*	226	10	0	0		87	0
27	8	59	0	0	0	8	51	51	*32*	251.5	12	10	10		87	0
28	8	51	0	10	0	8	43	43	*24*	273	10	12	22		87	0
29	8	43	10	12	0	8	35	35	*18*	290.5	10	10	32		77	0
30	8	45	12	10	0	8	37	37	*20*	309	12	10	32		65	0
31	8	49	10	10	0	8	41	41	*34*	329.5	12	12	32		55	5
32	8	51	10	12	0	8	43	43	*26*	351	12	12	34		50	5
33	8	53	12	12	0	8	45	45	*28*	373.5	12	12	36		43	9
34	8	57	12	12	0	8	49	49	*32*	398	10	12	36		40	2
35	8	61	12	12	0	8	53	53	*36*	424.5	8	10	34		30	2
36	8	65	12	10	0	8	57	57	*40*	453	6	8	30		20	0
37	8	69	10	8	0	8	61	61	*42*	483.5	6	6	24		10	0
38	8	71	8	2	0	8	63	63	*44*	515	10	6	20		2	5
39	8	71	2	5	0	8	63	63	*46*	546.5	10	10	22		5	1
40	8	65	5	1	0	8	57	57	*44*	575	10	10	30		1	2

FROSTY 2 BEER GAME MODEL

MODEL WORKSHEET

STEP 3
Record your inventory or backlog

STEP 4
Advance the order slips and the brewery Brews

					FROSTY FDA Costs	Wholesaler $ 881.50		IT							FROSTY FDA Costs
WEEK	WSD2	WBL	WINV2	MWEI	*DWEI*	WCOSTS	WOP	DIO	WSL		DINV1	DSD1	DSD2	DBL	DINV2	MDEI	*DDEI*
0	4	0	12			0	4	4			12	4	4	0	12		
1	4	0	12	12	*12*	6	4	4	12		16	4	4	0	12	12	*12*
2	4	0	12	12	*12*	12	4	4	12		16	4	4	0	12	12	*12*
3	4	0	12	12	*12*	18	4	4	12		16	4	4	0	12	12	*12*
4	4	0	12	12	*12*	24	4	4	12		16	4	4	0	12	12	*13*
5	4	0	12	12	*12*	30	4	4	12		16	4	4	0	12	12	*8*
6	4	0	12	12	*12*	36	8	4	12		16	4	4	0	12	12	*4*
7	4	0	8	8	*8*	40	10	8	16		16	4	4	0	12	12	*0*
8	8	0	2	2	*2*	41	12	10	22		16	4	4	0	8	8	*-4*
9	10	6	0	-6	*-6*	47	14	12	30		12	4	8	0	2	2	*-4*
10	6	14	0	-14	*-16*	61	30	14	36		6	8	10	6	0	-6	*-2*
11	8	16	0	-16	*-18*	77	20	30	56		8	10	12	12	0	-12	*-4*
12	10	30	0	-30	*-32*	107	16	20	70		10	12	2	32	0	-32	*-4*
13	12	30	0	-30	*-24*	137	12	16	78		12	2	10	40	0	-40	*-2*
14	2	32	0	-32	*-26*	169	12	12	80		2	10	25	54	0	-54	*-4*
15	10	38	0	-38	*-28*	205	20	12	80		10	25	25	56	0	-56	*-4*
16	25	42	0	-42	*-34*	247	20	20	98		25	25	10	43	0	-43	*-2*
17	25	52	0	-52	*-44*	299	20	20	108		25	10	10	38	0	-38	*0*
18	10	47	0	-47	*-39*	346	20	20	103		10	10	50	48	0	-48	*-2*
19	10	45	0	-45	*-26*	391	16	20	98		10	50	44	58	0	-58	*0*
20	50	47	0	-47	*-28*	438	20	16	104		50	44	20	28	0	-28	*17*
21	44	47	0	-47	*-28*	485	20	20	114		44	20	20	0	0	0	*24*
22	20	0	3	3	*16*	486.5	0	20	84		20	20	12	0	0	0	*36*
23	20	0	47	47	*32*	510	0	0	40		20	12	5	0	0	0	*38*
24	0	0	67	67	*52*	543.5	0	0	20		12	5	0	0	12	12	*56*
25	0	0	87	87	*62*	587	0	0	0		17	0	0	0	17	17	*48*
26	0	0	87	87	*62*	630.5	0	0	0		17	0	0	0	17	17	*40*
27	0	0	87	87	*62*	674	0	0	0		17	0	0	0	17	17	*32*
28	0	0	77	77	*52*	712.5	5	0	0		17	0	0	0	17	17	*24*
29	0	0	65	65	*40*	745	5	5	5		17	0	0	0	17	17	*18*
30	5	0	55	55	*30*	772.5	10	5	10		17	0	2	0	12	12	*20*
31	5	0	45	45	*20*	795	5	10	20		12	2	2	0	7	7	*34*
32	9	0	38	38	*14*	814	10	5	20		9	2	2	1	0	-1	*26*
33	2	0	31	31	*7*	829.5	10	10	25		2	2	0	4	0	-4	*28*
34	2	0	28	28	*5*	843.5	10	10	26		2	0	0	12	0	-12	*32*
35	0	0	18	18	*-2*	852.5	10	10	34		0	0	5	22	0	-22	*36*
36	0	0	10	10	*-2*	857.5	10	10	42		0	5	1	32	0	-32	*40*
37	5	0	2	2	*0*	858.5	10	10	52		5	1	2	37	0	-37	*42*
38	1	4	0	-4	*13*	862.5	5	10	62		1	2	10	46	0	-46	*44*
39	2	5	0	-5	*12*	867.5	10	5	62		2	10	1	54	0	-54	*46*
40	10	14	0	-14	*3*	881.5	10	10	71		10	1	5	49	0	-49	*44*

FROSTY 2 BEER GAME MODEL

MODEL WORKSHEET

STEP 5
Place and record your orders

	Distributor		IT									FROSTY FDA Costs	Factory	IT		
	$ 777.00												$ 1,009.50			
WEEK	DCOSTS	DOP	FIO	DSL		FPD1	FPD2	FSD2	FBL	FINV2	MFEI	*DFEI*	FCOSTS	FPR	FSL	
0	0	4	4	12		12	4	4	0	12			0	4	8	
1	6	4	4	12		16	4	4	0	12	12	*12*	6	4	8	
2	12	4	4	12		16	4	4	0	12	12	*12*	12	4	8	
3	18	4	4	12		16	4	4	0	12	12	*12*	18	4	8	
4	24	4	4	12		16	4	4	0	12	12	*12*	24	4	8	
5	30	4	4	12		16	4	4	0	12	12	*12*	30	4	8	
6	36	4	4	12		16	4	4	0	12	12	*12*	36	8	8	
7	42	8	4	12		16	4	8	0	12	12	*12*	42	4	12	
8	46	10	8	16		16	8	4	0	12	12	*16*	48	6	12	
9	47	20	10	22		20	4	6	0	12	12	*12*	54	2	10	
10	53	10	20	38		16	6	2	0	6	6	*8*	57	10	8	
11	65	8	10	40		12	2	10	8	0	-8	*-6*	65	25	12	
12	97	50	8	38		2	10	25	16	0	-16	*-14*	81	25	35	
13	137	30	50	76		10	25	25	14	0	-14	*-12*	95	10	50	
14	191	20	30	104		25	25	10	39	0	-39	*-37*	134	10	35	
15	247	20	20	114		25	10	10	44	0	-44	*-40*	178	50	20	
16	290	10	20	109		10	10	50	54	0	-54	*-50*	232	70	60	
17	328	20	10	94		10	50	70	64	0	-64	*-60*	296	25	120	
18	376	20	20	104		50	70	25	24	0	-24	*-20*	320	50	95	
19	434	20	20	114		70	25	50	0	26	26	*30*	333	20	75	
20	462	12	20	84		51	50	20	0	31	31	*35*	348.5	10	70	
21	462	5	12	52		81	20	10	0	61	61	*65*	379	0	30	
22	462	0	5	37		81	10	0	0	69	69	*73*	413.5	0	10	
23	462	0	0	17		79	0	0	0	74	74	*78*	450.5	0	0	
24	468	0	0	5		74	0	0	0	74	74	*78*	487.5	0	0	
25	476.5	0	0	0		74	0	0	0	74	74	*78*	524.5	0	0	
26	485	0	0	0		74	0	0	0	74	74	*78*	561.5	0	0	
27	493.5	0	0	0		74	0	0	0	74	74	*78*	598.5	0	0	
28	502	2	0	0		74	0	0	0	74	74	*78*	635.5	0	0	
29	510.5	2	2	2		74	0	0	0	74	74	*78*	672.5	0	0	
30	516.5	2	2	4		74	0	0	0	72	72	*76*	708.5	0	0	
31	520	0	2	6		72	0	0	0	70	70	*74*	743.5	0	0	
32	521	0	0	4		70	0	0	0	68	68	*72*	777.5	0	0	
33	525	5	0	2		68	0	0	0	68	68	*70*	811.5	0	0	
34	537	1	5	5		68	0	0	0	68	68	*70*	845.5	0	0	
35	559	2	1	6		68	0	0	0	63	63	*65*	877	0	0	
36	591	10	2	8		63	0	0	0	62	62	*64*	908	0	0	
37	628	1	10	13		62	0	0	0	60	60	*62*	939	0	0	
38	674	5	1	13		60	0	0	0	50	50	*52*	963	0	0	
39	728	10	5	16		50	0	0	0	49	49	*42*	987.5	0	0	
40	777	0	10	16		49	0	0	0	44	44	*38*	1009.5	0	0	

FROSTY 2 BEER GAME MODEL

MODEL DATA

FROSTY FDA IT Week	ROR	REI	WOR	WEI	DOR	DEI	FOR	FEI
1	4	12	4	12	4	12	4	12
2	4	12	4	12	4	12	4	12
3	4	12	4	12	4	12	4	12
4	4	13	4	12	4	13	4	12
5	8	8	4	12	4	8	4	12
6	10	4	8	12	4	4	8	12
7	12	0	10	8	8	0	4	12
8	16	-4	12	2	10	-4	6	16
9	12	-4	14	-6	20	-4	2	12
10	20	-2	30	-16	10	-2	10	8
11	8	-4	20	-18	8	-4	25	-6
12	12	-4	16	-32	50	-4	25	-14
13	16	-2	12	-24	30	-2	10	-12
14	8	-4	12	-26	20	-4	10	-37
15	20	-4	20	-28	20	-4	50	-40
16	20	-2	20	-34	10	-2	70	-50
17	23	0	20	-44	20	0	25	-60
18	12	-2	20	-39	20	-2	50	-20
19	10	0	16	-26	20	0	20	30
20	0	17	20	-28	12	17	10	35
21	0	24	20	-28	5	24	0	65
22	0	36	0	16	0	36	0	73
23	0	38	0	32	0	38	0	78
24	0	56	0	52	0	56	0	78
25	0	48	0	62	0	48	0	78
26	10	40	0	62	0	40	0	78
27	12	32	0	62	0	32	0	78
28	10	24	5	52	2	24	0	78
29	10	18	5	40	2	18	0	78
30	12	20	10	30	2	20	0	76
31	12	34	5	20	0	34	0	74
32	12	26	10	14	0	26	0	72
33	12	28	10	7	5	28	0	70
34	10	32	10	5	1	32	0	70
35	8	36	10	-2	2	36	0	65
36	6	40	10	-2	10	40	0	64
37	6	42	10	0	1	42	0	62
38	10	44	5	13	5	44	0	52
39	10	46	10	12	10	46	0	42
40	10	44	10	3	0	44	0	38

GUINESS IT BEER GAME MODEL

RME GRG NonLinear

RETAILE	incoming orders	expected incoming orders	actual orders	disturb-ance	model orders	error term	squared errors	effective inventory	Stock	Supply line
WEEK	IO	eIO	AO	ε	O_t	(AO-Ot)	$(AO-Ot)^2$	EI	S_t	SL_t
0	0	0								
1	4	0.00	4	1.149226	7.947364	-3.947364	15.5816806	12	12	12
2	4	1.37	4	1.781805	9.9454	-5.9454	35.3477773	12	12	12
3	4	2.26	8	-0.038	9.024934	-1.024934	1.05048926	12	12	12
4	4	2.86	6	0.771893	10.42716	-4.427163	19.5997765	12	12	16
5	8	3.25	8	0.465527	10.81994	-2.819938	7.9520479	8	8	18
6	8	4.87	12	1.046864	13.33269	-1.332694	1.77607407	4	4	22
7	8	5.94	8	1.035096	14.38951	-6.389505	40.8257796	4	4	26
8	8	6.64	12	-0.592869	13.61985	-1.619849	2.62390923	2	2	28
9	8	7.11	20	-2.270057	12.40621	7.5937883	57.665621	2	2	32
10	8	7.41	20	0.336166	15.47225	4.5277512	20.5005311	-4	0	50
11	8	7.61	24	-1.075949	14.26122	9.7387775	94.8437875	-2	0	60
12	8	7.74	20	0.652394	16.12201	3.87799	15.0388063	-2	0	76
13	8	7.83	4	-0.515681	15.04117	-11.04117	121.907385	0	0	86
14	8	7.89	20	1.395928	17.01023	2.9897689	8.938718	-6	0	88
15	8	7.93	30	-1.796206	13.85594	16.144062	260.63073	-12	0	106
16	8	7.95	20	-0.677835	14.99923	5.000767	25.0076704	-10	0	126
17	8	7.97	20	0.788874	16.46236	3.537642	12.5149107	-10	0	138
18	8	7.98	20	-0.044431	15.65986	4.3401352	18.8367738	-18	0	158
19	8	7.99	20	0.728188	16.43961	3.560395	12.6764123	-22	0	174
20	8	7.99	8	-1.12748	14.58863	-6.588627	43.4100104	0	0	164
21	8	7.99	20	-1.272863	13.05581	6.9441944	48.2218353	18	18	148
22	8	8.00	4	-0.726485	12.8317	-8.831702	77.998962	28	28	148
23	8	8.00	20	0.985625	14.39065	5.6093504	31.4648124	30	30	142
24	8	8.00	4	0.383911	13.61531	-9.615314	92.4542706	32	32	152
25	8	8.00	8	0.285175	11.83763	-3.837626	14.7273698	54	54	126
26	8	8.00	8	0.460728	10.70028	-2.700284	7.29153528	71	71	109
27	8	8.00	8	1.206021	8.97378	-0.97378	0.94824722	103	103	77
28	8	8.00	0	-0.709405	2.964186	-2.964186	8.78640062	156	156	24
29	8	8.00	8	1.382985	5.056686	2.9433135	8.66309445	156	156	16
30	8	8.00	10	-0.988448	2.685325	7.3146752	53.504473	156	156	16
31	8	8.00	10	-0.986384	2.707437	7.2925631	53.1814763	156	156	18
32	8	8.00	0	-0.753489	3.538375	-3.538375	12.5201009	148	148	28
33	8	8.00	8	-0.7648	3.527285	4.4727148	20.005178	148	148	20
34	8	8.00	8	-0.677835	3.45956	4.5404399	20.6155945	150	150	18
35	8	8.00	8	0.788874	4.751775	3.2482248	10.5509844	152	152	16
36	9	8.00	8	-0.044431	4.556488	3.4435116	11.8577723	144	144	24
37	10	8.34	0	0.728188	5.670476	-5.670476	32.1542936	144	144	24
38	11	8.91	0	-1.12748	4.381009	-4.381009	19.1932412	144	144	16
39	12	9.62	8	-1.272863	4.949911	3.0500887	9.30304112	144	144	8
40	13	10.43	10	-0.726485	6.308107	3.6918935	13.6300773	144	144	8
		mean of the disturbance		0.016779		0.7451041	mean of the standard errors			
		std dev of the disturbance		1.007219						

		constraints		
Σ (AO-Ot)2	1363.802			
θ	0.34	>=0	<=1	
αs	0.08	>=0	<=1	
β	0.00	>=0	<=1	
S'	100.00	>=0	<=100	INT

GRG NonLinear

Incoming Orders:
IO = COR
Expected Incoming Orders:
$eIO = \theta * IO_{(t-1)} + (1-\theta) * eIO_{(t-1)}$
Actual Orders:
AO = ROP
Disturbance:
normally distributed white noise
mean = 0
std dev = 1
Model Orders:
$Ot = MAX(0, eIO + \alpha s(s' - S_t - \beta SL_t) + \varepsilon$
Error Term:
$AO - O_t$
Squared errors:
$(AO - O_t)^2$
Effective Inventory:
EI = REI
Stock:
St = MAX(0,EI)
Supply Line:
SLt = RSL = RSD1+RSD2+WIO+WBL

GUINESS IT BEER GAME MODEL

WME - GRG NonLinear

WHOLES	incoming orders	expected incoming orders	actual orders	disturb-ance	model orders	error term	squared errors	effective inventory	Stock	Supply line
WEEK	IO	eIO	AO	ε	O_t	(AO-Ot)	$(AO-Ot)^2$	EI	S_t	SL_t
0	4	0								
1	4	1.593457	4	-1.434219	0.498317	3.5016825	12.2617805	12	12	12
2	4	2.552137	4	-2.10315	0.788067	3.2119329	10.316513	12	12	12
3	4	3.128914	4	-0.999197	2.488797	1.5312029	2.34458227	12	12	12
4	8	3.475923	0	0.834448	4.649451	-4.649451	21.617397	12	12	12
5	6	5.278153	10	1.449531	10.81359	-0.813591	0.66192986	8	8	8
6	8	5.565711	8	0.442624	11.96765	-3.967654	15.7422816	6	6	14
7	12	6.535445	10	-0.343722	15.89787	-5.897867	34.7848376	2	2	18
8	8	8.712328	8	-1.718988	18.5729	-10.5729	111.786149	-10	0	28
9	12	8.428562	10	1.883051	21.89117	-11.89117	141.399925	-8	0	26
10	20	9.851295	12	-0.356256	21.0746	-9.074596	82.3482974	-12	0	28
11	20	13.89418	20	0.943999	26.41773	-6.417731	41.1872755	-22	0	30
12	24	16.32662	30	0.809932	28.71601	1.283994	1.64864066	-40	0	48
13	20	19.38336	30	0.549769	31.51288	-1.512884	2.28821279	-62	0	76
14	4	19.62901	20	0.19826	31.40682	-11.40682	130.115604	-72	0	96
15	20	13.40297	30	-1.863076	23.11945	6.8805484	47.3419466	-68	0	108
16	30	16.03099	20	-0.017699	27.59285	-7.592848	57.6513453	-88	0	138
17	20	21.59574	50	-0.189649	32.98585	17.014349	289.488069	-114	0	154
18	20	20.96006	50	-0.740388	31.79923	18.200774	331.28817	-104	0	174
19	20	20.5776	50	-1.434219	30.72294	19.277058	371.604957	-98	0	198
20	20	20.34751	50	0.420963	32.34803	17.651972	311.592114	-100	0	230
21	8	20.20907	50	0.16319	31.95182	18.04818	325.736793	-110	0	270
22	20	15.34542	25	0.301842	27.22682	-2.226815	4.95870701	-108	0	310
23	4	17.19964	25	0.784326	29.56352	-4.563519	20.8257081	-98	0	305
24	20	11.94137	25	0.548191	24.06912	0.9308781	0.8665341	-77	0	305
25	4	15.15164	0	0.118631	26.84983	-26.84983	720.913355	-57	0	290
26	8	10.70923	0	-1.642367	0	0	0	39	39	190
27	8	9.629968	0	0.420963	0	0	0	71	71	150
28	8	8.980647	0	0.16319	0	0	0	143	143	70
29	0	8.589993	0	0.301842	0	0	0	205	205	0
30	8	5.168048	0	0.784326	0	0	0	205	205	0
31	10	6.296196	5	0.548191	0	5	25	197	197	0
32	10	7.771659	5	0.118631	0	5	25	187	187	5
33	0	8.65935	5	-1.642367	0	5	25	177	177	10
34	8	5.209775	0	0.420963	0	0	0	177	177	15
35	8	6.321301	0	0.16319	0	0	0	174	174	10
36	8	6.990034	0	0.301842	0	0	0	171	171	5
37	8	7.392368	0	0.784326	0	0	0	168	168	0
38	0	7.634427	0	0.548191	0	0	0	160	160	0
39	0	4.593145	0	0.118631	0	0	0	160	160	0
40	8	2.763401	8	-1.642367	0	8	64	160	160	0
	mean of the disturbance			-0.060436		0.4312884	mean of the standard errors			
	std dev of the disturbance			0.98726						

			constraints		
Σ (AO-Ot)2	3229.751				
θ	0.40		>=0	<=1	
αs	0.94		>=0	<=1	
β	0.00		>=0	<=1	
S'	12.36		>=0	<=100	INT

Standard GRG NonLinear

Incoming Orders:
IO = WIO
Expected Incoming Orders:
$eIO = \theta^* IO_{(t-1)} + (1-\theta)^* eIO_{(t-1)}$
Actual Orders:
AO = WOP
Disturbance:
normally distributed white noise
mean = 0
std dev = 1
Model Orders:
$Ot = MAX(0, eIO + \alpha s(s' - S_t - \beta SL_t) + \varepsilon$
Error Term:
$AO - O_t$
Squared errors:
$(AO - O_t)^2$
Effective Inventory:
EI = MWEI
Stock:
St = MAX(0,EI)
Supply Line:
SLt = WSL = WSD1+WSD2+DIO+DBL

GUINESS IT BEER GAME MODEL

DME - GRG NonLinear

DISTRIB	incoming orders	expected incoming orders	actual orders	disturb-ance	model orders	error term	squared errors	effective inventory	Stock	Supply line
WEEK	IO	eIO	AO	ε	O_t	(AO-Ot)	$(AO-Ot)^2$	EI	S_t	SL_t
0	4	0								
1	4	3.352678	4	0.858383	3.486096	0.5139039	0.26409724	12	12	12
2	4	3.895244	4	-0.639041	2.531237	1.468763	2.15726472	12	12	12
3	4	3.983047	6	-0.644217	2.613865	3.386135	11.4659105	12	12	12
4	4	3.997257	4	-0.888352	2.583939	1.416061	2.00522874	12	12	14
5	0	3.999556	2	-0.517681	2.757009	-0.757009	0.57306299	12	12	14
6	10	0.64725	2	-0.157063	0	2	4	16	16	12
7	8	8.48644	2	0.340434	8.101909	-6.101909	37.2332943	12	12	8
8	10	8.078721	10	0.350364	9.837721	0.162279	0.02633447	8	8	6
9	8	9.689079	20	-0.278198	15.08672	4.9132807	24.1403277	0	0	14
10	10	8.273344	14	1.536036	15.48522	-1.48522	2.20587797	-6	0	32
11	12	9.720575	4	-0.255276	15.14114	-11.14114	124.124941	-14	0	44
12	20	11.63112	10	-0.528688	16.77827	-6.778271	45.9449577	-16	0	38
13	30	18.64566	20	0.889111	25.21061	-5.21061	27.1504574	-28	0	40
14	30	28.16252	35	-0.657286	33.18107	1.8189251	3.30848851	-58	0	60
15	20	29.70264	20	0.051133	35.42961	-15.42961	238.072922	-84	0	91
16	30	21.57018	30	-1.334718	25.9113	4.0886958	16.7174334	-74	0	81
17	20	28.6358	40	1.397474	35.70911	4.2908881	18.4117204	-78	0	85
18	50	21.39754	30	-0.308741	26.76463	3.235367	10.4675994	-80	0	107
19	50	45.37125	60	0.858383	51.90547	8.094527	65.5213674	-120	0	127
20	50	49.25093	50	-0.639041	54.28773	-4.287726	18.3845901	-160	0	177
21	50	49.87878	80	-0.644217	54.9104	25.0896	629.488042	-180	0	197
22	50	49.98038	80	-0.88841	54.76781	25.232188	636.663335	-205	0	252
23	25	49.99683	50	-2.541628	53.13114	-3.131137	9.80401743	-215	0	292
24	25	29.04525	40	-1.668526	33.05256	6.9474393	48.266913	-140	0	242
25	25	25.65464	25	-0.459935	30.87056	-5.870549	34.4633415	-125	0	242
26	0	25.10594	0	-0.343579	30.4382	-30.4382	926.484134	-70	0	187
27	0	4.062906	0	-1.877389	0	0	0	50	50	67
28	0	0.657502	0	0.774032	0	0	0	92	92	25
29	0	0.106404	0	-1.761979	0	0	0	117	117	0
30	0	0.017219	0	0.965225	0	0	0	117	117	0
31	0	0.002787	0	0.072539	0	0	0	117	117	0
32	5	0.000451	0	0.600224	0	0	0	117	117	0
33	5	4.190921	0	-0.868634	0	0	0	112	112	0
34	5	4.869066	0	0.844132	0	0	0	107	107	0
35	0	4.978811	0	1.556953	0	0	0	102	102	0
36	0	0.805723	0	0.863538	0	0	0	102	102	0
37	0	0.130391	0	0.474694	0	0	0	102	102	0
38	0	0.021101	0	-1.415138	0	0	0	102	102	0
39	0	0.003415	0	-2.043826	0	0	0	102	102	0
40	0	0.000553	0	-0.88841	0	0	0	102	102	0
	mean of the disturbance			-0.188799		0.0579049	mean of the standard errors			
	std dev of the disturbance			0.992518						

Σ (AO-Ot)2	2937.346		constraints		
θ	0.84		>=0	<=1	
αs	0.53		>=0	<=1	
β	0.00		>=0	<=1	
S'	10.64		>=0	<=100	INT

GRG NonLinear

Incoming Orders:

IO = DIO

Expected Incoming Orders:

$eIO = \theta * IO_{(t-1)} + (1-\theta) * eIO_{(t-1)}$

Actual Orders:

AO = DOP

Disturbance:

normally distributed white noise

mean = 0

std dev = 1

Model Orders:

$Ot = MAX(0, eIO + \alpha s(s' - S_t - \beta SL_t) + \varepsilon$

Error Term:

$AO - O_t$

Squared errors:

$(AO - O_t)^2$

Effective Inventory:

EI = MDEI

Stock:

St = MAX(0,EI)

Supply Line:

SLt = DSL = DSD1+DSD2+FIO+FBL

GUINESS IT BEER GAME MODEL

FME - GRG NonLinear

FACTORY	incoming orders	expected incoming orders	actual orders	disturb-ance	model orders	error term	squared errors	effective inventory	Stock	Supply line
WEEK	IO	eIO	AO	ε	O_t	(AO-Ot)	$(AO-Ot)^2$	EI	S_t	SL_t
0	4	0								
1	4	4	4	-0.400968	8.302431	-4.302431	18.5109106	12	12	8
2	4	4	4	1.609769	10.31317	-6.313169	39.8560973	12	12	8
3	4	4	4	-0.853702	7.849697	-3.849697	14.8201667	12	12	8
4	6	4	4	0.664736	9.368135	-5.368135	28.8168723	12	12	8
5	4	6	6	-0.890347	11.81305	-5.813052	33.7915755	10	10	8
6	2	4	4	-0.321502	10.3819	-6.381898	40.7286158	10	10	10
7	2	2	0	0.474779	7.178178	-7.178178	51.5262414	12	12	10
8	2	2	0	-0.400968	2.302431	-2.302431	5.30118749	16	16	4
9	10	2	0	1.609769	2.313169	-2.313169	5.35074879	18	18	0
10	20	10	4	-0.853702	17.8497	-13.8497	191.814106	8	8	0
11	14	20	30	0.664736	37.36813	-7.368135	54.289412	-12	0	4
12	4	14	30	-0.890347	29.81305	0.1869478	0.03494949	-26	0	34
13	10	4	14	-0.321502	20.3819	-6.381898	40.7286158	-26	0	60
14	20	10	10	0.474779	27.17818	-17.17818	295.089804	-6	0	44
15	35	20	10	-0.400968	32.30243	-22.30243	497.398419	4	4	24
16	20	35	30	1.609769	53.31317	-23.31317	543.503828	-17	0	20
17	30	20	25	-0.853702	35.8497	-10.8497	117.715924	-27	0	40
18	40	30	40	0.664736	47.36813	-7.368135	54.289412	-47	0	55
19	30	40	100	-0.890347	55.81305	44.186948	1952.48636	-57	0	65
20	60	30	40	-0.321502	46.3819	-6.381898	40.7286158	-82	0	140
21	50	60	80	0.474779	77.17818	2.8218219	7.96267882	-82	0	140
22	80	50	120	-0.400968	66.30243	53.697569	2883.42894	-32	0	120
23	80	80	200	0.741053	97.44445	102.55555	10517.6403	-72	0	200
24	50	80	80	0.735349	97.43875	-17.43875	304.109954	-72	0	320
25	40	50	40	0.491292	67.19469	-27.19469	739.551228	-2	0	280
26	25	40	0	0.639527	0	0	0	158	158	120
27	0	25	0	-1.703634	0	0	0	213	213	40
28	0	0	0	2.434764	0	0	0	253	253	0
29	0	0	0	1.728996	0	0	0	253	253	0
30	0	0	0	-0.827107	0	0	0	253	253	0
31	0	0	0	-1.247662	0	0	0	253	253	0
32	0	0	0	1.725953	0	0	0	253	253	0
33	0	0	0	0.439559	0	0	0	253	253	0
34	0	0	0	0.054898	0	0	0	253	253	0
35	0	0	0	-0.628184	0	0	0	253	253	0
36	0	0	0	-0.421826	0	0	0	253	253	0
37	0	0	0	0.940109	0	0	0	253	253	0
38	0	0	0	-0.871156	0	0	0	253	253	0
39	0	0	0	-0.750155	0	0	0	253	253	0
40	0	0	0	-1.157782	0	0	0	253	253	0
	mean of the disturbance			0.143775		1.583E-14	mean of the standard errors			
	std dev of the disturbance			0.99913						

Σ (AO-Ot)2	18479.48		constraints		
θ	1.00		>=0	<=1	
αs	1.00		>=0	<=1	
β	0.00		>=0	<=1	
S'	16.70		>=0	<=100	INT

GRG NonLinear

Incoming Orders:

IO = FIO

Expected Incoming Orders:

$eIO = \theta^* IO_{(t-1)} + (1-\theta)^* eIO_{(t-1)}$

Actual Orders:

AO = FPR

Disturbance:

normally distributed white noise

mean = 0

std dev = 1

Model Orders:

$Ot = MAX(0, eIO + \alpha s(s' - S_t - \beta SL_t) + \varepsilon$

Error Term:

$AO - O_t$

Squared errors:

$(AO - O_t)^2$

Effective Inventory:

EI = MFEI

Stock:

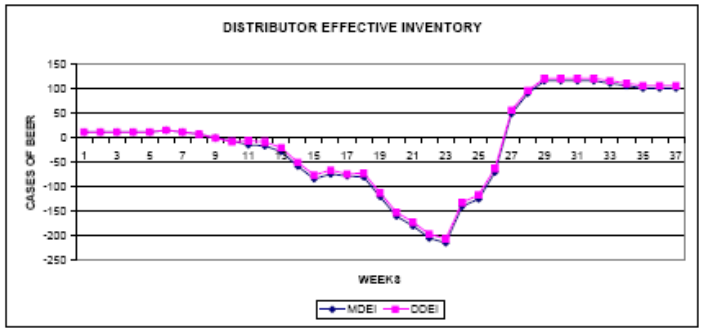
St = MAX(0,EI)

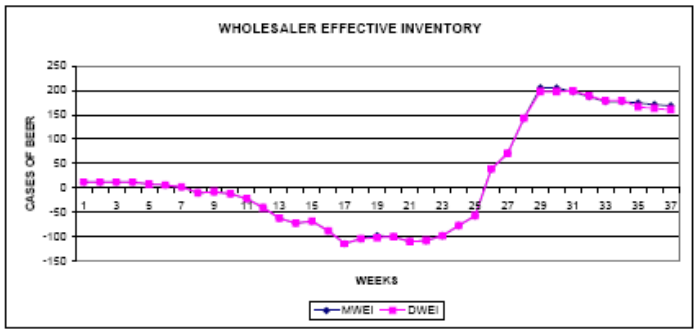
Supply Line:

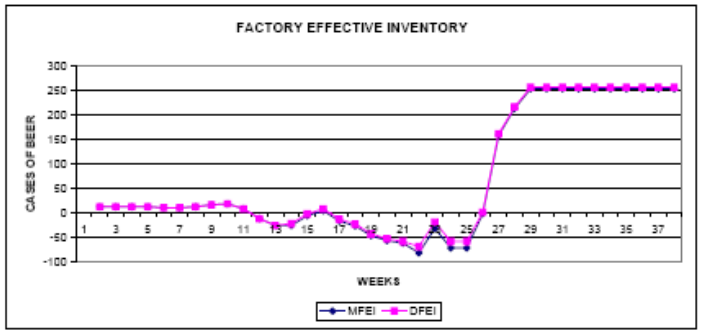
SLt = FSL = FPD1+FPD2

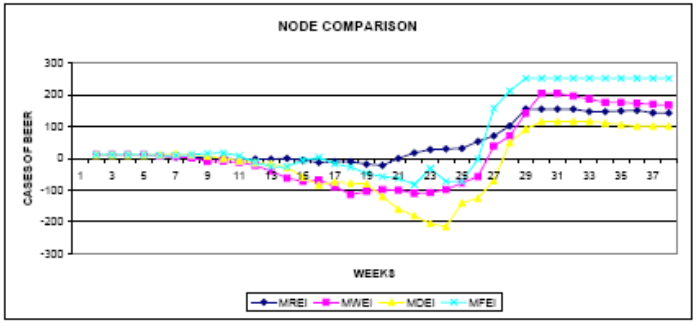
GUINESS IT BEER GAME MODEL

MODEL CHARTS



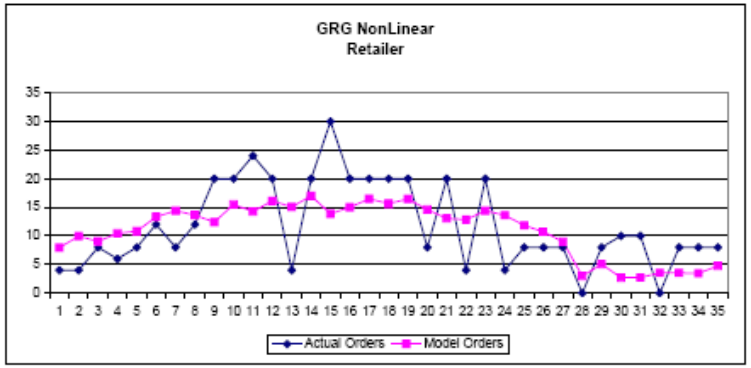


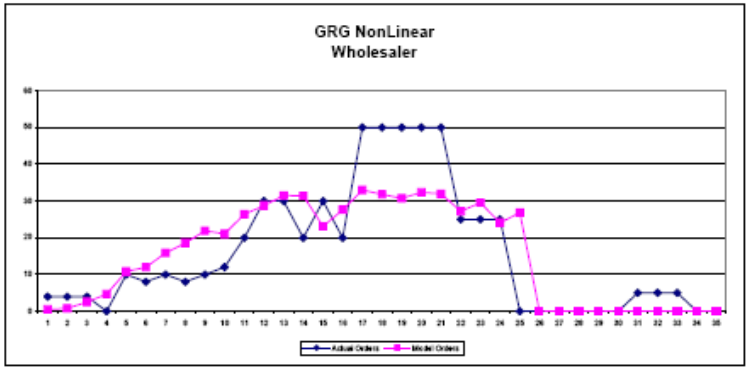


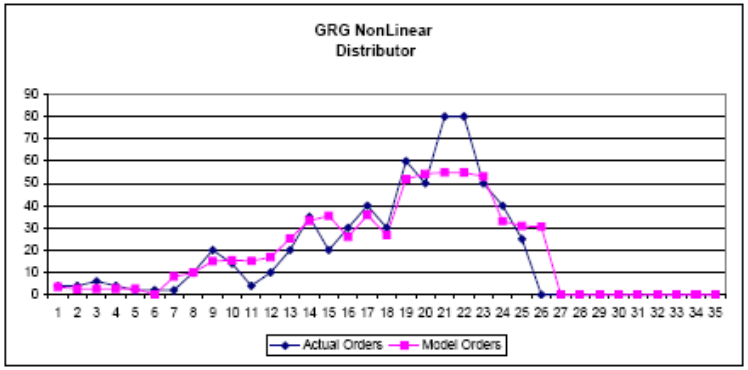


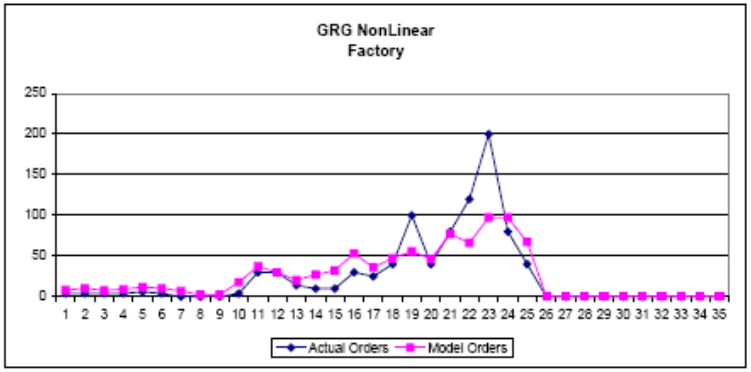
GUINESS IT BEER GAME MODEL

ORDER CHARTS









GUINESS IT BEER GAME MODEL

MODEL WORKSHEET

STEP 1
Receive The Inventory and Advance the shipping Delays

STEP 2
Look at the incoming orders and fill orders
all incoming orders + backlog

	GUINESS	IT							GUINESS	Retailer	IT					
	Team Costs	$ 7,602.00							Costs	$ 1,043.00						
WEEK	COR	RINV1	RSD1	RSD2	RBL	RSR	RINV2	MREI	*DREI*	RCOSTS	ROP	WIO	RSL		WINV1	WSD1
0	0	12	4	4	0	4	12			0	4	4			12	4
1	4	16	4	4	0	4	12	12	*12*	6	4	4	12		16	4
2	4	16	4	4	0	4	12	12	*12*	12	4	4	12		16	4
3	4	16	4	4	0	4	12	12	*12*	18	8	4	12		16	4
4	4	16	4	4	0	4	12	12	*12*	24	6	8	16		16	4
5	8	16	4	8	0	8	8	8	*8*	28	8	6	18		16	4
6	8	12	8	6	0	8	4	4	*4*	30	12	8	22		12	4
7	8	12	6	8	0	8	4	4	*4*	32	8	12	26		10	0
8	8	10	8	2	0	8	2	2	*2*	33	12	8	28		2	10
9	8	10	2	10	0	8	2	2	*2*	34	20	12	32		10	8
10	8	4	10	8	4	4	0	-4	*-6*	38	20	20	50		8	10
11	8	10	8	10	2	10	0	-2	*-4*	40	24	20	60		10	2
12	8	8	10	2	2	8	0	-2	*-4*	42	20	24	76		2	2
13	8	10	2	2	0	10	0	0	*-2*	42	4	20	86		2	10
14	8	2	2	10	6	2	0	-8	*-8*	48	20	4	88		10	8
15	8	2	10	8	12	2	0	-12	*-14*	60	30	20	106		8	0
16	8	10	8	0	10	10	0	-10	*-12*	70	20	30	126		0	4
17	8	8	0	4	10	8	0	-10	*-12*	80	20	20	138		4	30
18	8	0	4	30	18	0	0	-18	*-20*	98	20	20	158		30	26
19	8	4	30	26	22	4	0	-22	*-24*	120	20	20	174		26	18
20	8	30	26	18	0	30	0	0	*-2*	120	8	20	164		18	10
21	8	26	18	10	0	8	18	18	*10*	129	20	8	146		10	10
22	8	36	10	10	0	8	28	28	*24*	143	4	20	148		10	30
23	8	38	10	30	0	8	30	30	*18*	158	20	4	142		30	25
24	8	40	30	25	0	8	32	32	*20*	174	4	20	152		25	40
25	8	62	25	40	0	8	54	54	*42*	201	8	4	126		40	100
26	8	79	40	61	0	8	71	71	*59*	236.5	8	8	109		100	40
27	8	111	61	8	0	8	103	103	*91*	288	8	8	77		79	80
28	8	164	8	8	0	8	156	156	*144*	386	0	8	24		151	70
29	8	164	8	8	0	8	156	156	*152*	444	8	0	16		213	0
30	8	164	8	0	0	8	156	156	*144*	522	10	8	16		205	0
31	8	164	0	8	0	8	156	156	*144*	600	10	10	18		205	0
32	8	156	8	10	0	8	148	148	*136*	674	0	10	28		197	0
33	8	156	10	10	0	8	148	148	*136*	748	8	0	20		187	0
34	8	158	10	0	0	8	150	150	*138*	823	8	8	18		177	5
35	8	160	0	8	0	8	152	152	*140*	899	8	8	16		182	5
36	8	152	8	8	0	8	144	144	*132*	971	8	8	24		179	5
37	8	152	8	8	0	8	144	144	*142*	1043	0	8	24		176	0
38	8	152	8	8	0	8	144	144	*132*	1115	0	0	16		168	0
39	8	152	8	0	0	8	144	144	*132*	1187	8	0	8		160	0
40	8	152	0	0	0	8	144	144	*132*	1259	10	8	8		160	0

GUINESS IT BEER GAME MODEL

MODEL WORKSHEET

	STEP 3 Record your inventory or backlog										STEP 4 Advance the order slips and the brewery Brews						
					GUINESS	Wholesaler		IT									GUINESS
					Costs	$ 2,237.00											Costs
WEEK	WSD2	WBL	WINV2	MWEI	*DWEI*	WCOSTS	WOP	DIO	WSL		DINV1	DSD1	DSD2	DBL	DINV2	MDEI	*DDEI*
0	4	0	12			0	4	4			12	4	4	0	12		
1	4	0	12	12	*12*	6	4	4	12		16	4	4	0	12	12	*12*
2	4	0	12	12	*12*	12	4	4	12		16	4	4	0	12	12	*12*
3	4	0	12	12	*12*	18	4	4	12		16	4	4	0	12	12	*12*
4	4	0	12	12	*12*	24	0	4	12		16	4	4	0	12	12	*12*
5	4	0	8	8	*8*	28	10	0	8		16	4	6	0	12	12	*12*
6	0	0	6	6	*6*	31	8	10	14		16	6	4	0	16	16	*16*
7	10	0	2	2	*2*	32	10	8	18		22	4	2	0	12	12	*12*
8	8	10	0	-10	*-10*	42	8	10	28		16	2	2	0	8	8	*8*
9	10	8	0	-8	*-8*	50	10	8	26		10	2	2	0	0	0	*0*
10	2	12	0	-12	*-12*	62	12	10	28		2	2	10	6	0	-6	*-8*
11	2	22	0	-22	*-22*	84	20	12	30		2	10	8	14	0	-14	*-6*
12	10	40	0	-40	*-40*	124	30	20	48		10	8	0	16	0	-16	*-8*
13	8	62	0	-62	*-62*	186	30	30	76		8	0	4	28	0	-28	*-20*
14	0	72	0	-72	*-72*	258	20	30	96		0	4	30	58	0	-58	*-50*
15	4	68	0	-68	*-68*	326	30	20	108		4	30	26	84	0	-84	*-76*
16	30	88	0	-88	*-88*	414	20	30	138		30	26	18	74	0	-74	*-66*
17	26	114	0	-114	*-114*	528	50	20	154		26	18	10	78	0	-78	*-74*
18	18	104	0	-104	*-104*	632	50	50	174		18	10	10	80	0	-80	*-72*
19	10	98	0	-98	*-102*	730	50	50	198		10	10	30	120	0	-120	*-112*
20	10	100	0	-100	*-100*	830	50	50	230		10	30	25	160	0	-160	*-152*
21	30	110	0	-110	*-110*	940	50	50	270		30	25	40	180	0	-180	*-172*
22	25	108	0	-108	*-108*	1048	25	50	310		25	40	100	205	0	-205	*-197*
23	40	98	0	-98	*-98*	1146	25	25	305		40	100	40	215	0	-215	*-207*
24	100	77	0	-77	*-77*	1223	25	25	305		100	40	80	140	0	-140	*-132*
25	40	57	0	-57	*-57*	1280	0	25	290		40	80	120	125	0	-125	*-117*
26	80	0	39	39	*39*	1299.5	0	0	190		80	120	42	70	0	-70	*-62*
27	70	0	71	71	*71*	1335	0	0	150		120	42	25	0	50	50	*57*
28	0	0	143	143	*143*	1406.5	0	0	70		92	25	0	0	92	92	*97*
29	0	0	205	205	*197*	1509	0	0	0		117	0	0	0	117	117	*122*
30	0	0	205	205	*197*	1611.5	0	0	0		117	0	0	0	117	117	*122*
31	0	0	197	197	*199*	1710	5	0	0		117	0	0	0	117	117	*122*
32	0	0	187	187	*189*	1803.5	5	5	5		117	0	0	0	117	117	*122*
33	5	0	177	177	*179*	1892	5	5	10		117	0	0	0	112	112	*117*
34	5	0	177	177	*179*	1980.5	0	5	15		112	0	0	0	107	107	*112*
35	5	0	174	174	*166*	2067.5	0	0	10		107	0	0	0	102	102	*107*
36	0	0	171	171	*163*	2153	0	0	5		102	0	0	0	102	102	*107*
37	0	0	168	168	*160*	2237	0	0	0		102	0	0	0	102	102	*107*
38	0	0	160	160	*152*	2317	0	0	0		102	0	0	0	102	102	*107*
39	0	0	160	160	*152*	2397	0	0	0		102	0	0	0	102	102	*107*
40	0	0	160	160	*152*	2477	8	0	0		102	0	0	0	102	102	*107*

GUINESS IT BEER GAME MODEL

MODEL WORKSHEET

STEP 5
Place and record your orders

	Distributor		IT									GUINESS Costs	Factory	IT		
	$ 2,268.50												$ 2,053.50			
WEEK	DCOSTS	DOP	FIO	DSL		FPD1	FPD2	FSD2	FBL	FINV2	MFEI	*DFEI*	FCOSTS	FPR	FSL	
0	0	4	4	12		12	4	4	0	12			0	4	8	
1	6	4	4	12		16	4	4	0	12	12	*12*	6	4	8	
2	12	4	4	12		16	4	4	0	12	12	*12*	12	4	8	
3	18	6	4	12		16	4	4	0	12	12	*12*	18	4	8	
4	24	4	6	14		16	4	4	0	12	12	*12*	24	4	8	
5	30	2	4	14		16	4	4	0	10	10	*10*	29	6	8	
6	38	2	2	12		14	4	6	0	10	10	*10*	34	4	10	
7	44	2	2	8		14	6	4	0	12	12	*12*	40	0	10	
8	48	10	2	6		18	4	0	0	16	16	*16*	48	0	4	
9	48	20	10	14		20	0	0	0	18	18	*18*	57	0	0	
10	54	14	20	32		18	0	0	0	8	8	*8*	61	4	0	
11	68	4	14	44		8	0	4	12	0	-12	*-12*	73	30	4	
12	84	10	4	38		0	4	30	26	0	-26	*-26*	99	30	34	
13	112	20	10	40		4	30	30	26	0	-26	*-22*	125	14	60	
14	170	35	20	60		30	30	14	6	0	-6	*-2*	131	10	44	
15	254	20	35	91		30	14	10	0	4	4	*8*	133	10	24	
16	328	30	20	81		18	10	10	17	0	-17	*-13*	150	30	20	
17	406	40	30	85		10	10	30	27	0	-27	*-23*	177	25	40	
18	486	30	40	107		10	30	25	47	0	-47	*-43*	224	40	55	
19	606	60	30	127		30	25	40	57	0	-57	*-53*	281	100	65	
20	766	50	60	177		25	40	100	62	0	-62	*-59*	343	40	140	
21	946	80	50	197		40	100	40	82	0	-82	*-69*	425	80	140	
22	1151	80	80	252		100	40	80	32	0	-32	*-19*	457	120	120	
23	1366	50	80	292		40	80	120	72	0	-72	*-59*	529	200	200	
24	1506	40	50	242		80	120	200	72	0	-72	*-59*	601	80	320	
25	1631	25	40	242		120	200	80	2	0	-2	*1*	603	40	280	
26	1701	0	25	187		200	80	40	0	158	158	*161*	682	0	120	
27	1726	0	0	67		238	40	0	0	213	213	*216*	788.5	0	40	
28	1772	0	0	25		253	0	0	0	253	253	*256*	915	0	0	
29	1830.5	0	0	0		253	0	0	0	253	253	*256*	1041.5	0	0	
30	1889	0	0	0		253	0	0	0	253	253	*256*	1168	0	0	
31	1947.5	0	0	0		253	0	0	0	253	253	*256*	1294.5	0	0	
32	2006	0	0	0		253	0	0	0	253	253	*256*	1421	0	0	
33	2062	0	0	0		253	0	0	0	253	253	*256*	1547.5	0	0	
34	2115.5	0	0	0		253	0	0	0	253	253	*256*	1674	0	0	
35	2166.5	0	0	0		253	0	0	0	253	253	*256*	1800.5	0	0	
36	2217.5	0	0	0		253	0	0	0	253	253	*256*	1927	0	0	
37	2268.5	0	0	0		253	0	0	0	253	253	*256*	2053.5	0	0	
38	2319.5	0	0	0		253	0	0	0	253	253	*256*	2180	0	0	
39	2370.5	0	0	0		253	0	0	0	253	253	*256*	2306.5	0	0	
40	2421.5	0	0	0		253	0	0	0	253	253	*256*	2433	0	0	

GUINESS IT BEER GAME MODEL

MODEL DATA

GUINESS IT Week	ROR	REI	WOR	WEI	DOR	DEI	FOR	FEI
1	4	12	4	12	4	12	4	12
2	4	12	4	12	4	12	4	12
3	8	12	4	12	6	12	4	12
4	6	12	0	12	4	12	4	12
5	8	8	10	8	2	12	6	10
6	12	4	8	6	2	16	4	10
7	8	4	10	2	2	12	0	12
8	12	2	8	-10	10	8	0	16
9	20	2	10	-8	20	0	0	18
10	20	-6	12	-12	14	-8	4	8
11	24	-4	20	-22	4	-6	30	-12
12	20	-4	30	-40	10	-8	30	-26
13	4	-2	30	-62	20	-20	14	-22
14	20	-8	20	-72	35	-50	10	-2
15	30	-14	30	-68	20	-76	10	8
16	20	-12	20	-88	30	-66	30	-13
17	20	-12	50	-114	40	-74	25	-23
18	20	-20	50	-104	30	-72	40	-43
19	20	-24	50	-102	60	-112	100	-53
20	8	-2	50	-100	50	-152	40	-59
21	20	10	50	-110	80	-172	80	-69
22	4	24	25	-108	80	-197	120	-19
23	20	18	25	-98	50	-207	200	-59
24	4	20	25	-77	40	-132	80	-59
25	8	42	0	-57	25	-117	40	1
26	8	59	0	39	0	-62	0	161
27	8	91	0	71	0	57	0	216
28	0	144	0	143	0	97	0	256
29	8	152	0	197	0	122	0	256
30	10	144	0	197	0	122	0	256
31	10	144	5	199	0	122	0	256
32	0	136	5	189	0	122	0	256
33	8	136	5	179	0	117	0	256
34	8	138	0	179	0	112	0	256
35	8	140	0	166	0	107	0	256
36	8	132	0	163	0	107	0	256
37	0	142	0	160	0	107	0	256
38	0	132	0	152	0	107	0	256
39	8	132	0	152	0	107	0	256
40	10	132	8	152	0	107	0	256

GUINESS2 IT BEER GAME MODEL

RME GRG NonLinear

RETAILE	incoming orders	expected incoming orders	actual orders	disturb-ance	model orders	error term	squared errors	effective inventory	Stock	Supply line
WEEK	IO	eIO	AO	ε	O_t	(AO-Ot)	$(AO-Ot)^2$	EI	S_t	SL_t
0	0	0								
1	4	0.00	4	-1.445126	2.390741	1.6092586	2.5897133	12	12	12
2	4	0.04	4	-1.901586	1.972015	2.0279849	4.11272281	12	12	12
3	4	0.08	8	-0.573913	3.337066	4.6629343	21.7429563	12	12	12
4	4	0.11	6	-0.080524	3.664533	2.335467	5.45440595	12	12	16
5	8	0.15	6	-0.507432	5.148253	0.8517467	0.72547252	8	8	18
6	8	0.22	8	-0.452332	7.15137	0.8486303	0.7201734	4	4	20
7	8	0.30	6	-0.115423	7.561643	-1.561643	2.43873002	4	4	20
8	8	0.37	8	-0.329528	8.407924	-0.407924	0.16640232	2	2	20
9	8	0.44	10	1.06111	10.75679	-0.756789	0.57272976	0	0	22
10	8	0.51	8	-0.939159	8.726355	-0.726355	0.52759166	0	0	24
11	8	0.58	8	-0.118786	9.51591	-1.51591	2.29798463	-2	0	26
12	8	0.65	10	-0.543295	9.161351	0.8386495	0.70333296	-2	0	26
13	8	0.72	10	1.211826	10.98578	-0.985781	0.97176434	0	0	26
14	8	0.79	6	0.633452	10.37459	-4.374589	19.1370252	0	0	28
15	8	0.86	8	-0.390641	9.519977	-1.519977	2.310331	0	0	26
16	8	0.93	6	0.565793	10.54378	-4.543777	20.6459131	0	0	26
17	8	0.99	6	0.019328	9.911833	-3.911833	15.3024371	-5	0	29
18	8	1.06	12	-0.982524	8.874608	3.1253921	9.76807552	-9	0	31
19	8	1.12	12	-0.652921	8.965268	3.034732	9.20959852	-11	0	37
20	8	1.19	14	-0.514748	9.320511	4.6794885	21.8976128	-4	0	34
21	8	1.25	14	-0.385065	9.311495	4.6885049	21.982078	-2	0	38
22	8	1.32	12	1.632655	10.30367	1.6963291	2.87753249	2	2	40
23	8	1.38	6	1.988595	8.747227	-2.747227	7.54725571	6	6	40
24	8	1.44	4	-0.951227	4.198846	-0.198846	0.03953967	10	10	34
25	8	1.50	4	0.227262	6.528379	-2.528379	6.39270259	8	8	32
26	8	1.57	4	-0.449189	7.002389	-3.002389	9.01434205	6	6	30
27	8	1.63	4	-0.966864	5.862119	-1.862119	3.46748772	8	8	24
28	8	1.69	6	0.301812	4.292028	1.7079719	2.91716796	15	15	13
29	8	1.75	8	1.255697	6.736303	1.2636974	1.59693112	12	12	14
30	8	1.81	10	-0.867763	6.444316	3.5556837	12.6428868	8	8	18
31	8	1.86	10	-0.012803	9.028719	0.9712809	0.94338655	4	4	24
32	8	1.92	10	0.059338	9.943513	0.0564867	0.00319075	2	2	28
33	8	1.98	8	0.780195	10.62024	-2.620237	6.86564334	2	2	30
34	8	2.04	8	0.838268	11.57061	-3.570613	12.7492756	-1	0	33
35	8	2.09	8	-0.696475	9.990661	-1.990661	3.96272996	-3	0	35
36	9	2.15	10	-0.359223	10.38365	-0.383646	0.14718445	-3	0	35
37	10	2.21	11	0.348171	11.00347	-0.003471	1.2048E-05	-4	0	38
38	11	2.29	14	-0.012803	10.7667	3.233302	10.4542416	0	0	37
39	12	2.37	14	0.059338	10.21073	3.7892706	14.358572	-8	0	51
40	13	2.46	8	0.780195	10.31213	-2.312134	5.34596327	-16	0	65
	mean of the disturbance			-0.094342		-0.02488	mean of the standard errors			
	std dev of the disturbance			0.869618						

Σ (AO-Ot)2	264.6031		constraints		
θ	0.01		>=0	<=1	
αs	0.49		>=0	<=1	
β	0.10		>=0	<=1	
S'	21.00		>=0	<=100	INT
	GRG NonLinear				

Incoming Orders:
IO = COR
Expected Incoming Orders:
$eIO = \theta * IO_{(t-1)} + (1-\theta) * eIO_{(t-1)}$
Actual Orders:
AO = ROP
Disturbance:
normally distributed white noise
mean = 0
std dev = 1
Model Orders:
$Ot = MAX(0, eIO + \alpha s(s' - S_t - \beta SL_t) + \varepsilon$
Error Term:
$AO - O_t$
Squared errors:
$(AO - O_t)^2$
Effective Inventory:
EI = REI
Stock:
St = MAX(0,EI)
Supply Line:
SLt = RSL = RSD1+RSD2+WIO+WBL

GUINESS2 IT BEER GAME MODEL

WME - GRG NonLinear

WHOLES	incoming orders	expected incoming orders	actual orders	disturb-ance	model orders	error term	squared errors	effective inventory	Stock	Supply line
WEEK	IO	eIO	AO	ε	O_t	(AO-Ot)	$(AO-Ot)^2$	EI	S_t	SL_t
0	4	0								
1	4	0	4	-0.278525	4.017428	-0.017428	0.00030372	12	12	12
2	4	0	4	-1.481154	2.814799	1.1852007	1.40470079	12	12	12
3	4	0	5	-1.242269	3.053684	1.9463158	3.78814515	12	12	12
4	8	0	10	-0.980738	3.283839	6.7161608	45.1068155	12	12	13
5	6	0	8	-1.460616	4.692357	3.3076428	10.940501	8	8	19
6	6	0	10	-1.260261	5.805534	4.1944661	17.5935462	6	6	23
7	8	0	8	-0.981998	6.446082	1.5539182	2.41466176	5	5	28
8	6	0	7	-0.89233	5.560176	1.4398241	2.07309346	7	7	26
9	8	0	5	0.191841	5.637398	-0.637398	0.40627662	9	9	25
10	10	0	3	0.545834	5.109945	-2.109945	4.45186883	11	11	20
11	8	0	3	-0.494248	5.265065	-2.265065	5.13051904	9	9	15
12	8	0	4	-1.527809	4.876169	-0.876169	0.76767148	8	8	11
13	10	0	6	-1.260261	6.732578	-0.732578	0.53667065	5	5	10
14	10	0	15	-0.981998	9.512526	5.4874743	30.1123745	-2	0	13
15	6	0	10	-0.89233	9.225687	0.7743134	0.59956131	-9	0	25
16	8	0	15	0.191841	10.1216	4.8783955	23.7987423	-11	0	31
17	6	0	15	0.545834	10.19322	4.8067818	23.105151	-13	0	40
18	6	0	6	-0.494248	9.153136	-3.153136	9.94226607	-4	0	40
19	12	0	6	-1.527809	8.245077	-2.245077	5.04037287	0	0	36
20	12	0	6	-1.260261	7.237518	-1.237518	1.53145128	3	3	27
21	14	0	10	-0.981998	6.240675	3.759325	14.1325243	6	6	18
22	14	0	15	-0.89233	9.319813	5.6801868	32.2645224	-2	0	22
23	12	0	10	0.191841	10.1216	-0.121605	0.01478766	-10	0	31
24	6	0	5	0.545834	10.3501	-5.350096	28.6235264	-16	0	35
25	4	0	5	-0.494248	9.466891	-4.466891	19.9531178	-12	0	30
26	4	0	5	-1.527809	8.747086	-3.747086	14.0408541	-1	0	20
27	4	0	2	-1.260261	6.5757	-4.5757	20.9370335	5	5	15
28	4	0	5	-0.981998	6.428928	-1.428928	2.04183593	6	6	12
29	6	0	6	-0.89233	5.999433	0.0005666	3.2101E-07	7	7	12
30	8	0	8	0.191841	7.571391	0.4286087	0.18370546	6	6	13
31	10	0	7	0.545834	10.8521	-3.852105	14.8387093	0	0	19
32	10	0	20	0.507128	10.75085	9.2493531	85.5505328	-5	0	21
33	10	0	5	-1.851057	7.953205	-2.953205	8.72141902	-9	0	35
34	8	0	4	0.056329	9.954717	-5.954717	35.4586541	-11	0	32
35	8	0	7	-1.584247	8.408268	-1.408268	1.9832175	-12	0	29
36	8	0	10	0.835469	10.98486	-0.984862	0.9699525	-8	0	24
37	10	0	7	-0.520786	9.314851	-2.314851	5.35853586	-16	0	34
38	11	0	10	-0.436426	9.179583	0.8204172	0.67308445	-26	0	41
39	14	0	20	2.316206	11.77534	8.2246629	67.64508	-32	0	46
40	14	0	8	1.994945	11.73646	-3.736456	13.9610999	-17	0	37
	mean of the disturbance			-0.684828		0.2384463	mean of the standard errors			
	std dev of the disturbance			0.750717						

Σ (AO-Ot)2	556.0967		constraints		
θ	0.00		>=0	<=1	
αs	0.52		>=0	<=1	
β	0.06		>=0	<=1	
S'	21.00		>=0	<=100	INT

Standard GRG NonLinear

Incoming Orders:
IO = WIO

Expected Incoming Orders:
$eIO = \theta * IO_{(t-1)} + (1-\theta) * eIO_{(t-1)}$

Actual Orders:
AO = WOP

Disturbance:
normally distributed white noise
mean = 0
std dev = 1

Model Orders:
$Ot = MAX(0, eIO + \alpha s(s' - S_t - \beta SL_t) + \varepsilon$

Error Term:
$AO - O_t$

Squared errors:
$(AO - O_t)^2$

Effective Inventory:
EI = MWEI

Stock:
St = MAX(0,EI)

Supply Line:
SLt = WSL = WSD1+WSD2+DIO+DBL

GUINESS2 IT BEER GAME MODEL

DME - GRG NonLinear

DISTRIB	incoming orders	expected incoming orders	actual orders	disturb-ance	model orders	error term	squared errors	effective inventory	Stock	Supply line
WEEK	IO	eIO	AO	ε	O_t	(AO-Ot)	$(AO-Ot)^2$	EI	S_t	SL_t
0	4	0								
1	4	4	4	0.021079	7.370179	-3.370179	11.3581093	12	12	12
2	4	4	4	-0.166569	7.182531	-3.182531	10.1285042	12	12	12
3	4	4	12	-0.327005	7.022096	4.9779042	24.7795298	12	12	12
4	5	4	12	1.485784	8.834865	3.1651354	10.0180819	12	12	20
5	10	5	8	0.087429	8.994713	-0.994713	0.98945371	11	11	28
6	8	10	20	3.671807	20.92819	-0.928192	0.86153981	5	5	32
7	10	8	5	-1.791862	11.23179	-6.231789	38.8351966	9	9	40
8	8	10	20	0.021079	16.1611	3.8389035	14.7371802	7	7	37
9	7	8	30	0.314744	16.6875	13.312505	177.222777	3	3	53
10	5	7	10	0.061673	8.17804	1.8219605	3.31953999	16	16	63
11	3	5	10	2.126736	3.777635	6.222365	38.7178257	24	24	60
12	3	3	10	-1.49291	0	10	100	41	41	50
13	4	3	10	-0.330161	0	10	100	65	65	33
14	6	4	2	-0.666011	0	2	4	71	71	33
15	15	6	5	-1.338511	0	5	25	78	78	22
16	10	15	20	-1.869795	0	20	400	73	73	17
17	15	10	0	-1.467702	0	0	0	73	73	27
18	15	15	10	0.179916	0	10	100	60	60	25
19	6	15	0	0.123992	0	0	0	50	50	30
20	6	6	5	-0.367458	0	5	25	64	64	10
21	6	6	10	-0.444327	0	10	100	58	58	15
22	10	6	5	-0.368888	0	5	25	62	62	15
23	15	10	2	0.960327	0	2	4	52	52	20
24	10	15	2	-1.575315	0.028283	1.9717168	3.88766708	42	42	17
25	5	10	4	-0.068669	0	4	16	42	42	9
26	5	5	0	0.465678	0	0	0	42	42	8
27	5	5	0	-0.50881	0	0	0	39	39	6
28	2	5	0	0.949324	0	0	0	36	36	4
29	5	2	0	0.619617	0	0	0	38	38	0
30	6	5	0	0.706339	0	0	0	33	33	0
31	8	6	0	-0.74681	0.22954	-0.22954	0.05268844	27	27	0
32	7	8	0	0.211696	7.653513	-7.653513	58.5762538	19	19	0
33	20	7	5	-2.379693	7.969408	-2.969408	8.8173823	12	12	0
34	5	20	35	-0.344886	29.70243	5.2975651	28.0641956	-8	0	5
35	4	5	5	-0.324345	14.72296	-9.722956	94.5358793	-13	0	40
36	7	4	10	1.643311	15.69061	-5.690612	32.3830648	-17	0	45
37	10	7	10	-0.298734	16.74857	-6.748567	45.5431584	-19	0	50
38	7	10	10	-1.238551	15.45965	-5.45965	29.8077747	6	6	25
39	10	7	20	-0.621951	14.19282	5.8073831	33.725699	4	4	30
40	20	10	30	1.565981	19.38055	10.619451	112.77274	4	4	40
	mean of the disturbance			-0.130586		2.5235781	mean of the standard errors			
	std dev of the disturbance			1.162715						

Σ (AO-Ot)2	1678.134		constraints		
θ	1.00		>=0	<=1	
αs	0.56		>=0	<=1	
β	0.00		>=0	<=1	
S'	18.00		>=0	<=100	INT
	GRG NonLinear				

Incoming Orders:
IO = DIO
Expected Incoming Orders:
$eIO = \theta^* IO_{(t-1)} + (1-\theta)^* eIO_{(t-1)}$
Actual Orders:
AO = DOP
Disturbance:
normally distributed white noise
mean = 0
std dev = 1
Model Orders:
$Ot = MAX(0, eIO + \alpha s(s' - S_t - \beta SL_t) + \varepsilon$
Error Term:
$AO - O_t$
Squared errors:
$(AO - O_t)^2$
Effective Inventory:
EI = MDEI
Stock:
St = MAX(0,EI)
Supply Line:
SLt = DSL = DSD1+DSD2+FIO+FBL

GUINESS2 IT BEER GAME MODEL

FME - GRG NonLinear

FACTORY	incoming orders	expected incoming orders	actual orders	disturb-ance	model orders	error term	squared errors	effective inventory	Stock	Supply line
WEEK	IO	eIO	AO	ε	O_t	(AO-Ot)	$(AO-Ot)^2$	EI	S_t	SL_t
0	4	0								
1	4	3.196154	4	0.543107	7.203961	-3.203961	10.2663651	12	12	8
2	4	3.838458	4	-0.933776	6.369382	-2.369382	5.61397034	12	12	8
3	4	3.967538	4	0.127554	7.559791	-3.559791	12.6721091	12	12	8
4	12	3.993476	4	0.842915	8.301092	-4.301092	18.4993886	12	12	8
5	12	10.391	20	0.301132	15.98194	4.0180649	16.1448457	4	4	8
6	8	11.67865	30	-1.082472	16.2433	13.756699	189.246761	-4	0	24
7	20	8.738866	10	-0.734926	12.75405	-2.754049	7.58478454	-8	0	50
8	5	17.73694	20	-0.177372	22.65546	-2.655456	7.05144614	-8	0	40
9	20	7.559636	10	0.638701	9.761643	0.2383568	0.05681398	17	17	30
10	30	17.49997	20	0.949829	22.29448	-2.294484	5.26465465	7	7	30
11	10	27.48797	50	-0.797459	32.13217	17.867829	319.259299	-3	0	30
12	10	13.51441	20	-0.287535	17.28544	2.7145636	7.3688557	-3	0	70
13	10	10.70626	10	0.886228	14.05408	-4.054082	16.4355825	7	7	70
14	10	10.14193	10	0.000799	4.861887	5.1381129	26.4002038	47	47	30
15	2	10.02852	5	0.867713	3.679783	1.3202166	1.74297192	57	57	20
16	5	3.613425	0	-0.243512	0	0	0	65	65	15
17	20	4.721352	0	-0.834465	0	0	0	70	70	5
18	0	16.92958	30	1.609235	12.47019	17.529814	307.294366	55	55	0
19	10	3.402195	0	-0.287535	0	0	0	55	55	30
20	0	8.674095	0	0.886228	4.735756	-4.735756	22.4273832	45	45	30
21	5	1.74316	15	0.000799	0	15	225	75	75	0
22	10	4.3455	5	0.867713	0	5	25	70	70	15
23	5	8.863863	0	-0.243512	0.719284	-0.719284	0.51736933	60	60	20
24	2	5.776448	0	-0.834465	0	0	0	70	70	5
25	2	2.758921	0	1.609235	0	0	0	73	73	0
26	4	2.152514	0	-0.287535	0	0	0	71	71	0
27	0	3.629726	0	0.886228	0	0	0	67	67	0
28	0	0.729235	0	0.000799	0	0	0	67	67	0
29	0	0.146548	0	0.867713	0	0	0	67	67	0
30	0	0.029451	0	-0.243512	0	0	0	67	67	0
31	0	0.005918	0	-0.834465	0	0	0	67	67	0
32	0	0.001189	0	1.609235	0	0	0	67	67	0
33	0	0.000239	0	-0.287535	0	0	0	67	67	0
34	5	4.8E-05	0	0.886228	0	0	0	67	67	0
35	35	3.995202	10	0.000799	0	10	100	62	62	0
36	5	28.76923	10	0.867713	29.61041	-19.61041	384.568215	27	27	10
37	10	9.776701	5	0.88448	11.40957	-6.409569	41.0825792	22	22	20
38	10	9.955126	5	0.5272	11.4236	-6.423601	41.2626513	22	22	15
39	10	9.990982	5	1.079116	12.18426	-7.184261	51.6136009	22	22	10
40	20	9.998188	20	0.055434	12.30848	7.691524	59.1595418	17	17	10
	mean of the disturbance			0.179203		1.7696092	mean of the standard errors			
	std dev of the disturbance			0.773012						

				constraints		
Σ (AO-Ot)2	1901.533					
θ	0.80			>=0	<=1	
αs	0.23			>=0	<=1	
β	0.15			>=0	<=1	
S'	28.40			>=0	<=100	INT

GRG NonLinear

Incoming Orders:

IO = FIO

Expected Incoming Orders:

$eIO = \theta^* IO_{(t-1)} + (1-\theta)^* eIO_{(t-1)}$

Actual Orders:

AO = FPR

Disturbance:

normally distributed white noise

mean = 0

std dev = 1

Model Orders:

$Ot = MAX(0, eIO + \alpha s(s' - S_t - \beta SL_t) + \varepsilon$

Error Term:

$AO - O_t$

Squared errors:

$(AO - O_t)^2$

Effective Inventory:

EI = MFEI

Stock:

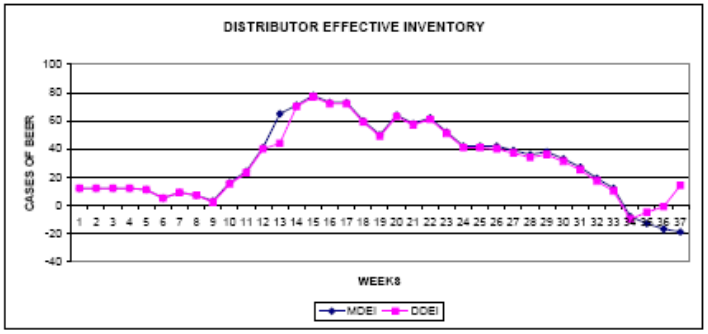
St = MAX(0,EI)

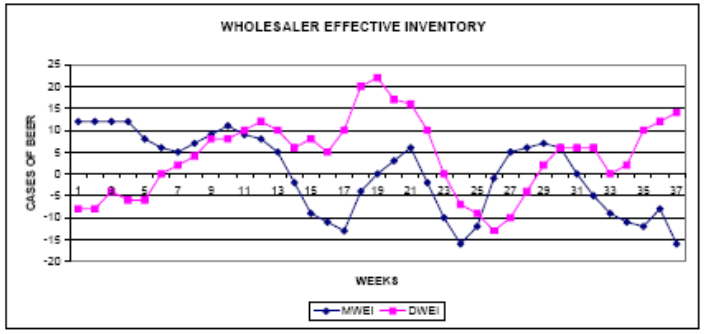
Supply Line:

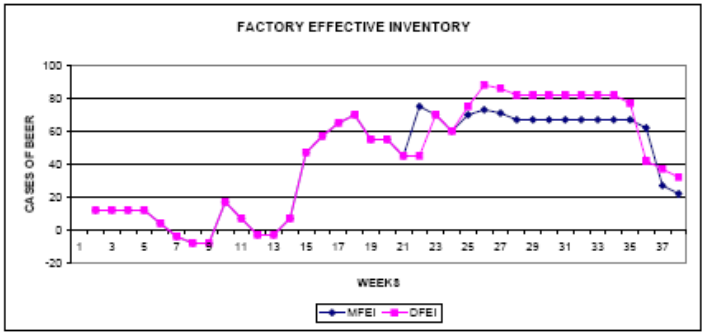
SLt = FSL = FPD1+FPD2

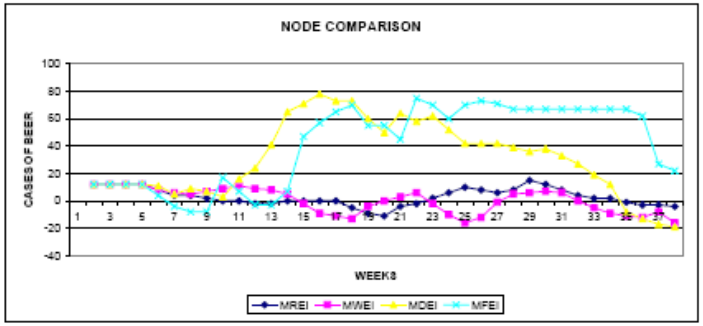
GUINESS2 IT BEER GAME MODEL

MODEL CHARTS



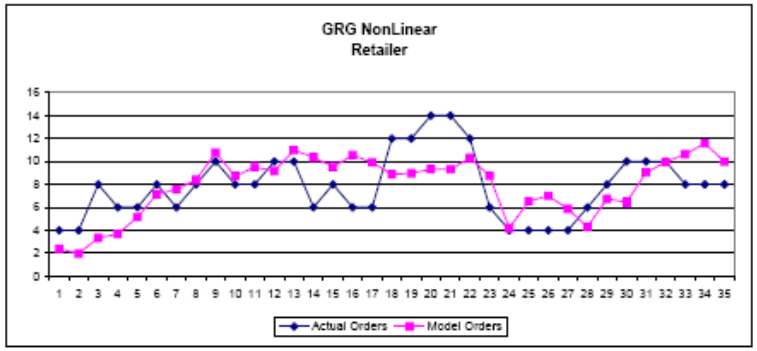


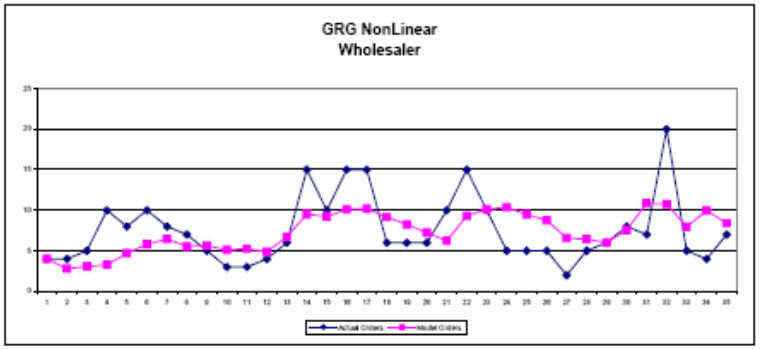


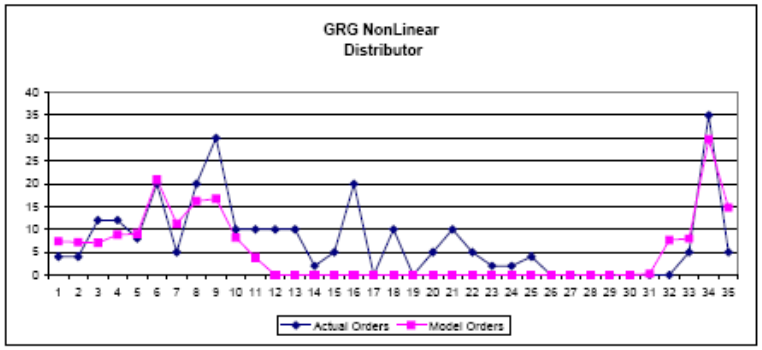


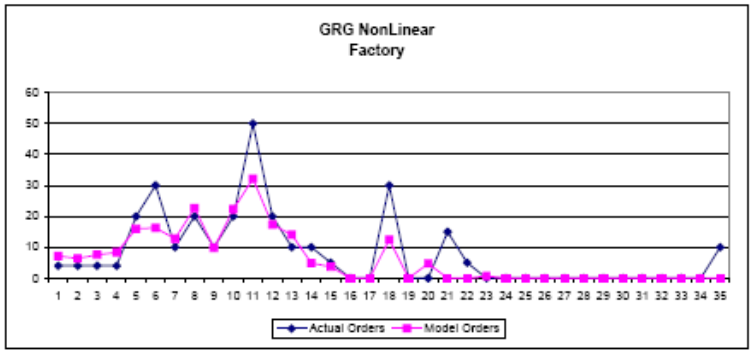
GUINESS2 IT BEER GAME MODEL

ORDER CHARTS









GUINESS2 IT BEER GAME MODEL

MODEL WORKSHEET

STEP 1
Receive The Inventory and Advance the shipping Delays

STEP 2
Look at the incoming orders and fill orders
all incoming orders + backlog

	GUINESS 2	IT							GUINESS 2	Retailer	IT					
	Team Costs	$ 1,927.00							Costs	$ 144.50						
WEEK	COR	RINV1	RSD1	RSD2	RBL	RSR	RINV2	MREI	*DREI*	RCOSTS	ROP	WIO	RSL		WINV1	WSD1
0	0	12	4	4	0	4	12			0	4	4			12	4
1	4	16	4	4	0	4	12	12	*12*	6	4	4	12		16	4
2	4	16	4	4	0	4	12	12	*12*	12	4	4	12		16	4
3	4	16	4	4	0	4	12	12	*12*	18	8	4	12		16	4
4	4	16	4	4	0	4	12	12	*12*	24	6	8	16		16	4
5	8	16	4	8	0	8	8	8	*12*	28	6	6	18		16	4
6	8	12	8	6	0	8	4	4	*8*	30	8	6	20		12	5
7	8	12	6	6	0	8	4	4	*4*	32	6	8	20		11	10
8	8	10	6	8	0	8	2	2	*4*	33	8	6	20		15	8
9	8	8	8	6	0	8	0	0	*2*	33	10	8	22		15	10
10	8	8	6	8	0	8	0	0	*0*	33	8	10	24		19	8
11	8	6	8	10	2	6	0	-2	*-2*	35	8	8	26		19	7
12	8	8	10	8	2	8	0	-2	*-2*	37	10	8	26		16	5
13	8	10	8	8	0	10	0	0	*0*	37	10	10	26		13	3
14	8	8	8	8	0	8	0	0	*0*	37	6	10	28		8	3
15	8	8	8	3	0	8	0	0	*0*	37	8	6	26		3	4
16	8	8	3	4	0	8	0	0	*1*	37	6	8	26		4	6
17	8	3	4	6	5	3	0	-5	*-4*	42	6	6	29		6	15
18	8	4	6	15	9	4	0	-9	*-8*	51	12	6	31		15	10
19	8	6	15	10	11	6	0	-11	*-10*	62	12	12	37		10	15
20	8	15	10	12	4	15	0	-4	*-3*	66	14	12	34		15	15
21	8	10	12	12	2	10	0	-2	*-2*	68	14	14	38		18	6
22	8	12	12	12	0	10	2	2	*2*	69	12	14	40		12	6
23	8	14	12	6	0	8	6	6	*6*	72	6	12	40		6	6
24	8	18	6	6	0	8	10	10	*11*	77	4	6	34		6	10
25	8	16	6	10	0	8	8	8	*13*	81	4	4	32		10	15
26	8	14	10	15	0	8	6	6	*17*	84	4	4	30		15	10
27	8	16	15	5	0	8	8	8	*14*	88	4	4	24		10	5
28	8	23	5	4	0	8	15	15	*10*	95.5	6	4	13		10	5
29	8	20	4	4	0	8	12	12	*6*	101.5	8	6	14		11	5
30	8	16	4	6	0	8	8	8	*4*	105.5	10	8	18		12	2
31	8	12	6	8	0	8	4	4	*4*	107.5	10	10	24		8	5
32	8	10	8	5	0	8	2	2	*4*	108.5	10	10	28		5	6
33	8	10	5	6	0	8	2	2	*8*	109.5	8	10	30		6	8
34	8	7	6	8	1	7	0	-1	*6*	110.5	8	8	33		8	7
35	8	6	8	7	3	6	0	-3	*-2*	113.5	8	8	35		7	12
36	8	8	7	12	3	8	0	-3	*-2*	116.5	10	8	35		12	0
37	8	7	12	0	4	7	0	-4	*-3*	120.5	11	10	38		0	0
38	8	12	0	0	0	12	0	0	*-3*	120.5	14	11	37		0	5
39	8	0	0	5	8	0	0	-8	*-4*	128.5	14	14	51		5	29
40	8	0	5	29	16	0	0	-16	*2*	144.5	8	14	65		29	7

GUINESS2 IT BEER GAME MODEL

MODEL WORKSHEET

	STEP 3 Record your inventory or backlog										STEP 4 Advance the order slips and the brewery Brews						
					GUINESS 2	Wholesaler		IT									GUINESS 2
					Costs	$ 290.50											Costs
WEEK	WSD2	WBL	WINV2	MWEI	*DWEI*	WCOSTS	WOP	DIO	WSL		DINV1	DSD1	DSD2	DBL	DINV2	MDEI	*DDEI*
0	4	0	12			0	4	4			12	4	4	0	12		
1	4	0	12	12	*-8*	6	4	4	12		16	4	4	0	12	12	*12*
2	4	0	12	12	*-8*	12	4	4	12		16	4	4	0	12	12	*12*
3	4	0	12	12	*-4*	18	5	4	12		16	4	4	0	12	12	*12*
4	4	0	12	12	*-6*	24	10	5	13		16	4	4	0	12	12	*12*
5	5	0	8	8	*-6*	28	8	10	19		16	4	12	0	11	11	*11*
6	10	0	6	6	*0*	31	10	8	23		15	12	8	0	5	5	*5*
7	8	0	5	5	*2*	33.5	8	10	28		17	8	4	0	9	9	*9*
8	10	0	7	7	*4*	37	7	8	26		17	4	20	0	7	7	*7*
9	8	0	9	9	*8*	41.5	5	7	25		11	20	13	0	3	3	*2*
10	7	0	11	11	*8*	47	3	5	20		23	13	20	0	16	16	*15*
11	5	0	9	9	*10*	51.5	3	3	15		29	20	27	0	24	24	*23*
12	3	0	8	8	*12*	55.5	4	3	11		44	27	10	0	41	41	*40*
13	3	0	5	5	*10*	58	6	4	10		68	10	13	0	65	65	*44*
14	4	2	0	-2	*6*	60	15	6	13		75	13	10	0	71	71	*70*
15	6	9	0	-9	*8*	69	10	15	25		84	10	10	0	78	78	*77*
16	15	11	0	-11	*5*	80	15	10	31		88	10	2	0	73	73	*72*
17	10	13	0	-13	*10*	93	15	15	40		83	2	5	0	73	73	*72*
18	15	4	0	-4	*20*	97	6	15	40		75	5	20	0	60	60	*59*
19	15	0	0	0	*22*	97	6	6	36		65	20	0	0	50	50	*49*
20	6	0	3	3	*17*	98.5	6	6	27		70	0	10	0	64	64	*63*
21	6	0	6	6	*16*	101.5	10	6	18		64	10	0	0	58	58	*57*
22	6	2	0	-2	*10*	103.5	15	10	22		68	0	5	0	62	62	*61*
23	10	10	0	-10	*0*	113.5	10	15	31		62	5	10	0	52	52	*51*
24	15	16	0	-16	*-7*	129.5	5	10	35		57	10	5	0	42	42	*41*
25	10	12	0	-12	*-9*	141.5	5	5	30		52	5	2	0	42	42	*41*
26	5	1	0	-1	*-13*	142.5	5	5	20		47	2	2	0	42	42	*40*
27	5	0	5	5	*-10*	145	2	5	15		44	2	4	0	39	39	*37*
28	5	0	6	6	*-4*	148	5	2	12		41	4	0	0	36	36	*34*
29	2	0	7	7	*2*	151.5	6	5	12		40	0	0	0	38	38	*36*
30	5	0	8	8	*6*	154.5	8	6	13		38	0	0	0	33	33	*31*
31	6	0	0	0	*6*	154.5	7	8	19		33	0	0	0	27	27	*25*
32	8	5	0	-5	*6*	159.5	20	7	21		27	0	0	0	19	19	*17*
33	7	9	0	-9	*0*	168.5	5	20	35		19	0	0	0	12	12	*10*
34	12	11	0	-11	*2*	179.5	4	5	32		12	0	0	8	0	-8	*-10*
35	0	12	0	-12	*10*	191.5	7	4	29		0	0	5	13	0	-13	*-5*
36	0	8	0	-8	*12*	199.5	10	7	24		0	5	35	17	0	-17	*-1*
37	5	16	0	-16	*14*	215.5	7	10	34		5	35	5	19	0	-19	*14*
38	29	26	0	-26	*17*	241.5	10	7	41		35	5	10	0	6	6	*9*
39	7	32	0	-32	*18*	273.5	20	10	46		11	10	10	0	4	4	*7*
40	10	17	0	-17	*6*	290.5	8	20	37		14	10	10	0	4	4	*7*

GUINESS2 IT BEER GAME MODEL

MODEL WORKSHEET

STEP 5
Place and record your orders

	Distributor		IT							GUINESS 2	Factory	IT		
	$ 664.00									Costs	$ 828.00			
WEEK	DCOSTS	DOP	FIO	DSL		FPD1	FPD2	FSD2	FBL	FINV2	MFEI	*DFEI*	FCOSTS	FPR	FSL
0	0	4	4	12		12	4	4	0	12			0	4	8
1	6	4	4	12		16	4	4	0	12	12	*12*	6	4	8
2	12	4	4	12		16	4	4	0	12	12	*12*	12	4	8
3	18	12	4	12		16	4	4	0	12	12	*12*	18	4	8
4	24	12	12	20		16	4	4	0	12	12	*12*	24	4	8
5	29.5	8	12	28		16	4	4	0	4	4	*4*	26	20	8
6	32	20	8	32		8	4	20	4	0	-4	*-4*	30	30	24
7	36.5	5	20	40		4	20	30	8	0	-8	*-8*	38	10	50
8	40	20	5	37		20	30	10	8	0	-8	*-8*	46	20	40
9	41.5	30	20	53		30	10	20	0	17	17	*17*	54.5	10	30
10	49.5	10	30	63		27	20	10	0	7	7	*7*	58	20	30
11	61.5	10	10	60		27	10	20	3	0	-3	*-3*	61	50	30
12	82	10	10	50		10	20	50	3	0	-3	*-3*	64	20	70
13	114.5	10	10	33		20	50	20	0	7	7	*7*	67.5	10	70
14	150	2	10	33		57	20	10	0	47	47	*47*	91	10	30
15	189	5	2	22		67	10	10	0	57	57	*57*	119.5	5	20
16	225.5	20	5	17		67	10	5	0	65	65	*65*	152	0	15
17	262	0	20	27		75	5	0	0	70	70	*70*	187	0	5
18	292	10	0	25		75	0	0	0	55	55	*55*	214.5	30	0
19	317	0	10	30		55	0	30	0	55	55	*55*	242	0	30
20	349	5	0	10		55	30	0	0	45	45	*45*	264.5	0	30
21	378	10	5	15		75	0	0	0	75	75	*45*	302	15	0
22	409	5	10	15		75	0	15	0	70	70	*70*	337	5	15
23	435	2	5	20		70	15	5	0	60	60	*60*	367	0	20
24	456	2	2	17		75	5	0	0	70	70	*75*	402	0	5
25	477	4	2	9		75	0	0	0	73	73	*88*	438.5	0	0
26	498	0	4	8		73	0	0	0	71	71	*86*	474	0	0
27	517.5	0	0	6		71	0	0	0	67	67	*82*	507.5	0	0
28	535.5	0	0	4		67	0	0	0	67	67	*82*	541	0	0
29	554.5	0	0	0		67	0	0	0	67	67	*82*	574.5	0	0
30	571	0	0	0		67	0	0	0	67	67	*82*	608	0	0
31	584.5	0	0	0		67	0	0	0	67	67	*82*	641.5	0	0
32	594	0	0	0		67	0	0	0	67	67	*82*	675	0	0
33	600	5	0	0		67	0	0	0	67	67	*82*	708.5	0	0
34	608	35	5	5		67	0	0	0	67	67	*77*	742	0	0
35	621	5	35	40		67	0	0	0	62	62	*42*	773	10	0
36	638	10	5	45		62	0	10	0	27	27	*37*	786.5	10	10
37	657	10	10	50		27	10	10	0	22	22	*32*	797.5	5	20
38	660	10	10	25		32	10	5	0	22	22	*32*	808.5	5	15
39	662	20	10	30		32	5	5	0	22	22	*32*	819.5	5	10
40	664	30	20	40		27	5	5	0	17	17	*27*	828	20	10

GUINESS2 IT BEER GAME MODEL

MODEL DATA

GUINESS 2 IT Week	ROR	REI	WOR	WEI	DOR	DEI	FOR	FEI
1	4	12	4	-8	4	12	4	12
2	4	12	4	-8	4	12	4	12
3	8	12	5	-4	12	12	4	12
4	6	12	10	-6	12	12	4	12
5	6	12	8	-6	8	11	20	4
6	8	8	10	0	20	5	30	-4
7	6	4	8	2	5	9	10	-8
8	8	4	7	4	20	7	20	-8
9	10	2	5	8	30	2	10	17
10	8	0	3	8	10	15	20	7
11	8	-2	3	10	10	23	50	-3
12	10	-2	4	12	10	40	20	-3
13	10	0	6	10	10	44	10	7
14	6	0	15	6	2	70	10	47
15	8	0	10	8	5	77	5	57
16	6	1	15	5	20	72	0	65
17	6	-4	15	10	0	72	0	70
18	12	-8	6	20	10	59	30	55
19	12	-10	6	22	0	49	0	55
20	14	-3	6	17	5	63	0	45
21	14	-2	10	16	10	57	15	45
22	12	2	15	10	5	61	5	70
23	6	6	10	0	2	51	0	60
24	4	11	5	-7	2	41	0	75
25	4	13	5	-9	4	41	0	88
26	4	17	5	-13	0	40	0	86
27	4	14	2	-10	0	37	0	82
28	6	10	5	-4	0	34	0	82
29	8	6	6	2	0	36	0	82
30	10	4	8	6	0	31	0	82
31	10	4	7	6	0	25	0	82
32	10	4	20	6	0	17	0	82
33	8	8	5	0	5	10	0	82
34	8	6	4	2	35	-10	0	77
35	8	-2	7	10	5	-5	10	42
36	10	-2	10	12	10	-1	10	37
37	11	-3	7	14	10	14	5	32
38	14	-3	10	17	10	9	5	32
39	14	-4	20	18	20	7	5	32
40	8	2	8	6	30	7	20	27

GUZZLERS BEER GAME MODEL

RME GRG NonLinear

RETAILE	incoming orders	expected incoming orders	actual orders	disturb-ance	model orders	error term	squared errors	effective inventory	Stock	Supply line
WEEK	IO	eIO	AO	ε	O_t	(AO-Ot)	$(AO-Ot)^2$	EI	S_t	SL_t
0	0	0								
1	4	0.00	4	-1.194513	0	4	16	12	12	12
2	4	3.92	4	0.284952	4.449821	-0.449821	0.20215869	12	12	12
3	4	4.00	6	0.24765	4.490204	1.509796	2.27948402	12	12	12
4	4	4.00	4	1.026051	5.269378	-1.269378	1.6113195	12	12	14
5	8	4.00	10	0.761241	5.015907	4.9840933	24.8411857	8	8	14
6	8	7.92	10	0.810672	8.994857	1.0051433	1.01031298	4	4	20
7	8	8.00	10	-0.790644	7.475531	2.5244685	6.37294139	2	2	24
8	8	8.00	10	-1.194513	7.076539	2.9234611	8.54662472	-2	0	30
9	8	8.00	10	0.284952	8.556034	1.4439655	2.08503645	0	0	30
10	8	8.00	8	0.24765	8.517957	-0.517957	0.26827995	0	0	32
11	8	8.00	8	1.026051	9.295584	-1.295584	1.67853743	-2	0	34
12	8	8.00	8	0.761241	9.029224	-1.029224	1.05930177	-6	0	38
13	8	8.00	8	0.810672	9.078655	-1.078655	1.16349574	-6	0	38
14	8	8.00	8	-1.282679	6.982204	1.0177962	1.03590905	-14	0	46
15	8	8.00	8	0.051287	8.31307	-0.31307	0.09801255	-22	0	54
16	8	8.00	8	0.083374	8.322832	-0.322832	0.10422039	-28	0	60
17	8	8.00	8	0.03163	8.288762	-0.288762	0.08338363	-34	0	66
18	8	8.00	8	0.471437	8.726245	-0.726245	0.52743165	-40	0	72
19	8	8.00	8	1.580636	9.833894	-1.833894	3.36316716	-44	0	76
20	8	8.00	8	0.109372	8.360304	-0.360304	0.12981905	-50	0	82
21	8	8.00	8	-1.282679	6.967479	1.0325214	1.06610039	-52	0	84
22	8	8.00	8	0.051287	8.300669	-0.300669	0.09040208	-54	0	86
23	8	8.00	8	0.083374	8.311982	-0.311982	0.09733257	-56	0	88
24	8	8.00	20	0.03163	8.281787	11.718213	137.316513	-52	0	84
25	8	8.00	10	0.471437	8.71772	1.2822802	1.64424256	-50	0	94
26	8	8.00	8	1.580636	9.826919	-1.826919	3.33763264	-48	0	94
27	8	8.00	8	0.109372	8.364179	-0.364179	0.13262846	-28	0	72
28	8	8.00	2	-1.282679	6.976779	-4.976779	24.7683267	-14	0	60
29	8	8.00	2	0.051287	8.315782	-6.315782	39.8891034	-7	0	47
30	8	8.00	8	0.083374	8.328644	-0.328644	0.10800715	-11	0	45
31	8	8.00	8	0.03163	8.2938	-0.2938	0.08631833	-19	0	53
32	8	8.00	8	0.471437	8.730507	-0.730507	0.53364114	-27	0	61
33	8	8.00	8	1.580636	9.842807	-1.842807	3.3959362	-19	0	53
34	8	8.00	8	0.109372	8.376192	-0.376192	0.14152028	-7	0	41
35	8	8.00	8	-1.282679	6.974656	1.025344	1.05133028	5	5	29
36	9	8.00	8	0.051287	8.296424	-0.296424	0.08786714	10	10	24
37	10	8.98	8	0.083374	9.288645	-1.288645	1.66060611	10	10	24
38	11	9.98	8	0.03163	10.25661	-2.256606	5.09181961	10	10	24
39	12	10.98	15	0.471437	11.69831	3.3036943	10.9143961	10	10	24
40	13	11.98	8	-1.651482	10.57069	-2.570694	6.60846683	10	10	31
	mean of the disturbance			0.139256		0.2089514	mean of the standard errors			
	std dev of the disturbance			0.812874						

Σ (AO-Ot)2	310.4828		constraints		
θ	0.98		>=0	<=1	
αs	0.00		>=0	<=1	
β	0.14		>=0	<=1	
S'	100.00		>=0	<=100	INT

GRG NonLinear

Incoming Orders:
IO = COR
Expected Incoming Orders:
$eIO = \theta * IO_{(t-1)} + (1-\theta) * eIO_{(t-1)}$
Actual Orders:
AO = ROP
Disturbance:
normally distributed white noise
mean = 0
std dev = 1
Model Orders:
$Ot = MAX(0, eIO + \alpha s(s' - S_t - \beta SL_t) + \varepsilon$
Error Term:
$AO - O_t$
Squared errors:
$(AO - O_t)^2$
Effective Inventory:
EI = REI
Stock:
St = MAX(0,EI)
Supply Line:
$SLt = RSL = RSD1 + RSD2 + WIO + WBL$

GUZZLERS BEER GAME MODEL

WME - GRG NonLinear

WHOLES	incoming orders	expected incoming orders	actual orders	disturb-ance	model orders	error term	squared errors	effective inventory	Stock	Supply line
WEEK	IO	eIO	AO	ε	O_t	(AO-Ot)	$(AO-Ot)^2$	EI	S_t	SL_t
0	4	0								
1	4	2.31561	4	-0.063103	1.434103	2.5658967	6.58382595	12	12	12
2	4	3.290623	4	0.536596	3.008915	0.9910846	0.98224866	12	12	12
3	4	3.701265	4	1.352071	4.235033	-0.235033	0.05524049	12	12	12
4	6	3.974196	4	-1.527113	1.528779	2.4712206	6.10693108	12	12	12
5	4	5.104776	6	-0.121001	4.399983	1.6000165	2.56005291	10	10	12
6	10	4.465246	4	0.266576	4.14803	-0.14803	0.02191281	10	10	14
7	10	7.66919	10	0.716824	8.505758	1.4942421	2.23275931	4	4	14
8	10	9.018443	10	-1.516377	8.090834	1.9091661	3.64491517	-2	0	20
9	10	9.586644	10	0.992712	11.16812	-1.168124	1.36451311	-6	0	24
10	10	9.825927	10	-0.426459	9.988235	0.0117653	0.00013842	-12	0	30
11	8	9.926694	10	-1.291852	9.22361	0.7763905	0.60278214	-14	0	32
12	8	8.811374	8	0.890297	10.29044	-2.290438	5.24610841	-22	0	42
13	8	8.341688	8	-1.14116	7.789296	0.2107044	0.04439635	-30	0	50
14	8	8.143893	8	-1.077272	7.655388	0.3446117	0.11875721	-36	0	56
15	8	8.060596	12	-0.795014	7.85435	4.1456497	17.1864116	-42	0	62
16	8	8.025519	1	-1.451974	7.162312	-6.162312	37.974092	-48	0	72
17	8	8.010746	2	-1.192467	7.407047	-5.407047	29.2361558	-52	0	69
18	8	8.004526	4	1.88333	10.47662	-6.476623	41.9466501	-58	0	69
19	8	8.001906	15	-0.804043	7.78663	7.2133698	52.0327039	-60	0	67
20	8	8.000803	10	-0.560478	8.029092	1.9709077	3.88447706	-62	0	76
21	8	8.000338	10	-1.011327	7.577778	2.4222216	5.86715755	-64	0	80
22	8	8.000142	10	-1.588975	6.999936	3.0000646	9.00038786	-60	0	78
23	8	8.00006	14	-1.271264	7.317564	6.6824361	44.6549526	-58	0	78
24	8	8.000025	30	-0.884136	7.704657	22.295343	497.082342	-56	0	82
25	20	8.000011	10	0.464124	9.052902	0.9470983	0.89699519	-34	0	82
26	10	14.94653	20	1.33501	16.87031	3.1296888	9.79495216	-34	0	72
27	8	12.0831	10	0.564859	13.23672	-3.236723	10.4763789	-29	0	77
28	8	9.719484	10	-1.534303	8.773949	1.226051	1.50320111	-33	0	83
29	2	8.724114	8	-0.607714	8.705167	-0.705167	0.49726117	-41	0	93
30	2	4.831676	4	-0.700368	4.720076	-0.720076	0.5185097	-43	0	101
31	8	3.192483	4	-1.121603	2.659647	1.3403526	1.79654513	-29	0	89
32	8	5.975446	0	-0.493467	6.070746	-6.070746	36.8539605	-17	0	73
33	8	7.147414	0	2.263447	9.999629	-9.999629	99.992575	-5	0	53
34	8	7.640957	0	-0.792093	7.203119	-7.203119	51.8849288	2	2	38
35	8	7.848799	0	0.241449	8.209992	-8.209992	67.4039625	4	4	28
36	8	7.936326	4	0.423731	7.307241	-3.307241	10.9378452	14	14	10
37	8	7.973185	8	-0.979954	5.940415	2.0595847	4.24188895	14	14	6
38	8	7.988708	4	-0.512332	7.127096	-3.127096	9.77872653	8	8	12
39	8	7.995245	4	0.49301	9.077022	-5.077022	25.7761553	0	0	16
40	15	7.997997	10	0.619258	9.206022	0.7939776	0.63040036	-4	0	16
	mean of the disturbance			-0.299036		0.2490063	mean of the standard errors			
	std dev of the disturbance			1.053972						

Σ (AO-Ot)2	1101.414		constraints		
θ	0.58		>=0	<=1	
$\alpha\varepsilon$	0.12		>=0	<=1	
β	0.00		>=0	<=1	
S'	5.02		>=0	<=100	INT

Standard GRG NonLinear

Incoming Orders:
IO = WIO

Expected Incoming Orders:
$eIO = \theta * IO_{(t-1)} + (1-\theta) * eIO_{(t-1)}$

Actual Orders:
AO = WOP

Disturbance:
normally distributed white noise
mean = 0
std dev = 1

Model Orders:
$Ot = MAX(0, eIO + \alpha s(s' - S_t - \beta SL_t) + \varepsilon$

Error Term:
$AO - O_t$

Squared errors:
$(AO - O_t)^2$

Effective Inventory:
EI = MWEI

Stock:
St = MAX(0,EI)

Supply Line:
SLt = WSL = WSD1+WSD2+DIO+DBL

GUZZLERS BEER GAME MODEL

DME - GRG NonLinear

DISTRIB	incoming orders	expected incoming orders	actual orders	disturb-ance	model orders	error term	squared errors	effective inventory	Stock	Supply line
WEEK	IO	eIO	AO	ε	O_t	(AO-Ot)	$(AO-Ot)^2$	EI	S_t	SL_t
0	4	0								
1	4	1.662877	4	-0.002708	0	4	16	12	12	12
2	4	2.634464	4	0.197462	0	4	16	12	12	12
3	4	3.202143	4	-1.98545	0	4	16	12	12	12
4	4	3.533828	2	0.233521	0	2	4	12	12	12
5	4	3.727624	0	1.278123	0	0	0	12	12	10
6	6	3.840856	0	-1.369653	0	0	0	12	12	6
7	4	4.738454	0	-1.261645	0	0	0	10	10	2
8	10	4.431464	2	-1.639867	0	2	4	8	8	0
9	10	6.746411	2	0.518842	7.265253	-5.265253	27.7228941	-2	0	2
10	10	8.09899	2	-0.662347	7.436643	-5.436643	29.5570891	-12	0	4
11	10	8.889277	4	-2.048579	6.840698	-2.840698	8.06956257	-22	0	6
12	10	9.351026	2	1.022972	10.374	-8.373998	70.1238388	-30	0	8
13	8	9.620817	6	0.511584	10.1324	-4.132401	17.0767369	-38	0	8
14	8	8.947012	8	-0.286934	8.660078	-0.660078	0.43570302	-44	0	12
15	8	8.553321	10	0.412353	8.965674	1.034326	1.06983021	-48	0	16
16	12	8.323295	25	1.97284	10.29614	14.703865	216.203643	-54	0	24
17	1	9.851772	18	0.216611	10.06838	7.931617	62.9105485	-60	0	43
18	2	6.171921	12	-0.278734	5.893187	6.106813	37.2931645	-55	0	55
19	4	4.437573	12	0.580207	5.01778	6.98222	48.7513956	-51	0	61
20	15	4.255666	11	-0.926255	3.329411	7.6705892	58.8379385	-43	0	61
21	10	8.722291	13	-0.565773	8.156518	4.8434821	23.4593188	-48	0	62
22	10	9.253459	4	0.412353	9.665812	-5.665812	32.1014286	-48	0	65
23	10	9.563811	0	1.97284	11.53665	-11.53665	133.094311	-28	0	39
24	14	9.745143	0	0.216611	9.961754	-9.961754	99.236547	-18	0	19
25	30	11.51397	20	-0.278734	11.23523	8.7647651	76.8211066	-17	0	4
26	10	19.19897	30	0.580207	19.77917	10.220827	104.465311	-43	0	20
27	20	15.37478	15	-0.926255	14.44852	0.5514753	0.30412501	-53	0	50
28	10	17.29757	10	-0.565773	16.7318	-6.731799	45.3171168	-73	0	65
29	10	14.26383	18	0.412353	14.67618	3.3238153	11.0477483	-67	0	59
30	8	12.49128	8	1.97284	14.46412	-6.464115	41.7847878	-57	0	57
31	4	10.62417	22	0.216611	10.84078	11.159223	124.528249	-45	0	45
32	4	7.870373	2	-0.278734	7.59164	-5.59164	31.2664353	-34	0	52
33	0	6.261385	0	0.580207	6.841592	-6.841592	46.8073775	-28	0	44
34	0	3.658407	0	-0.926255	2.732152	-2.732152	7.46465688	-10	0	26
35	0	2.137537	0	-0.565773	1.571764	-1.571764	2.47044181	-2	0	18
36	0	1.248922	0	0.412353	0	0	0	16	16	0
37	4	0.729721	0	1.97284	0	0	0	16	16	0
38	8	2.089239	0	0.216611	0	0	0	12	12	0
39	4	4.546455	0	-0.278734	0.267722	-0.267722	0.07167502	4	4	0
40	4	4.319283	0	0.580207	4.89949	-4.89949	24.0050043	0	0	0
	mean of the disturbance			-0.036027		0.4424762	mean of the standard errors			
	std dev of the disturbance			1.017205						

Σ (AO-Ot)2	1438.298		constraints		
θ	0.42		>=0	<=1	
αs	1.00		>=0	<=1	
β	0.00		>=0	<=1	
S'	0.00		>=0	<=100	INT

GRG NonLinear

Incoming Orders:

IO = DIO

Expected Incoming Orders:

$eIO = \theta * IO_{(t-1)} + (1-\theta) * eIO_{(t-1)}$

Actual Orders:

AO = DOP

Disturbance:

normally distributed white noise

mean = 0

std dev = 1

Model Orders:

$Ot = MAX(0, eIO + \alpha s(s' - S_t - \beta SL_t) + \varepsilon$

Error Term:

$AO - O_t$

Squared errors:

$(AO - O_t)^2$

Effective Inventory:

EI = MDEI

Stock:

St = MAX(0,EI)

Supply Line:

SLt = DSL = DSD1+DSD2+FIO+FBL

GUZZLERS BEER GAME MODEL

FME - GRG NonLinear

FACTORY	incoming orders	expected incoming orders	actual orders	disturb-ance	model orders	error term	squared errors	effective inventory	Stock	Supply line
WEEK	IO	eIO	AO	ε	O_t	(AO-Ot)	$(AO-Ot)^2$	EI	S_t	SL_t
0	4	0								
1	4	2.402007	4	1.550284	3.747863	0.2521373	0.06357323	12	12	8
2	4	3.361604	4	-2.186298	0.970878	3.0291218	9.17557917	12	12	8
3	4	3.744962	5	1.165626	4.70616	0.2938402	0.08634206	12	12	8
4	4	3.898113	0	-1.422169	2.261294	-2.261294	5.1134525	12	12	9
5	2	3.959296	0	-0.068877	3.716655	-3.716655	13.8135242	12	12	5
6	0	2.782736	0	0.784996	3.41441	-3.41441	11.6581978	15	15	0
7	0	1.111698	0	-0.446701	0.511676	-0.511676	0.26181255	15	15	0
8	0	0.444122	0	1.550284	1.841085	-1.841085	3.38959323	15	15	0
9	2	0.177426	0	-2.186298	0	0	0	15	15	0
10	2	1.271885	4	1.165626	2.304632	1.6953677	2.87427177	13	13	0
11	2	1.709119	2	-1.422169	0.133629	1.8663708	3.48333999	11	11	4
12	4	1.883794	1	-0.068877	1.661595	-0.661595	0.4377081	9	9	6
13	2	3.154579	2	0.784996	3.816918	-1.816918	3.30119051	9	9	3
14	6	2.461252	6	-0.446701	1.891894	4.1081055	16.8765309	9	9	3
15	8	4.586276	12	0.465074	4.928694	7.0713062	50.0033714	4	4	8
16	10	6.636223	10	-0.055283	6.396955	3.6030449	12.9819326	-2	0	18
17	25	8.656177	10	0.541583	8.972888	1.0271116	1.05495827	-6	0	22
18	18	18.47067	30	-0.928951	17.33729	12.66271	160.344214	-19	0	20
19	12	18.18803	20	-1.872367	15.90681	4.0931913	16.754215	-27	0	40
20	12	14.47211	20	0.722542	14.68358	5.3164192	28.2643132	-29	0	50
21	11	12.9876	10	0.908422	13.48717	-3.487169	12.1603502	-11	0	40
22	13	11.79404	4	-2.198338	9.289065	-5.289065	27.9742042	-2	0	30
23	4	12.51822	1	0.669232	12.99325	-11.99325	143.837997	5	5	14
24	0	7.403016	0	0.674827	7.914301	-7.914301	62.6361576	11	11	5
25	0	2.957493	20	-0.564839	2.229112	17.770888	315.804463	15	15	1
26	20	1.181514	20	0.991845	1.805389	18.194611	331.043886	16	16	20
27	30	12.48205	15	-0.040098	12.03309	2.9669082	8.80254434	-4	0	40
28	15	23.00161	10	-0.397919	22.24594	-12.24594	149.962997	-14	0	35
29	10	18.19663	18	-0.765919	17.17517	0.8248257	0.68033751	-9	0	25
30	18	13.27454	8	0.625436	13.61378	-5.613777	31.5144912	-4	0	28
31	8	16.11219	22	0.138235	15.98486	6.0153354	36.1842596	-12	0	26
32	22	11.24081	2	1.304907	12.23907	-10.23907	104.838559	-2	0	30
33	2	17.70172	0	-0.706309	16.7501	-16.7501	280.565757	-16	0	24
34	0	8.272811	0	-0.055283	8.1562	-8.1562	66.5236006	4	4	2
35	0	3.304975	0	0.541583	3.785229	-3.785229	14.3279565	6	6	0
36	0	1.320332	0	-0.928951	0.330053	-0.330053	0.10893476	6	6	0
37	0	0.52747	0	-1.872367	0	0	0	6	6	0
38	0	0.210724	0	0.722542	0.871937	-0.871937	0.76027463	6	6	0
39	0	0.084184	0	0.908422	0.931277	-0.931277	0.8672773	6	6	0
40	0	0.033631	0	-2.198338	0	0	0	6	6	0
	mean of the disturbance			-0.035654		-0.25447	mean of the standard errors			
	std dev of the disturbance			1.079868						

Σ (AO-Ot)2	1928.532		constraints		
θ	0.60		>=0	<=1	
αs	0.01		>=0	<=1	
β	1.00		>=0	<=1	
S'	0.00		>=0	<=100	INT
	GRG NonLinear				

Incoming Orders:

IO = FIO

Expected Incoming Orders:

$eIO = \theta * IO_{(t-1)} + (1-\theta) * eIO_{(t-1)}$

Actual Orders:

AO = FPR

Disturbance:

normally distributed white noise

mean = 0

std dev = 1

Model Orders:

$Ot = MAX(0, eIO + \alpha s(s' - S_t - \beta SL_t) + \varepsilon$

Error Term:

$AO - O_t$

Squared errors:

$(AO - O_t)^2$

Effective Inventory:

EI = MFEI

Stock:

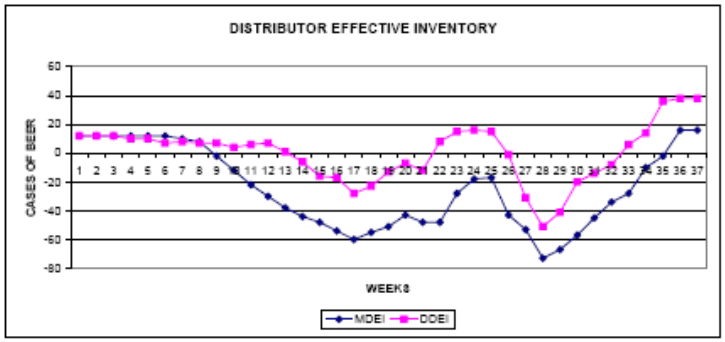
St = MAX(0,EI)

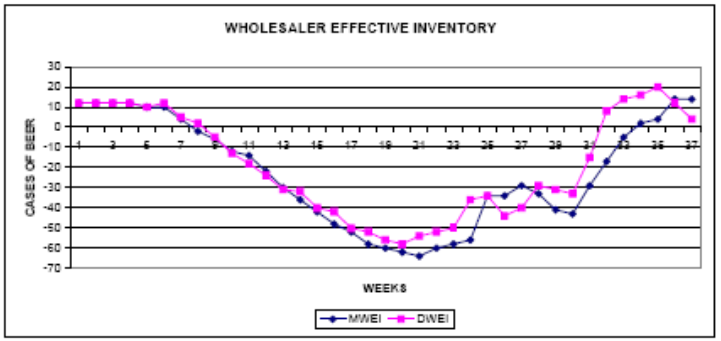
Supply Line:

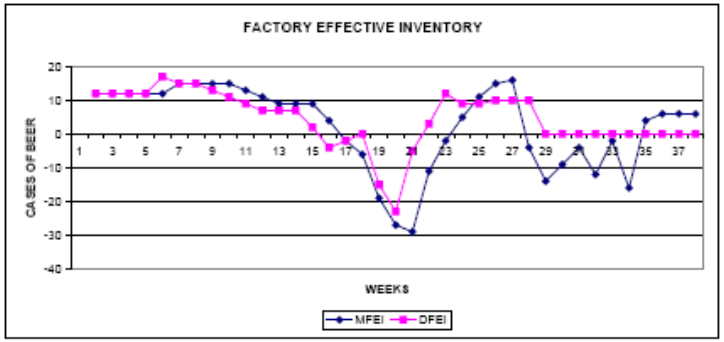
SLt = FSL = FPD1+FPD2

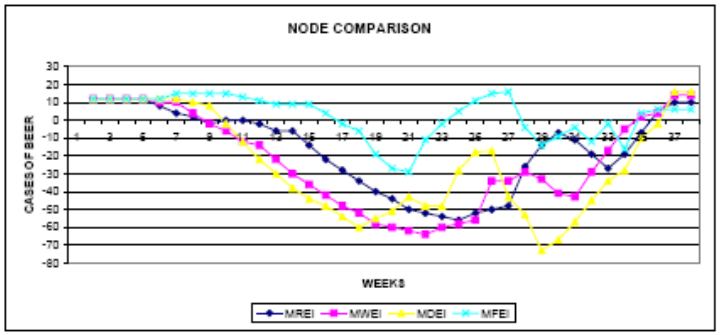
GUZZLERS BEER GAME MODEL

MODEL CHARTS



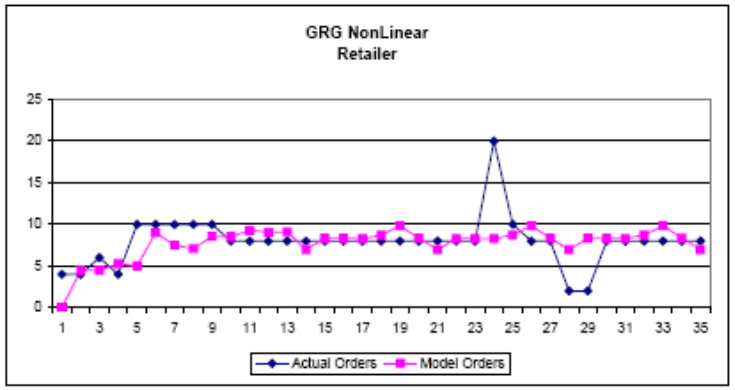


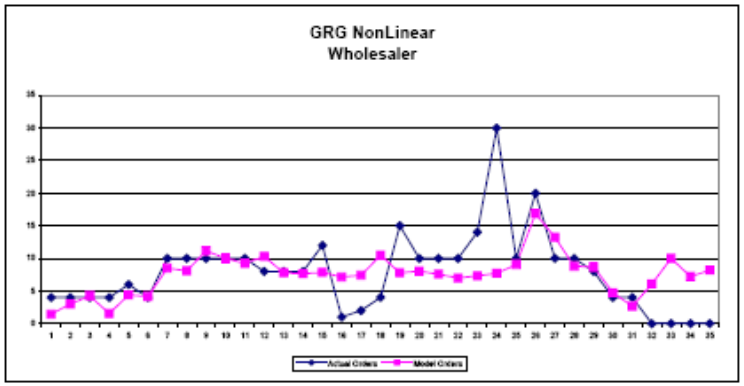


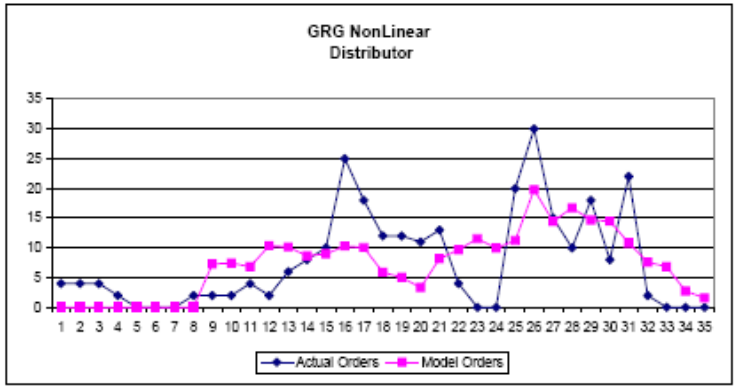


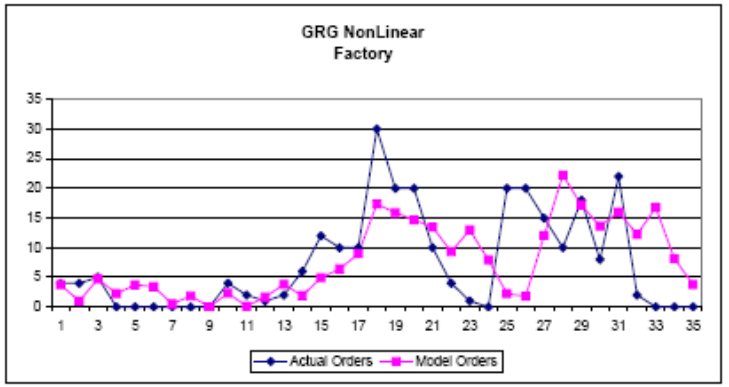
GUZZLERS BEER GAME MODEL

ORDER CHARTS









GUZZLERS BEER GAME MODEL

MODEL WORKSHEET

STEP 1
Receive The Inventory and Advance the shipping Delays

STEP 2
Look at the incoming orders and fill orders
all incoming orders + backlog

	GUZZLERS	IT							GUZZLERS	Retailer	IT					
	Team Costs	$ 3,143.50							Costs	$ 748.50						
WEEK	COR	RINV1	RSD1	RSD2	RBL	RSR	RINV2	MREI	*DREI*	RCOSTS	ROP	WIO	RSL		WINV1	WSD1
0	0	12	4	4	0	4	12			0	4	4			12	4
1	4	16	4	4	0	4	12	12	*12*	6	4	4	12		16	4
2	4	16	4	4	0	4	12	12	*12*	12	4	4	12		16	4
3	4	16	4	4	0	4	12	12	*12*	18	6	4	12		16	4
4	4	16	4	4	0	4	12	12	*12*	24	4	6	14		16	4
5	8	16	4	6	0	8	8	8	*8*	28	10	4	14		16	4
6	8	12	6	4	0	8	4	4	*4*	30	10	10	20		14	4
7	8	10	4	10	0	8	2	2	*2*	31	10	10	24		14	4
8	8	6	10	8	2	6	0	-2	*-2*	33	10	10	30		8	6
9	8	10	8	6	0	10	0	0	*0*	33	10	10	30		6	4
10	8	8	6	4	0	8	0	0	*2*	33	8	10	32		4	8
11	8	6	4	8	2	6	0	-2	*-1*	35	8	8	34		8	0
12	8	4	8	0	6	4	0	-8	*-9*	41	8	8	38		0	0
13	8	8	0	0	6	8	0	-8	*-12*	47	8	8	38		0	2
14	8	0	0	2	14	0	0	-14	*-18*	61	8	8	46		2	2
15	8	0	2	2	22	0	0	-22	*-25*	83	8	8	54		2	2
16	8	2	2	2	28	2	0	-28	*-26*	111	8	8	60		2	4
17	8	2	2	4	34	2	0	-34	*-34*	145	8	8	66		4	2
18	8	2	4	2	40	2	0	-40	*-36*	185	8	8	72		2	6
19	8	4	2	6	44	4	0	-44	*-44*	229	8	8	76		6	6
20	8	2	6	6	50	2	0	-50	*-46*	279	8	8	82		6	6
21	8	6	6	6	52	6	0	-52	*-50*	331	8	8	84		6	12
22	8	6	6	12	54	6	0	-54	*-52*	385	8	8	86		12	10
23	8	6	12	10	56	6	0	-56	*-48*	441	8	8	88		10	10
24	8	12	10	10	52	12	0	-52	*-46*	493	20	8	84		10	30
25	8	10	10	30	50	10	0	-50	*-44*	543	10	20	94		30	20
26	8	10	30	20	48	10	0	-48	*-30*	591	8	10	94		20	15
27	8	30	20	15	26	30	0	-26	*-28*	617	8	8	72		15	4
28	8	20	15	4	14	20	0	-14	*-26*	631	2	8	60		4	0
29	8	15	4	0	7	15	0	-7	*-20*	638	2	2	47		0	0
30	8	4	0	0	11	4	0	-11	*-10*	649	8	2	45		0	16
31	8	0	0	16	19	0	0	-19	*-18*	668	8	8	53		16	20
32	8	0	16	20	27	0	0	-27	*-26*	695	8	8	61		20	20
33	8	16	20	20	19	16	0	-19	*-14*	714	8	8	53		20	15
34	8	20	20	13	7	20	0	-7	*1*	721	8	8	41		15	10
35	8	20	13	8	0	15	5	5	*1*	723.5	8	8	29		12	18
36	8	18	8	8	0	8	10	10	*1*	728.5	8	8	24		22	8
37	8	18	8	8	0	8	10	10	*1*	733.5	8	8	24		22	2
38	8	18	8	8	0	8	10	10	*1*	738.5	8	8	24		16	0
39	8	18	8	8	0	8	10	10	*1*	743.5	15	8	24		8	4
40	8	18	8	4	0	8	10	10	*-3*	748.5	8	15	31		4	8

GUZZLERS BEER GAME MODEL

MODEL WORKSHEET

	STEP 3 Record your inventory or backlog										STEP 4 Advance the order slips and the brewery Brews						
					GUZZLERS	Wholesaler		IT									GUZZLERS
					Costs	$ 1,008.00											Costs
WEEK	WSD2	WBL	WINV2	MWEI	*DWEI*	WCOSTS	WOP	DIO	WSL		DINV1	DSD1	DSD2	DBL	DINV2	MDEI	*DDEI*
0	4	0	12			0	4	4			12	4	4	0	12		
1	4	0	12	12	*12*	6	4	4	12		16	4	4	0	12	12	*12*
2	4	0	12	12	*12*	12	4	4	12		16	4	4	0	12	12	*12*
3	4	0	12	12	*12*	18	4	4	12		16	4	4	0	12	12	*12*
4	4	0	12	12	*12*	24	4	4	12		16	4	4	0	12	12	*10*
5	4	0	10	10	*10*	29	6	4	12		16	4	4	0	12	12	*10*
6	4	0	10	10	*12*	34	4	6	14		16	4	2	0	12	12	*7*
7	6	0	4	4	*5*	36	10	4	14		16	2	0	0	10	10	*8*
8	4	2	0	-2	*2*	38	10	10	20		12	0	0	0	8	8	*7*
9	8	6	0	-6	*-5*	44	10	10	24		8	0	0	2	0	-2	*7*
10	0	12	0	-12	*-13*	56	10	10	30		0	0	2	12	0	-12	*4*
11	0	14	0	-14	*-18*	70	10	10	32		0	2	2	22	0	-22	*6*
12	2	22	0	-22	*-24*	92	8	10	42		2	2	2	30	0	-30	*7*
13	2	30	0	-30	*-31*	122	8	8	50		2	2	4	38	0	-38	*1*
14	2	36	0	-36	*-32*	158	8	8	56		2	4	2	44	0	-44	*-6*
15	4	42	0	-42	*-40*	200	12	8	62		4	2	6	48	0	-48	*-16*
16	2	48	0	-48	*-42*	248	1	12	72		2	6	6	54	0	-54	*-17*
17	6	52	0	-52	*-50*	300	2	1	69		6	6	6	60	0	-60	*-28*
18	6	58	0	-58	*-52*	358	4	2	69		6	6	12	55	0	-55	*-23*
19	6	60	0	-60	*-56*	418	15	4	67		6	12	10	51	0	-51	*-13*
20	12	62	0	-62	*-58*	480	10	15	76		12	10	10	43	0	-43	*-7*
21	10	64	0	-64	*-54*	544	10	10	80		10	10	30	48	0	-48	*-12*
22	10	60	0	-60	*-52*	604	10	10	78		10	30	20	48	0	-48	*8*
23	30	58	0	-58	*-50*	662	14	10	78		30	20	15	28	0	-28	*15*
24	20	56	0	-56	*-36*	718	30	14	82		20	15	4	18	0	-18	*16*
25	15	34	0	-34	*-34*	752	10	30	82		15	4	0	17	0	-17	*15*
26	4	34	0	-34	*-44*	786	20	10	72		4	0	0	43	0	-43	*-1*
27	0	29	0	-29	*-40*	815	10	20	77		0	0	16	53	0	-53	*-31*
28	0	33	0	-33	*-29*	848	10	10	83		0	16	20	73	0	-73	*-51*
29	16	41	0	-41	*-31*	889	8	10	93		16	20	20	67	0	-67	*-41*
30	20	43	0	-43	*-33*	932	4	8	101		20	20	15	57	0	-57	*-20*
31	20	29	0	-29	*-15*	961	4	4	89		20	15	10	45	0	-45	*-14*
32	15	17	0	-17	*8*	978	0	4	73		15	10	18	34	0	-34	*-8*
33	10	5	0	-5	*14*	983	0	0	53		10	18	8	28	0	-28	*6*
34	18	0	2	2	*16*	984	0	0	38		18	8	18	10	0	-10	*14*
35	8	0	4	4	*20*	986	0	0	28		8	18	0	2	0	-2	*36*
36	2	0	14	14	*12*	993	4	0	10		18	0	0	0	16	16	*38*
37	0	0	14	14	*4*	1000	8	4	6		16	0	0	0	16	16	*38*
38	4	0	8	8	*-4*	1004	4	8	12		16	0	0	0	12	12	*34*
39	8	0	0	0	*-12*	1004	4	4	16		12	0	0	0	4	4	*30*
40	4	4	0	-4	*-16*	1008	10	4	16		4	0	0	0	0	0	*22*

GUZZLERS BEER GAME MODEL

MODEL WORKSHEET

STEP 5
Place and record your orders

	Distributor		IT									GUZZLERS Costs	Factory	IT		
	$ 1,099.00												$ 288.00			
WEEK	DCOSTS	DOP	FIO	DSL		FPD1	FPD2	FSD2	FBL	FINV2	MFEI	*DFEI*	FCOSTS	FPR	FSL	
0	0	4	4	12		12	4	4	0	12			0	4	8	
1	6	4	4	12		16	4	4	0	12	12	*12*	6	4	8	
2	12	4	4	12		16	4	4	0	12	12	*12*	12	4	8	
3	18	4	4	12		16	4	4	0	12	12	*12*	18	5	8	
4	24	2	4	12		16	4	5	0	12	12	*12*	24	0	9	
5	30	0	2	10		16	5	0	0	12	12	*17*	30	0	5	
6	36	0	0	6		17	0	0	0	15	15	*15*	37.5	0	0	
7	41	0	0	2		15	0	0	0	15	15	*15*	45	0	0	
8	45	2	0	0		15	0	0	0	15	15	*13*	52.5	0	0	
9	47	2	2	2		15	0	0	0	15	15	*11*	60	0	0	
10	59	2	2	4		15	0	0	0	13	13	*9*	66.5	4	0	
11	81	4	2	6		13	0	4	0	11	11	*7*	72	2	4	
12	111	2	4	8		11	4	2	0	9	9	*7*	76.5	1	6	
13	149	6	2	8		13	2	1	0	9	9	*7*	81	2	3	
14	193	8	6	12		11	1	2	0	9	9	*2*	85.5	6	3	
15	241	10	8	16		10	2	6	0	4	4	*-4*	87.5	12	8	
16	295	25	10	24		6	6	12	2	0	-2	*-2*	89.5	10	18	
17	355	18	25	43		6	12	10	6	0	-6	*0*	95.5	10	22	
18	410	12	18	55		12	10	10	19	0	-19	*-15*	114.5	30	20	
19	461	12	12	61		10	10	30	27	0	-27	*-23*	141.5	20	40	
20	504	11	12	61		10	30	20	29	0	-29	*-5*	170.5	20	50	
21	552	13	11	62		30	20	20	11	0	-11	*3*	181.5	10	40	
22	600	4	13	65		20	20	10	2	0	-2	*12*	183.5	4	30	
23	628	0	4	39		20	10	4	0	5	5	*9*	186	1	14	
24	646	0	0	19		15	4	1	0	11	11	*9*	191.5	0	5	
25	663	20	0	4		15	1	0	0	15	15	*10*	199	20	1	
26	706	30	20	20		16	0	20	0	16	16	*10*	207	20	20	
27	759	15	30	50		16	20	20	4	0	-4	*10*	211	15	40	
28	832	10	15	65		20	20	15	14	0	-14	*0*	225	10	35	
29	899	18	10	59		20	15	10	9	0	-9	*0*	234	18	25	
30	956	8	18	57		15	10	18	4	0	-4	*0*	238	8	28	
31	1001	22	8	45		10	18	8	12	0	-12	*0*	250	22	26	
32	1035	2	22	52		18	8	22	2	0	-2	*0*	252	2	30	
33	1063	0	2	44		8	22	2	16	0	-16	*0*	268	0	24	
34	1073	0	0	26		22	2	0	0	4	4	*0*	270	0	2	
35	1075	0	0	18		6	0	0	0	6	6	*0*	273	0	0	
36	1083	0	0	0		6	0	0	0	6	6	*0*	276	0	0	
37	1091	0	0	0		6	0	0	0	6	6	*0*	279	0	0	
38	1097	0	0	0		6	0	0	0	6	6	*0*	282	0	0	
39	1099	0	0	0		6	0	0	0	6	6	*0*	285	0	0	
40	1099	0	0	0		6	0	0	0	6	6	*0*	288	0	0	

GUZZLERS BEER GAME MODEL

MODEL DATA

GUZZLERS IT Week	ROR	REI	WOR	WEI	DOR	DEI	FOR	FEI
1	4	12	4	12	4	12	4	12
2	4	12	4	12	4	12	4	12
3	6	12	4	12	4	12	5	12
4	4	12	4	12	2	10	0	12
5	10	8	6	10	0	10	0	17
6	10	4	4	12	0	7	0	15
7	10	2	10	5	0	8	0	15
8	10	-2	10	2	2	7	0	13
9	10	0	10	-5	2	7	0	11
10	8	2	10	-13	2	4	4	9
11	8	-1	10	-18	4	6	2	7
12	8	-9	8	-24	2	7	1	7
13	8	-12	8	-31	6	1	2	7
14	8	-18	8	-32	8	-6	6	2
15	8	-25	12	-40	10	-16	12	-4
16	8	-26	1	-42	25	-17	10	-2
17	8	-34	2	-50	18	-28	10	0
18	8	-36	4	-52	12	-23	30	-15
19	8	-44	15	-56	12	-13	20	-23
20	8	-46	10	-58	11	-7	20	-5
21	8	-50	10	-54	13	-12	10	3
22	8	-52	10	-52	4	8	4	12
23	8	-48	14	-50	0	15	1	9
24	20	-46	30	-36	0	16	0	9
25	10	-44	10	-34	20	15	20	10
26	8	-30	20	-44	30	-1	20	10
27	8	-28	10	-40	15	-31	15	10
28	2	-26	10	-29	10	-51	10	0
29	2	-20	8	-31	18	-41	18	0
30	8	-10	4	-33	8	-20	8	0
31	8	-18	4	-15	22	-14	22	0
32	8	-26	0	8	2	-8	2	0
33	8	-14	0	14	0	6	0	0
34	8	1	0	16	0	14	0	0
35	8	1	0	20	0	36	0	0
36	8	1	4	12	0	38	0	0
37	8	1	8	4	0	38	0	0
38	8	1	4	-4	0	34	0	0
39	15	1	4	-12	0	30	0	0
40	8	-3	10	-16	0	22	0	0