APPENDIX 2 – BEER DISTRIBUTION GAME EXPERIMENTAL DATA

Appendix 2 contains the data from the Beer Distribution Game experiment. For each trial there are several documents first there is the experimental data for the full 40 weeks of play (Pages 265 – 454)

1. RME GRG Nonlinear – the model and results of the GRG NON Linear Solver for the Retail Position for the full 40 weeks of play.
2. WME GRG Nonlinear – the model and results of the GRG NON Linear Solver for the Wholesaler Position for the full 40 weeks of play.
3. DME GRG Nonlinear – the model and results of the GRG NON Linear Solver for the Distributor Position for the full 40 weeks of play
4. FME GRG Nonlinear – the model and results of the GRG NON Linear Solver for the Factory Position for the full 40 weeks of play
5. Model Charts comparing the model simulated inventory to the actual inventory for each position.
6. Order Charts comparing the model simulated orders with the actual orders for each position.
7. Model Worksheet for the trial.
8. The Model Raw Data from the game play.

This is followed by data for the first 20 weeks of play (Pages: 455 – 644)

1. RME GRG Nonlinear – the model and results of the GRG NON Linear Solver for the Retail Position for the first 20 weeks of play.
2. WME GRG Nonlinear – the model and results of the GRG NON Linear Solver for the Wholesaler Position for the first 20 weeks of play.
3. DME GRG Nonlinear – the model and results of the GRG NON Linear Solver for the Distributor Position for the first 20 weeks of play
4. FME GRG Nonlinear – the model and results of the GRG NON Linear Solver for the Factory Position for the first 20 weeks of play

5. Model Charts comparing the model simulated inventory to the actual inventory for each position.
6. Order Charts comparing the model simulated orders with the actual orders for each position.
7. Model Worksheet for the trial.
8. The Model Raw Data from the game play.

This is followed by data for the second 20 weeks of play (Pages 645 – 834).

1. RME GRG Nonlinear – the model and results of the GRG NON Linear Solver for the Retail Position for the second 20 weeks of play.
2. WME GRG Nonlinear – the model and results of the GRG NON Linear Solver for the Wholesaler Position for the second 20 weeks of play.
3. DME GRG Nonlinear – the model and results of the GRG NON Linear Solver for the Distributor Position for the second 20 weeks of play
4. FME GRG Nonlinear – the model and results of the GRG NON Linear Solver for the Factory Position for the second 20 weeks of play
5. Model Charts comparing the model simulated inventory to the actual inventory for each position.
6. Order Charts comparing the model simulated orders with the actual orders for each position.
7. Model Worksheet for the trial.
8. The Model Raw Data from the game play.

#1 NO 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	-0.858401	3.178711	0.8212888	0.67451535	12	12	12
2	4	0.00	4	-0.024913	4.012199	-0.012199	0.00014882	12	12	12
3	4	0.00	4	-0.169645	3.867467	0.1325327	0.01756492	12	12	12
4	4	0.00	4	1.483937	5.521049	-1.521049	2.31359127	12	12	12
5	8	0.00	8	-0.360115	5.890189	2.1098105	4.45130049	8	8	12
6	8	0.00	8	0.059485	7.655494	0.3445063	0.11868462	4	4	16
7	8	0.00	8	-1.171606	7.770107	0.2298931	0.05285086	0	0	20
8	8	0.00	8	0.564177	8.638402	-0.638402	0.40755756	-4	0	24
9	8	0.00	8	-1.532596	6.541629	1.4583712	2.12684641	-4	0	24
10	8	0.00	8	-0.503122	7.571103	0.4288968	0.18395249	-4	0	24
11	8	0.00	8	-0.308854	7.765371	0.2346288	0.05506067	-4	0	24
12	8	0.00	8	-0.29301	7.781215	0.2187849	0.04786685	-4	0	24
13	8	0.00	8	1.002222	9.076447	-1.076447	1.15873806	-4	0	24
14	8	0.00	8	1.395107	9.469332	-1.469332	2.15893791	-4	0	24
15	8	0.00	8	1.23135	9.305576	-1.305576	1.70452752	-4	0	24
16	8	0.00	8	0.754299	8.828524	-0.828524	0.68646176	-4	0	24
17	8	0.00	8	0.180461	8.254686	-0.254686	0.06486521	-4	0	24
18	8	0.00	8	1.276995	9.35122	-1.35122	1.82579528	-4	0	24
19	8	0.00	8	-1.421193	6.653032	1.3469682	1.81432324	-4	0	24
20	8	0.00	8	0.143434	8.217659	-0.217659	0.0473755	-4	0	24
21	8	0.00	8	-2.582471	5.491754	2.5082461	6.2912986	-4	0	24
22	8	0.00	8	-2.820674	5.253551	2.7464485	7.54297961	-4	0	24
23	8	0.00	8	-0.837952	7.236273	0.7637268	0.58327865	-4	0	24
24	8	0.00	8	1.23227	9.306495	-1.306495	1.70692937	-4	0	24
25	8	0.00	8	0.483949	8.558174	-0.558174	0.31155792	-4	0	24
26	8	0.00	8	-1.421193	6.653032	1.3469682	1.81432324	-4	0	24
27	8	0.00	8	0.143434	8.217659	-0.217659	0.0473755	-4	0	24
28	8	0.00	8	-2.582471	5.491754	2.5082461	6.2912986	-4	0	24
29	8	0.00	8	-2.820674	5.253551	2.7464485	7.54297961	-4	0	24
30	8	0.00	8	-0.837952	7.236273	0.7637268	0.58327865	-4	0	24
31	8	0.00	8	1.23227	9.306495	-1.306495	1.70692937	-4	0	24
32	8	0.00	8	0.483949	8.558174	-0.558174	0.31155792	-4	0	24
33	8	0.00	8	-1.421193	6.653032	1.3469682	1.81432324	-4	0	24
34	8	0.00	8	0.143434	8.217659	-0.217659	0.0473755	-4	0	24
35	8	0.00	8	-2.582471	5.491754	2.5082461	6.2912986	-4	0	24
36	9	0.00	8	-2.820674	5.253551	2.7464485	7.54297961	-4	0	24
37	10	0.00	8	-0.837952	7.236273	0.7637268	0.58327865	-4	0	24
38	11	0.00	8	1.23227	9.306495	-1.306495	1.70692937	-4	0	24
39	12	0.00	8	0.483949	8.558174	-0.558174	0.31155792	-4	0	24
40	13	0.00	8	-1.421193	6.653032	1.3469682	1.81432324	-4	0	24
	mean of the disturbance			-0.363992		0.3349987	mean of the standard errors			
	std dev of the disturbance			1.290104						

Σ (AO-Ot)2	74.7588		constraints		
θ	0.00		>=0	<=1	
αs	0.55		>=0	<=1	
β	0.39		>=0	<=1	
S'	24.00		>=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

#1 NO 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	2.30424	4	-0.073802	3.700746	0.2992538	0.08955285	12	12	12
2	4	3.281099	4	0.60065	5.352056	-1.352056	1.82806207	12	12	12
3	4	3.695229	6	0.586285	5.731823	0.2681772	0.07191902	12	12	12
4	4	3.870796	6	-0.130118	4.895531	1.1044694	1.21985274	12	12	14
5	4	3.945225	5	1.110756	5.895379	-0.895379	0.80170394	12	12	16
6	8	3.976779	8	1.250845	5.909084	2.0909084	4.37188939	12	12	17
7	8	6.294396	8	-0.50935	6.691258	1.3087423	1.71280842	10	10	19
8	8	7.276926	10	-0.144406	8.263274	1.7367258	3.01621846	8	8	21
9	8	7.69346	10	0.948189	9.79378	0.2062395	0.04253474	5	5	26
10	8	7.870045	8	0.453827	9.160529	-1.160529	1.34682735	5	5	28
11	8	7.944907	8	-1.007244	7.774319	0.225681	0.0509319	5	5	28
12	8	7.976644	8	0.815029	9.403787	-1.403787	1.97061862	7	7	26
13	8	7.990098	8	-1.474809	6.902862	1.097138	1.20371182	9	9	24
14	8	7.995802	5	1.282907	9.666281	-4.666281	21.7741823	9	9	24
15	8	7.99822	5	-1.037369	7.821607	-2.821607	7.96146431	9	9	21
16	8	7.999246	8	-0.578148	8.755036	-0.755036	0.57007971	9	9	18
17	8	7.99968	8	0.437885	9.771503	-1.771503	3.13822387	9	9	18
18	8	7.999864	9	-0.339654	9.330961	-0.330961	0.10953546	6	6	21
19	8	7.999943	9	-1.022458	8.827321	0.1726788	0.02981796	3	3	25
20	8	7.999976	9	-1.30804	8.384045	0.6159555	0.37940113	3	3	26
21	8	7.99999	8	-0.544222	8.990149	-0.990149	0.98039499	3	3	27
22	8	7.999996	8	-1.978151	7.443955	0.5560455	0.30918659	4	4	26
23	8	7.999998	8	1.714709	11.13682	-3.136817	9.83962195	4	4	26
24	8	7.999999	15	-0.344856	9.301795	5.6982046	32.4695354	2	2	28
25	8	8	8	-1.00109	7.316926	0.6830739	0.46659001	4	4	33
26	8	8	8	0.394122	8.487596	-0.487596	0.23775002	6	6	31
27	8	8	8	0.414532	8.508006	-0.508006	0.25807029	6	6	31
28	8	8	8	0.677029	8.433691	-0.433691	0.18808814	9	9	28
29	8	8	8	-1.527343	6.34159	1.65841	2.75032373	8	8	29
30	8	8	8	0.568992	8.662466	-0.662466	0.4388618	6	6	31
31	8	8	7	0.190722	8.059655	-1.059655	1.12286788	8	8	29
32	8	8	7	0.399221	7.864526	-0.864526	0.74740596	13	13	23
33	8	8	7	-0.721835	6.901199	0.0988013	0.0097617	13	13	22
34	8	8	8	-0.802832	6.97793	1.0220704	1.04462798	13	13	21
35	8	8	8	-0.231651	7.661381	0.3386188	0.11466266	12	12	22
36	8	8	8	2.018192	10.0235	-2.023495	4.09453234	11	11	23
37	8	8	8	-0.750125	7.367449	0.6325506	0.40012032	10	10	24
38	8	8	7	0.726023	8.843597	-1.843597	3.39885039	10	10	24
39	8	8	8	-0.840167	7.435135	0.5648653	0.31907284	10	10	23
40	8	8	8	0.200191	8.475493	-0.475493	0.22609332	10	10	23
	mean of the disturbance			-0.084339		-0.117682	mean of the standard errors			
	std dev of the disturbance			0.903251						

Σ (AO-Ot)2	111.1058		constraints		
θ	0.58		>=0	<=1	
αs	0.27		>=0	<=1	
β	0.58		>=0	<=1	
S'	24.46		>=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

#1 NO 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	3.324827	4	0.620994	4.582902	-0.582902	0.33977499	12	12	12
2	4	3.886035	4	-2.101185	2.421931	1.5780687	2.49030068	12	12	12
3	4	3.980763	6	-0.344364	4.27348	1.7265197	2.98087028	12	12	12
4	6	3.996753	6	-0.785392	3.638096	2.3619036	5.57858848	12	12	14
5	6	5.661865	10	-0.173607	5.914994	4.0850064	16.6872769	10	10	16
6	5	5.942925	8	1.040269	6.989239	1.0107614	1.02163851	8	8	22
7	8	5.159159	5	-1.535879	3.313807	1.686193	2.84324671	9	9	24
8	8	7.520485	6	-0.722844	6.803685	-0.803685	0.64591024	7	7	23
9	10	7.919061	8	-0.401288	7.734163	0.2658369	0.07066923	9	9	19
10	10	9.648751	10	-0.278725	9.796762	0.2032377	0.04130556	7	7	19
11	8	9.940712	12	0.750862	11.11831	0.8816907	0.7773785	2	2	24
12	8	8.327579	8	0.955674	9.289297	-1.289297	1.66228775	0	0	30
13	8	8.055293	8	0.465292	8.52663	-0.52663	0.27733934	0	0	30
14	8	8.009333	8	-0.466482	7.548896	0.4511042	0.20349496	2	2	28
15	5	8.001575	4	-0.545743	7.461877	-3.461877	11.9845908	6	6	24
16	5	5.506646	3	-0.617371	5.000492	-2.000492	4.00196777	9	9	20
17	8	5.085518	6	-1.060903	4.346178	1.653822	2.73512713	11	11	16
18	8	7.508055	6	-0.080174	7.959789	-1.959789	3.84077236	11	11	14
19	9	7.916963	10	-0.909592	7.749625	2.2503754	5.06418937	8	8	15
20	9	8.817191	12	0.480772	9.935043	2.0649567	4.26404625	2	2	22
21	9	8.969143	10	-0.078969	9.108564	0.8934358	0.7982275	-1	0	28
22	8	8.994792	8	-0.087448	8.703043	-0.703043	0.49426925	-4	0	32
23	8	8.167914	6	-1.323527	6.850432	-0.850432	0.72323399	-2	0	30
24	8	8.028343	6	1.040269	9.495347	-3.495347	12.2174541	2	2	24
25	15	8.004784	10	-1.535879	7.105987	2.8940133	8.37531322	4	4	20
26	8	13.81925	13	-0.722844	13.83866	-0.838664	0.7033571	-4	0	23
27	8	8.982251	10	-0.401288	8.692181	1.3078192	1.7103911	-5	0	29
28	8	8.165798	10	-0.278725	7.577599	2.422401	5.86802638	-7	0	33
29	8	8.027996	12	0.750862	8.469374	3.5306262	12.4653214	-5	0	33
30	8	8.004724	8	0.955674	8.756096	-0.756096	0.5716817	0	0	32
31	8	8.000797	8	0.166433	7.96293	0.0370704	0.00137422	2	2	30
32	7	8.000135	6	-0.803521	6.992312	-0.992312	0.98468401	4	4	28
33	7	7.168816	5	0.618601	7.688289	-2.688289	7.22689785	9	9	22
34	7	7.028496	4	0.088659	7.208371	-3.208371	10.2936444	10	10	19
35	8	7.00481	6	-0.439926	6.991619	-0.991619	0.98330872	11	11	15
36	8	7.832018	6	-1.126895	7.342204	-1.342204	1.80151278	9	9	15
37	8	7.971646	8	0.146652	8.965725	-0.965725	0.93262415	6	6	16
38	8	7.995214	8	2.720373	11.56301	-3.563014	12.6950665	2	2	20
39	7	7.999192	8	-0.68103	8.165589	-0.165589	0.02741967	0	0	22
40	8	7.168657	8	0.31376	8.119498	-0.119498	0.01427978	-1	0	24
	mean of the disturbance			-0.222323		0.1758856	mean of the standard errors			
	std dev of the disturbance			0.795547						

Σ (AO-Ot)2	146.3989		constraints		
θ	0.83		>=0	<=1	
αs	0.11		>=0	<=1	
β	1.00		>=0	<=1	
S'	30.06		>=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

#1 NO 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	0	4	-0.764494	6.873636	-2.873636	8.25778251	12	12	8
2	4	0	4	-1.671917	5.966212	-1.966212	3.86599097	12	12	8
3	4	0	8	-1.273646	6.364484	1.6355159	2.67491241	12	12	8
4	6	0	8	-1.455461	6.182668	1.8173319	3.3026951	12	12	12
5	6	0	8	0.434851	8.914484	-0.914484	0.83628157	10	10	16
6	10	0	8	0.428715	8.068844	-0.068844	0.00446819	12	12	16
7	8	0	12	0.36252	8.842154	3.157846	9.97199142	10	10	16
8	5	0	10	-0.684817	7.794817	2.205183	4.8628321	10	10	20
9	6	0	6	0.181827	7.399205	-1.399205	1.95777448	13	13	22
10	8	0	6	0.247459	4.940324	1.0596757	1.12291268	19	19	16
11	10	0	0	-1.058496	2.792865	-2.792865	7.80009273	21	21	12
12	12	0	4	-1.612047	3.922322	0.0776778	0.00603385	17	17	6
13	8	0	8	-1.111289	6.947593	1.0524071	1.1075606	11	11	4
14	8	0	15	-1.305994	10.1189	4.8810959	23.8250974	3	3	12
15	8	0	15	0.480701	13.16786	1.8321449	3.3567548	-1	0	23
16	4	0	10	-1.204113	11.48304	-1.483041	2.19941155	-1	0	30
17	3	0	6	0.767679	9.247313	-3.247313	10.5450428	10	10	25
18	6	0	4	0.853477	4.284086	-0.284086	0.08070508	22	22	16
19	6	0	3	0.701689	2.44929	0.5507102	0.30328168	26	26	10
20	10	0	3	0.707625	2.455226	0.5447743	0.29677908	26	26	7
21	12	0	3	0.849805	5.121918	-2.121918	4.50253627	20	20	6
22	10	0	8	1.218827	9.277708	-1.277708	1.63253843	11	11	6
23	8	0	10	-0.452588	10.55156	-0.551558	0.3042162	4	4	11
24	6	0	12	1.281979	13.96913	-1.969134	3.87748681	-1	0	18
25	6	0	10	-0.976438	11.28996	-1.289965	1.66400896	1	1	22
26	10	0	10	-0.56932	10.01407	-0.014074	0.00019807	5	5	22
27	13	0	10	0.768496	10.51039	-0.510386	0.26049351	7	7	20
28	10	0	12	-0.097887	10.90826	1.0937406	1.19626846	4	4	20
29	10	0	10	0.054453	11.0586	-1.0586	1.1206332	4	4	22
30	12	0	10	-0.157713	10.84643	-0.846433	0.7164496	4	4	22
31	8	0	12	0.211217	11.21536	0.7846363	0.61565411	4	4	20
32	8	0	10	-2.089147	8.093495	1.9065049	3.63476085	6	6	22
33	6	0	10	0.728373	10.04951	-0.049511	0.00245136	8	8	22
34	5	0	8	-0.945739	5.850887	2.1491135	4.61868867	14	14	20
35	4	0	6	-0.196627	4.496238	1.503762	2.26130025	19	19	18
36	6	0	4	-0.225715	1.942838	2.057362	4.23273822	25	25	14
37	6	0	2	-0.967367	0.359482	1.640518	2.69129934	27	27	10
38	8	0	2	0.349055	1.675903	0.3240965	0.10503857	27	27	6
39	8	0	2	-0.409086	2.600771	-0.600771	0.36092574	23	23	4
40	8	0	2	1.422052	6.956422	-4.956422	24.5661153	17	17	4
	mean of the disturbance			-0.209373		0.0438613	mean of the standard errors			
	std dev of the disturbance			0.924444						

			constraints		
Σ (AO-Ot)2	144.7422				
θ	0.00		>=0	<=1	
αs	0.42		>=0	<=1	
β	0.00		>=0	<=1	
S'	30.15		>=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:

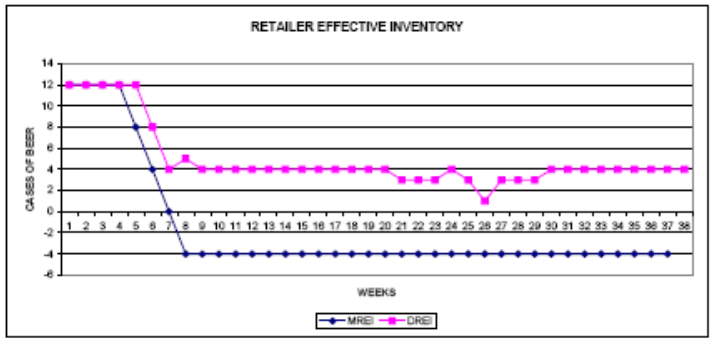
St = MAX(0,EI)

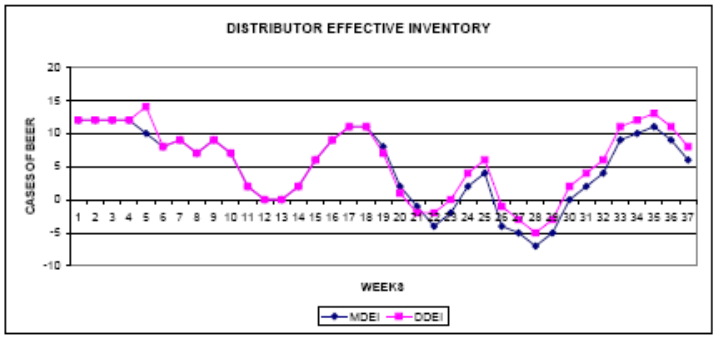
Supply Line:

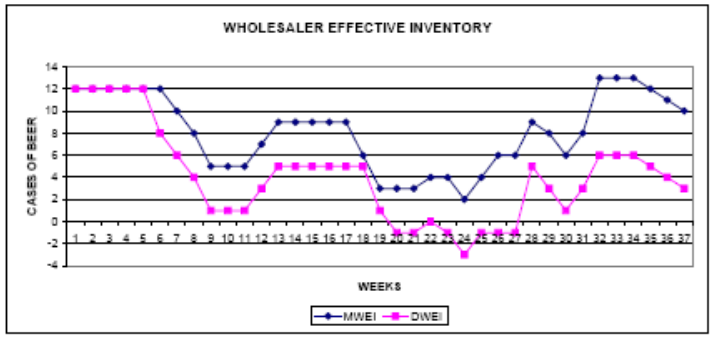
SLt = FSL = FPD1+FPD2

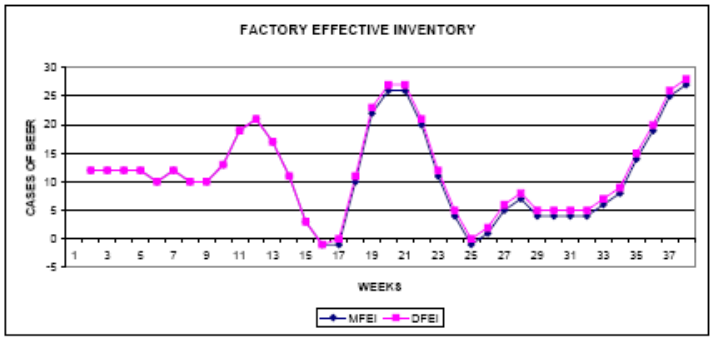
#1 NO IT BEER GAME MODEL

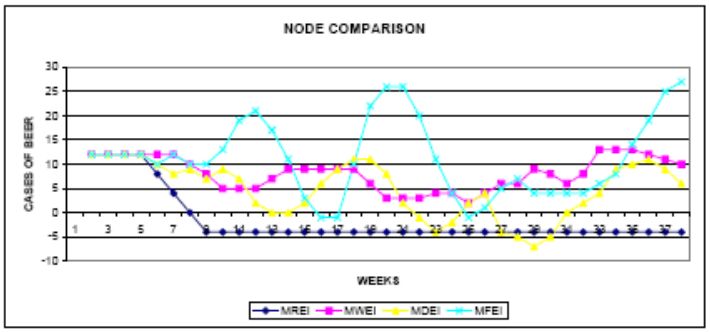
MODEL CHARTS





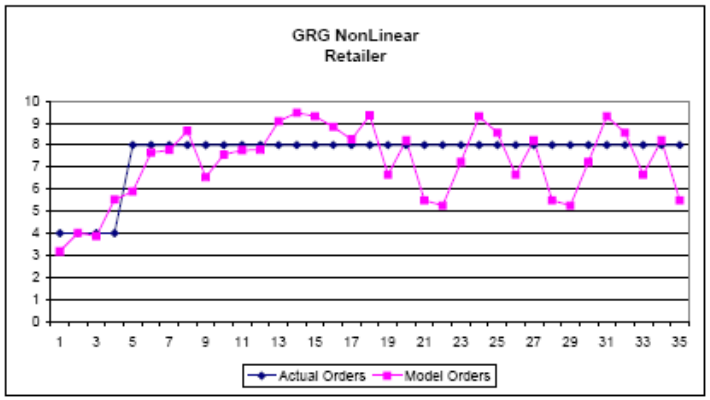


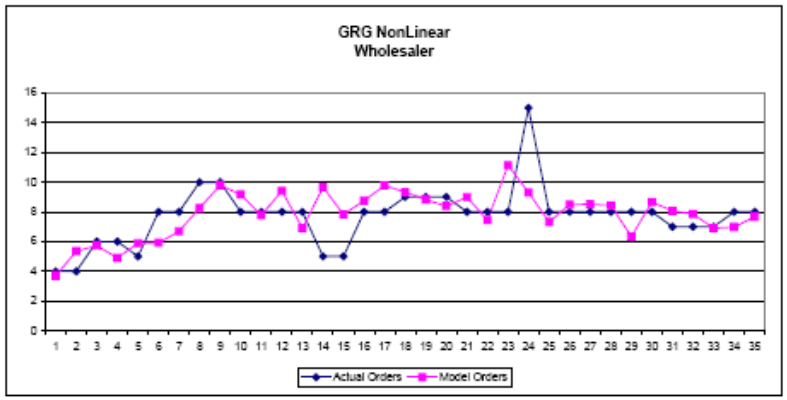


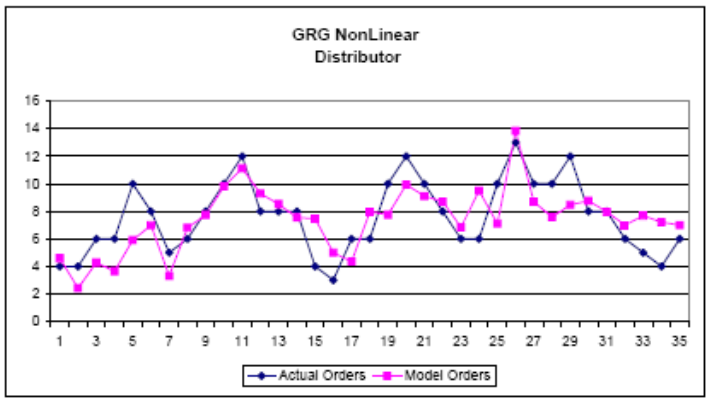


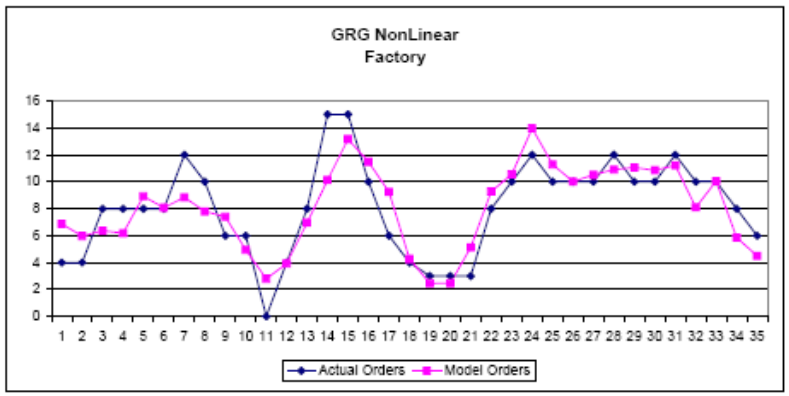
#1 NO IT BEER GAME MODEL

ORDER CHARTS









#1 NO 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

	#1	NO IT							#1	Retailer	NO IT					
	Team Costs	$ 707.50							Costs	$ 162.00						
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	4	4	12		16	4
4	4	16	4	4	0	4	12	12	*12*	24	4	4	12		16	4
5	8	16	4	4	0	8	8	8	*12*	28	8	4	12		16	4
6	8	12	4	4	0	8	4	4	*8*	30	8	8	16		16	6
7	8	8	4	8	0	8	0	0	*4*	30	8	8	20		18	6
8	8	4	8	8	4	4	0	-4	*5*	34	8	8	24		16	5
9	8	8	8	8	4	8	0	-4	*4*	38	8	8	24		13	8
10	8	8	8	8	4	8	0	-4	*4*	42	8	8	24		13	8
11	8	8	8	8	4	8	0	-4	*4*	46	8	8	24		13	10
12	8	8	8	8	4	8	0	-4	*4*	50	8	8	24		15	10
13	8	8	8	8	4	8	0	-4	*4*	54	8	8	24		17	8
14	8	8	8	8	4	8	0	-4	*4*	58	8	8	24		17	8
15	8	8	8	8	4	8	0	-4	*4*	62	8	8	24		17	8
16	8	8	8	8	4	8	0	-4	*4*	66	8	8	24		17	8
17	8	8	8	8	4	8	0	-4	*4*	70	8	8	24		17	5
18	8	8	8	8	4	8	0	-4	*4*	74	8	8	24		14	5
19	8	8	8	8	4	8	0	-4	*4*	78	8	8	24		11	8
20	8	8	8	8	4	8	0	-4	*4*	82	8	8	24		11	8
21	8	8	8	8	4	8	0	-4	*3*	86	8	8	24		11	9
22	8	8	8	8	4	8	0	-4	*3*	90	8	8	24		12	8
23	8	8	8	8	4	8	0	-4	*3*	94	8	8	24		12	6
24	8	8	8	8	4	8	0	-4	*4*	98	8	8	24		10	10
25	8	8	8	8	4	8	0	-4	*3*	102	8	8	24		12	10
26	8	8	8	8	4	8	0	-4	*1*	106	8	8	24		14	8
27	8	8	8	8	4	8	0	-4	*3*	110	8	8	24		14	11
28	8	8	8	8	4	8	0	-4	*3*	114	8	8	24		17	7
29	8	8	8	8	4	8	0	-4	*3*	118	8	8	24		16	6
30	8	8	8	8	4	8	0	-4	*4*	122	8	8	24		14	10
31	8	8	8	8	4	8	0	-4	*4*	126	8	8	24		16	13
32	8	8	8	8	4	8	0	-4	*4*	130	8	8	24		21	8
33	8	8	8	8	4	8	0	-4	*4*	134	8	8	24		21	8
34	8	8	8	8	4	8	0	-4	*4*	138	8	8	24		21	7
35	8	8	8	8	4	8	0	-4	*4*	142	8	8	24		20	7
36	8	8	8	8	4	8	0	-4	*4*	146	8	8	24		19	7
37	8	8	8	8	4	8	0	-4	*4*	150	8	8	24		18	8
38	8	8	8	8	4	8	0	-4	*4*	154	8	8	24		18	8
39	8	8	8	8	4	8	0	-4	*4*	158	8	8	24		18	8
40	8	8	8	8	4	8	0	-4	*4*	162	8	8	24		18	8

#1 NO IT BEER GAME MODEL

MODEL WORKSHEET

STEP 3
Record your inventory or backlog

STEP 4
Advance the order slips and the brewery Brews

#1 Wholesaler Costs $ 165.50

NO IT

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	6	4	12	16	4	4	0	12	12	*12*
4	4	0	12	12	*12*	24	6	6	14	16	4	4	0	12	12	*12*
5	6	0	12	12	*12*	30	5	6	16	16	4	6	0	10	10	*14*
6	6	0	12	12	*8*	36	8	5	17	14	6	6	0	8	8	*8*
7	5	0	10	10	*6*	41	8	8	19	14	6	10	0	9	9	*9*
8	8	0	8	8	*4*	45	10	8	21	15	10	8	0	7	7	*7*
9	8	0	5	5	*1*	47.5	10	10	28	17	8	5	0	9	9	*9*
10	10	0	5	5	*1*	50	8	10	28	17	5	6	0	7	7	*7*
11	10	0	5	5	*1*	52.5	8	8	28	12	6	8	0	2	2	*2*
12	8	0	7	7	*3*	56	8	8	26	8	8	10	0	0	0	*0*
13	8	0	9	9	*5*	60.5	8	8	24	8	10	12	0	0	0	*0*
14	8	0	9	9	*5*	65	5	8	24	10	12	8	0	2	2	*2*
15	8	0	9	9	*5*	69.5	5	5	21	14	8	7	0	6	6	*6*
16	5	0	9	9	*5*	74	8	5	18	14	7	8	0	9	9	*9*
17	5	0	9	9	*5*	78.5	8	8	18	16	8	5	0	11	11	*11*
18	8	0	6	6	*5*	81.5	9	8	21	19	5	3	0	11	11	*11*
19	8	0	3	3	*1*	83	9	9	25	16	3	6	0	8	8	*7*
20	9	0	3	3	*-1*	84.5	9	9	26	11	6	6	0	2	2	*1*
21	8	0	3	3	*-1*	86	8	9	27	8	6	10	1	0	-1	*-2*
22	6	0	4	4	*0*	88	8	8	26	6	10	12	4	0	-4	*-2*
23	10	0	4	4	*-1*	90	8	8	26	10	12	10	2	0	-2	*0*
24	10	0	2	2	*-3*	91	15	8	28	12	10	7	0	2	2	*4*
25	8	0	4	4	*-1*	93	8	15	33	12	7	7	0	4	4	*6*
26	11	0	6	6	*-1*	96	8	8	31	11	7	6	4	0	-4	*-1*
27	7	0	6	6	*-1*	99	8	8	31	7	6	10	5	0	-5	*-3*
28	6	0	9	9	*5*	103.5	8	8	28	6	10	13	7	0	-7	*-5*
29	10	0	8	8	*3*	107.5	8	8	29	10	13	10	5	0	-5	*-3*
30	13	0	6	6	*1*	110.5	8	8	31	13	10	10	0	0	0	*2*
31	8	0	8	8	*3*	114.5	7	8	29	10	10	12	0	2	2	*4*
32	8	0	13	13	*6*	121	7	7	23	12	12	8	0	4	4	*6*
33	7	0	13	13	*6*	127.5	7	7	22	16	8	8	0	9	9	*11*
34	7	0	13	13	*6*	134	8	7	21	17	8	6	0	10	10	*12*
35	7	0	12	12	*5*	140	8	8	22	18	6	5	0	11	11	*13*
36	8	0	11	11	*4*	145.5	8	8	23	17	5	4	0	9	9	*11*
37	8	0	10	10	*3*	150.5	8	8	24	14	4	6	0	6	6	*8*
38	8	0	10	10	*3*	155.5	7	8	24	10	6	6	0	2	2	*4*
39	8	0	10	10	*3*	160.5	8	7	23	8	6	8	0	0	0	*2*
40	6	0	10	10	*3*	165.5	8	8	23	6	8	8	1	0	-1	*1*

#1 NO IT BEER GAME MODEL

MODEL WORKSHEET

STEP 5
Place and record your orders

	Distributor		NO IT									#1	Factory	NO IT		
	$ 133.00											Costs	$ 247.00			
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	6	4	12		16	4	4	0	12	12	*12*	18	8	8	
4	24	6	6	14		16	4	8	0	12	12	*12*	24	8	12	
5	29	10	6	16		16	8	8	0	10	10	*10*	29	8	16	
6	33	8	10	22		18	8	8	0	12	12	*12*	35	8	16	
7	37.5	5	8	24		20	8	8	0	10	10	*10*	40	12	16	
8	41	6	5	23		18	8	12	0	10	10	*10*	45	10	20	
9	45.5	8	6	19		18	12	10	0	13	13	*13*	51.5	6	22	
10	49	10	8	19		25	10	6	0	19	19	*19*	61	6	16	
11	50	12	10	24		29	6	6	0	21	21	*21*	71.5	0	12	
12	50	8	12	30		27	6	0	0	17	17	*17*	80	4	6	
13	50	8	8	30		23	0	4	0	11	11	*11*	85.5	8	4	
14	51	8	8	28		11	4	8	0	3	3	*3*	87	15	12	
15	54	4	8	24		7	8	15	1	0	-1	*-1*	88	15	23	
16	58.5	3	4	20		8	15	15	1	0	-1	*0*	89	10	30	
17	64	6	3	16		15	15	10	0	10	10	*11*	94	6	25	
18	69.5	6	6	14		25	10	6	0	22	22	*23*	105	4	16	
19	73.5	10	6	15		32	6	4	0	26	26	*27*	118	3	10	
20	74.5	12	10	22		32	4	3	0	26	26	*27*	131	3	7	
21	75.5	10	12	28		30	3	3	0	20	20	*21*	141	3	6	
22	79.5	8	10	32		23	3	3	0	11	11	*12*	146.5	8	6	
23	81.5	6	8	30		14	3	8	0	4	4	*5*	148.5	10	11	
24	82.5	6	6	24		7	8	10	1	0	-1	*0*	149.5	12	18	
25	84.5	10	6	20		8	10	12	0	1	1	*2*	150	10	22	
26	88.5	13	10	23		11	12	10	0	5	5	*6*	152.5	10	22	
27	93.5	10	13	29		17	10	10	0	7	7	*8*	156	10	20	
28	100.5	10	10	33		17	10	10	0	4	4	*5*	158	12	20	
29	105.5	12	10	33		14	10	12	0	4	4	*5*	160	10	22	
30	105.5	8	12	32		14	12	10	0	4	4	*5*	162	10	22	
31	106.5	8	8	30		16	10	10	0	4	4	*5*	164	12	20	
32	108.5	6	8	28		14	10	12	0	6	6	*7*	167	10	22	
33	113	5	6	22		16	12	10	0	8	8	*9*	171	10	22	
34	118	4	5	19		20	10	10	0	14	14	*15*	178	8	20	
35	123.5	6	4	15		24	10	8	0	19	19	*20*	187.5	6	18	
36	128	6	6	15		29	8	6	0	25	25	*26*	200	4	14	
37	131	8	6	16		33	6	4	0	27	27	*28*	213.5	2	10	
38	132	8	8	20		33	4	2	0	27	27	*28*	227	2	6	
39	132	8	8	22		31	2	2	0	23	23	*24*	238.5	2	4	
40	133	8	8	24		25	2	2	0	17	17	*18*	247	2	4	

#1 NO IT BEER GAME MODEL

MODEL DATA

#1 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	6	12	6	12	8	12
4	4	12	6	12	6	12	8	12
5	8	12	5	12	10	14	8	10
6	8	8	8	8	8	8	8	12
7	8	4	8	6	5	9	12	10
8	8	5	10	4	6	7	10	10
9	8	4	10	1	8	9	6	13
10	8	4	8	1	10	7	6	19
11	8	4	8	1	12	2	0	21
12	8	4	8	3	8	0	4	17
13	8	4	8	5	8	0	8	11
14	8	4	5	5	8	2	15	3
15	8	4	5	5	4	6	15	-1
16	8	4	8	5	3	9	10	0
17	8	4	8	5	6	11	6	11
18	8	4	9	5	6	11	4	23
19	8	4	9	1	10	7	3	27
20	8	4	9	-1	12	1	3	27
21	8	3	8	-1	10	-2	3	21
22	8	3	8	0	8	-2	8	12
23	8	3	8	-1	6	0	10	5
24	8	4	15	-3	6	4	12	0
25	8	3	8	-1	10	6	10	2
26	8	1	8	-1	13	-1	10	6
27	8	3	8	-1	10	-3	10	8
28	8	3	8	5	10	-5	12	5
29	8	3	8	3	12	-3	10	5
30	8	4	8	1	8	2	10	5
31	8	4	7	3	8	4	12	5
32	8	4	7	6	6	6	10	7
33	8	4	7	6	5	11	10	9
34	8	4	8	6	4	12	8	15
35	8	4	8	5	6	13	6	20
36	8	4	8	4	6	11	4	26
37	8	4	8	3	8	8	2	28
38	8	4	7	3	8	4	2	28
39	8	4	8	3	8	2	2	24
40	8	4	8	3	8	1	2	18

A&W ROOTBEER NO 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	-0.725096	86.03126	-82.03126	6729.12832	12	12	12
2	4	2.53	4	-0.735531	88.5547	-84.5547	7149.49757	12	12	12
3	4	3.46	8	-1.94309	88.27589	-80.27589	6444.21819	12	12	12
4	4	3.80	6	0.841479	90.98632	-84.98632	7222.67533	12	12	16
5	8	3.93	1000	0.231578	94.29392	905.70608	820303.499	8	8	18
6	8	6.51	0	-0.116301	0	0	0	4	4	1014
7	8	7.45	0	1.128608	0.323037	-0.323037	0.10435314	4	4	1006
8	8	7.80	10	-0.289188	1.87462	8.1253799	66.0217993	2	2	1000
9	8	7.93	0	0.225666	0.515499	-0.515499	0.26573925	4	4	1000
10	8	7.97	0	-1.286182	2.568393	-2.568393	6.59664066	1	1	995
11	8	7.99	0	1.013394	6.506855	-6.506855	42.3391584	-1	0	989
12	8	8.00	0	0.306183	6.738629	-6.738629	45.4091163	0	0	980
13	8	8.00	0	-1.255268	0	0	0	12	12	960
14	8	8.00	0	-0.65473	2.060854	-2.060854	4.24712112	6	6	958
15	8	8.00	0	0.596052	0	0	0	48	48	908
16	8	8.00	0	-0.0363	0	0	0	60	60	888
17	8	8.00	1000	0.310282	0	1000	1000000	57	57	883
18	8	8.00	0	-0.189955	0	0	0	59	59	1873
19	8	8.00	0	-0.603365	0	0	0	924	924	1000
20	8	8.00	0	1.260481	0	0	0	916	916	1000
21	8	8.00	0	0.915187	0	0	0	1908	1908	0
22	8	8.00	0	0.987587	0	0	0	1900	1900	0
23	8	8.00	0	0.0411	0	0	0	1892	1892	0
24	8	8.00	0	1.041357	0	0	0	1884	1884	0
25	8	8.00	0	-0.292306	0	0	0	1876	1876	0
26	8	8.00	0	-0.314566	0	0	0	1868	1868	0
27	8	8.00	200	-2.170191	0	200	40000	1860	1860	0
28	8	8.00	200	0.915187	0	200	40000	1852	1852	200
29	8	8.00	200	0.987587	0	200	40000	1844	1844	400
30	8	8.00	200	0.0411	0	200	40000	1836	1836	600
31	8	8.00	200	1.041357	0	200	40000	2028	2028	600
32	8	8.00	200	-0.292306	0	200	40000	2220	2220	600
33	8	8.00	200	-0.314566	0	200	40000	2412	2412	600
34	8	8.00	200	-2.170191	0	200	40000	2604	2604	600
35	8	8.00	200	0.915187	0	200	40000	2796	2796	600
36	9	8.00	838	0.987587	0	838	702244	2988	2988	600
37	10	8.63	1862	0.0411	0	1862	3467044	3180	3180	1238
38	11	9.50	0	1.041357	0	0	0	3372	3372	2900
39	12	10.45	100	-0.292306	0	100	10000	3564	3564	2700
40	13	11.43	200	-0.314566	0	200	40000	4394	4394	1962
	mean of the disturbance			-0.016822		98.093429	mean of the standard errors			
	std dev of the disturbance			0.94962						

		constraints		
Σ (AO-Ot)2	6427302			
θ	0.63	>=0	<=1	
αs	1.00	>=0	<=1	
β	0.10	>=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

A&W ROOTBEER NO 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	1.128648	4	0.876789	2.005438	1.9945625	3.97827947	12	12	12
2	4	1.938835	4	-1.416051	0.522784	3.4772161	12.0910318	12	12	12
3	4	2.520417	4	0.205864	2.726281	1.2737192	1.62236061	12	12	12
4	8	2.937899	5	-0.317388	2.620511	2.3794891	5.66196851	12	12	12
5	6	4.366232	6	0.625913	4.992145	1.0078552	1.01577203	8	8	13
6	1000	4.827219	50	-1.120704	3.706516	46.293484	2143.08669	6	6	15
7	0	285.6272	1200	0.006454	285.6336	914.36635	836065.824	-990	0	61
8	0	205.034	1500	0.876789	205.9108	1294.0892	1674666.77	-985	0	1256
9	10	147.1812	0	-1.416051	145.7652	-145.7652	21247.4851	-979	0	2750
10	0	108.4739	0	0.205864	108.6798	-108.6798	11811.2887	-980	0	2741
11	0	77.86668	0	-0.317388	77.54929	-77.54929	6013.89202	-960	0	2721
12	0	55.89586	0	0.625913	56.52157	-56.52157	3194.6878	-958	0	2719
13	0	40.12402	0	-1.120704	39.00332	-39.00332	1521.25903	-908	0	2669
14	0	28.80255	0	0.442777	29.24533	-29.24533	855.289057	-889	0	2649
15	0	20.67556	0	-0.136901	20.53866	-20.53866	421.836617	-883	0	2644
16	0	14.8417	0	2.025699	16.8674	-16.8674	284.509267	-873	0	2634
17	0	10.65394	300	-0.684275	9.969663	290.03034	84117.5963	127	127	1634
18	1000	7.647802	300	0.109908	7.757709	292.24229	85405.5566	1761	1761	300
19	0	287.6519	0	-0.053462	287.5985	-287.5985	82712.8704	761	761	600
20	0	206.4875	0	1.804757	208.2922	-208.2922	43385.6501	761	761	600
21	0	148.2245	200	-0.90266	147.3219	52.678117	2774.98405	1061	1061	300
22	0	106.4012	200	-1.320567	105.0806	94.919362	9009.68535	1361	1361	200
23	0	76.37882	200	-0.507895	75.87093	124.12907	15408.0263	1361	1361	400
24	0	54.82762	500	-0.521384	54.30624	445.69376	198642.931	1361	1361	600
25	0	39.35735	200	-1.769361	37.58799	162.41201	26377.6622	1561	1561	900
26	0	28.2522	200	-0.035897	28.2163	171.7837	29509.6392	1761	1761	900
27	0	20.2805	200	0.863545	21.14405	178.85595	31989.4526	1961	1961	900
28	200	14.55811	200	-1.069331	13.48878	186.51122	34786.4345	2461	2461	600
29	200	66.88277	400	0.301948	67.18472	332.81528	110766.01	2461	2461	600
30	200	104.4434	200	0.710994	105.1544	94.845606	8995.68895	2461	2461	800
31	200	131.4058	1000	0.321567	131.7274	868.27259	753897.287	2461	2461	800
32	200	150.7605	1000	0.39184	151.1524	848.84765	720542.331	2461	2461	1600
33	200	164.654	1000	-0.136901	164.5171	835.48288	698031.635	2661	2661	2200
34	200	174.6273	1000	2.025699	176.653	823.34698	677900.256	2661	2661	3000
35	200	181.7885	1000	-0.684275	181.1022	818.89775	670593.525	3461	3461	3000
36	200	186.9257	200	0.109908	187.0356	12.964416	168.076085	4261	4261	3000
37	838	190.6148	400	-0.330901	190.2839	209.71615	43980.8625	5061	5061	2200
38	1862	373.2823	200	-0.205478	373.0768	-173.0768	29955.5832	5223	5223	1600
39	0	793.3419	100	0.090138	793.432	-693.432	480848.001	4361	4361	800
40	100	569.4909	100	-0.938284	568.5527	-468.5527	219541.593	4561	4561	700
	mean of the disturbance			-0.031682		225.61672	mean of the standard errors			
	std dev of the disturbance			0.950337						

Σ (AO-Ot)2	7617592		constraints		
θ	0.28		>=0	<=1	
αs	0.00		>=0	<=1	
β	0.87		>=0	<=1	
S'	19.17		>=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

A&W ROOTBEER NO 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	2.113451	4	-1.750369	2.423249	1.5767505	2.48614224	12	12	12
2	4	3.110233	4	2.254515	7.424916	-3.424916	11.7300465	12	12	12
3	4	3.580353	2	0.507871	6.148391	-4.148391	17.209152	12	12	12
4	4	3.802079	2	-1.111999	4.750247	-2.750247	7.56385764	12	12	10
5	5	3.906653	20	0.821789	6.788609	13.211391	174.540856	12	12	8
6	6	4.484337	2	0.821028	7.388943	-5.388943	29.0407092	11	11	24
7	50	5.285157	50	-2.351782	5.110597	44.889403	2015.05851	7	7	24
8	1200	28.91081	1000	-1.750369	29.50154	970.49846	941867.256	-41	0	72
9	1500	647.6707	1000	2.254515	652.2663	347.73373	120918.745	-1221	0	1052
10	0	1098.01	2000	0.507871	1100.859	899.14134	808455.144	-2719	0	2050
11	0	517.8623	1000	-0.208473	519.995	480.00505	230404.847	-2869	0	4000
12	0	244.2432	1000	-0.709143	245.8751	754.12486	568704.298	-2849	0	4980
13	0	115.1942	1000	1.190922	118.7262	881.27378	776643.478	-2844	0	5975
14	0	54.32988	1000	-0.034615	56.63636	943.36364	889934.95	-2834	0	6965
15	0	25.624	1000	-1.430025	26.53507	973.46493	947633.966	-1634	0	6965
16	0	12.08523	0	0.327417	0	0	0	1366	1366	4965
17	0	5.699847	0	-1.325756	0	0	0	4331	4331	2000
18	300	2.68826	0	0.860901	0	0	0	5331	5331	1000
19	300	159.7787	0	-0.003098	20.923	-20.923	437.771958	6031	6031	0
20	0	233.8655	0	0.368969	102.4071	-102.4071	10487.2204	5731	5731	0
21	0	110.2997	0	-0.186262	0	0	0	5731	5731	0
22	200	52.02144	0	-1.072272	0	0	0	5731	5731	0
23	200	130.2078	0	-1.934428	1.128265	-1.128265	1.27298187	5531	5531	0
24	200	167.0834	0	-0.132349	44.49814	-44.49814	1979.19473	5331	5331	0
25	500	184.4753	0	-1.152898	65.5417	-65.5417	4295.71441	5131	5131	0
26	200	351.1868	0	0.048527	245.1601	-245.1601	60103.4763	4631	4631	0
27	200	271.3053	0	-1.779131	168.1332	-168.1332	28268.7687	4431	4431	0
28	200	233.6303	0	-0.208473	136.711	-136.711	18689.8891	4231	4231	0
29	200	215.8613	0	-0.709143	123.1235	-123.1235	15159.4029	4031	4031	0
30	400	207.4808	0	1.190922	121.3253	-121.3253	14719.8239	3831	3831	0
31	200	309.2008	0	-0.208138	231.0106	-231.0106	53365.8965	3431	3431	0
32	1000	251.5031	3000	-0.449895	177.7534	2822.2466	7965075.67	3231	3231	0
33	1000	646.981	1600	-0.293636	596.7985	1003.2015	1006413.24	2231	2231	3000
34	1000	833.5031	0	-1.138678	805.8865	-805.8865	649453.125	1231	1231	4600
35	1000	921.4738	1000	-0.098612	918.3084	81.69162	6673.5208	231	231	4600
36	1000	962.9641	0	1.19878	914.2741	-914.2741	835897.103	2231	2231	2600
37	200	982.5325	762	-0.233559	919.3	-157.3	24743.2784	2791	2791	1040
38	400	569.0715	0	-0.208138	510.5466	-510.5466	260657.827	2591	2591	1802
39	200	479.7404	500	-0.449895	430.3382	69.661847	4852.77287	2191	2191	1802
40	100	331.936	0	-0.293636	285.0311	-285.0311	81242.728	2091	2091	2202
	mean of the disturbance			-0.253837		232.42492	mean of the standard errors			
	std dev of the disturbance			1.117606						

Σ (AO-Ot)2	18329338		constraints		
θ	0.53		>=0	<=1	
αs	0.02		>=0	<=1	
β	0.00		>=0	<=1	
S'	100.00		>=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

A&W ROOTBEER NO 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	0.434084	92.43408	-88.43408	7820.58719	12	12	8
2	4	4	4	0.851454	92.85145	-88.85145	7894.58091	12	12	8
3	4	4	10	0.865565	92.86556	-82.86556	6866.70179	12	12	8
4	2	4	50	1.273029	93.27303	-43.27303	1872.555	12	12	14
5	2	2	8	-0.810034	87.18997	-79.18997	6271.05079	14	14	60
6	20	2	2	0.512406	80.51241	-78.51241	6164.19782	22	22	58
7	2	20	10	-0.019075	67.98092	-57.98092	3361.78765	52	52	10
8	50	2	5	-1.309068	42.69093	-37.69093	1420.60636	58	58	12
9	1000	50	10	-1.07014	138.9299	-128.9299	16622.9088	10	10	15
10	1000	1000	1000	-0.049368	1099.951	-99.95063	9990.12876	-980	0	15
11	2000	1000	3000	-1.399524	1098.6	1901.3995	3615320.15	-1975	0	1010
12	1000	2000	8000	0.527655	2100.528	5899.4723	34803773.9	-3965	0	4000
13	1000	1000	1000	-1.092653	1098.907	-98.90735	9782.86323	-3965	0	11000
14	1000	1000	500	1.172431	1101.172	-601.1724	361408.291	-1965	0	9000
15	1000	1000	10	0.858393	0	10	100	5035	5035	1500
16	1000	1000	5	-0.440828	0	5	25	5035	5035	510
17	0	1000	10	0.059037	0	10	100	4535	4535	15
18	0	0	0	0.429099	0	0	0	4545	4545	15
19	0	0	0	1.069163	0	0	0	4550	4550	10
20	0	0	0	0.570354	0	0	0	4560	4560	0
21	0	0	0	-0.046724	0	0	0	4560	4560	0
22	0	0	0	-1.415247	0	0	0	4560	4560	0
23	0	0	0	1.789356	0	0	0	4560	4560	0
24	0	0	0	0.675543	0	0	0	4560	4560	0
25	0	0	0	0.219308	0	0	0	4560	4560	0
26	0	0	0	0.583485	0	0	0	4560	4560	0
27	0	0	0	-1.282306	0	0	0	4560	4560	0
28	0	0	0	-0.374978	0	0	0	4560	4560	0
29	0	0	0	0.94814	0	0	0	4560	4560	0
30	0	0	0	0.558781	0	0	0	4560	4560	0
31	0	0	0	1.851826	0	0	0	4560	4560	0
32	0	0	0	-0.802541	0	0	0	4560	4560	0
33	3000	0	0	0.583485	0	0	0	4560	4560	0
34	1600	3000	0	-1.282306	1538.718	-1538.718	2367652.14	1560	1560	0
35	0	1600	100	-0.374978	1699.625	-1599.625	2558800.21	-40	0	0
36	1000	0	100	0.94814	100.9481	-0.94814	0.8989693	-40	0	100
37	0	1000	100	0.558781	1100.559	-1000.559	1001117.87	-1040	0	200
38	762	0	0	1.851826	101.8518	-101.8518	10373.7944	-940	0	200
39	0	762	300	-0.802541	861.1975	-561.1975	314942.588	-1602	0	100
40	500	0	100	0.583485	100.5835	-0.583485	0.34045448	-1502	0	300
	mean of the disturbance			0.116081		91.479158	mean of the standard errors			
	std dev of the disturbance			0.927225						

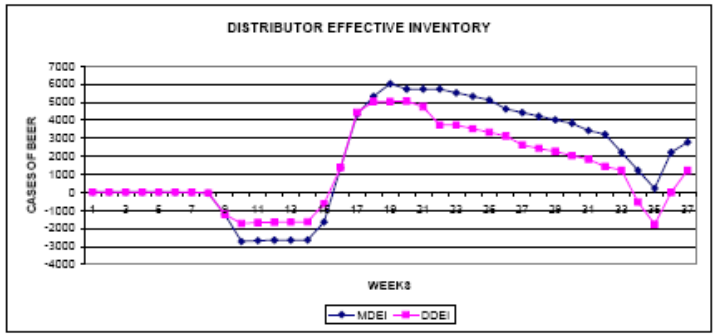
Σ (AO-Ot)2	45111683		constraints		
θ	1.00		>=0	<=1	
αs	1.00		>=0	<=1	
β	0.00		>=0	<=1	
S'	100.00		>=0	<=100	INT

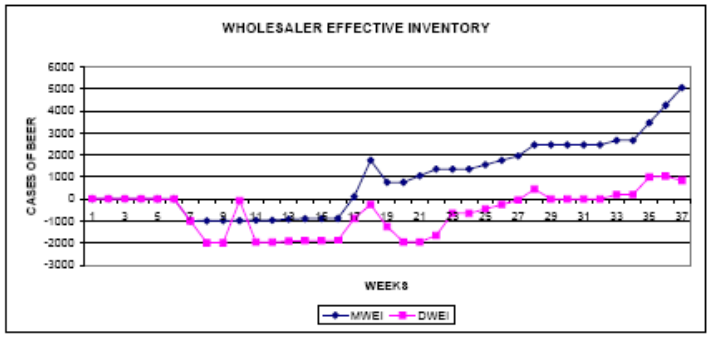
GRG NonLinear

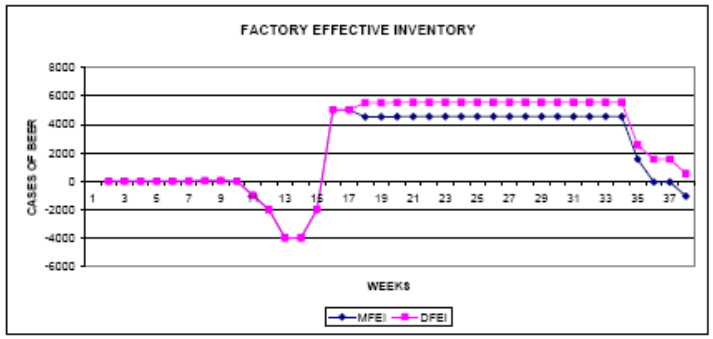
Incoming Orders:
IO = FIO
Expected Incoming Orders:
$eIO = \theta * IO_{(t-1)} + (1-\theta) * eIO_{(t-1)}$
Actual Orders:
AO = FPR
Disturbance:
normally distributed white noise
mean = 0
std dev = 1
Model Orders:
$Ot = MAX(0, eIO + \alpha s(s' - S_t - \beta SL_t) + \varepsilon$
Error Term:
$AO - O_t$
Squared errors:
$(AO - O_t)^2$
Effective Inventory:
EI = MFEI
Stock:
St = MAX(0,EI)
Supply Line:
SLt = FSL = FPD1+FPD2

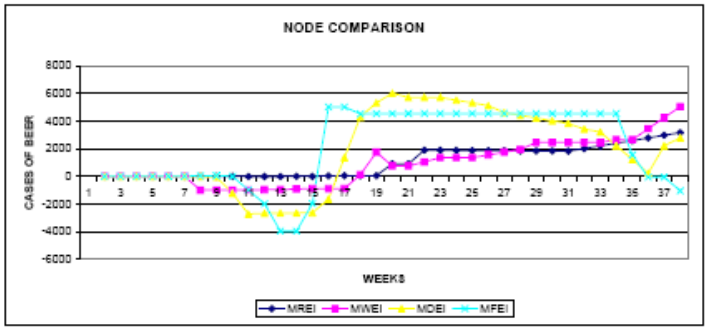
A&W ROOTBEER NO IT BEER GAME MODEL

MODEL CHARTS



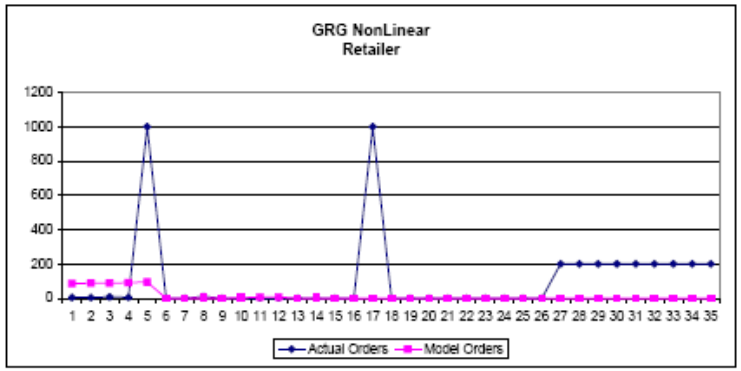


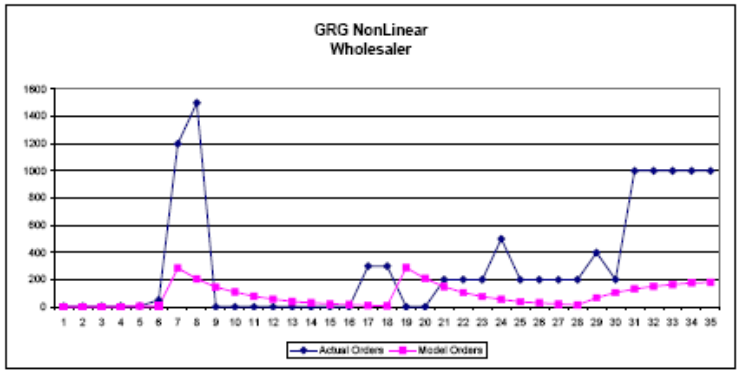


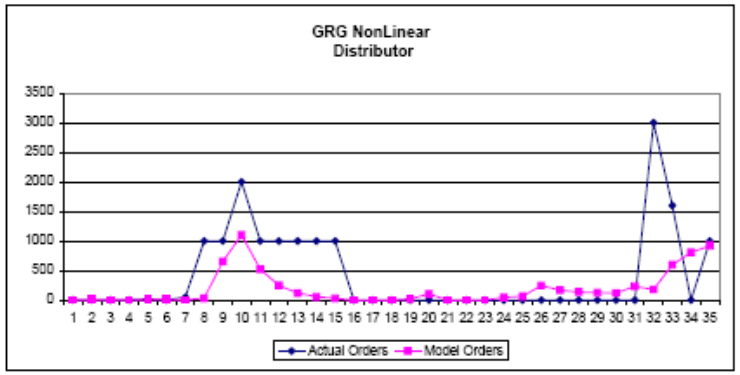


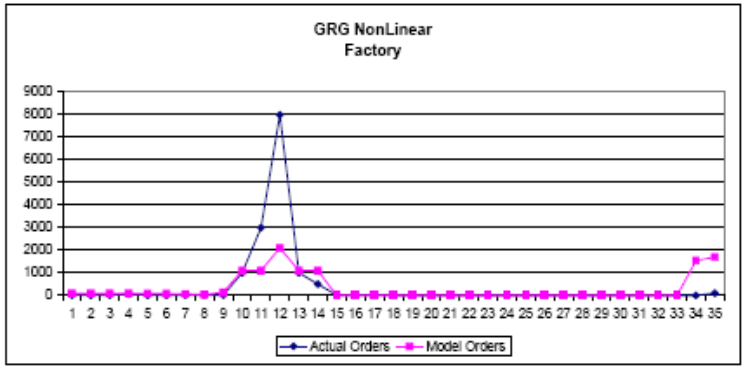
A&W ROOTBEER NO IT BEER GAME MODEL

ORDER CHARTS









A&W ROOTBEER NO 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

	A&W ROOTBEER	NO IT							A&W ROOTBEER	Retailer	NO IT					
	Team Costs	$ 169,370.50								Costs	$ 19,551.50					
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	8	8	16		16	4
5	8	16	4	8	0	8	8	8	*8*	28	1000	6	18		16	4
6	8	12	8	6	0	8	4	4	*4*	30	0	1000	1014		12	4
7	8	12	6	10	0	8	4	4	*4*	32	0	0	1006		10	5
8	8	10	10	5	0	8	2	2	*2*	33	10	0	1000		5	6
9	8	12	5	6	0	8	4	4	*4*	35	0	10	1000		6	9
10	8	9	6	9	0	8	1	1	*1*	35.5	0	0	995		9	20
11	8	7	9	20	1	7	0	-1	*-1*	36.5	0	0	989		20	2
12	8	9	20	2	0	9	0	0	*0*	36.5	0	0	980		2	50
13	8	20	2	50	0	8	12	12	*12*	42.5	0	0	960		50	20
14	8	14	50	20	0	8	6	6	*6*	45.5	0	0	958		20	5
15	8	56	20	5	0	8	48	48	*48*	69.5	0	0	908		5	10
16	8	68	5	10	0	8	60	60	*65*	99.5	0	0	888		10	1000
17	8	65	10	873	0	8	57	57	*67*	128	1000	0	883		1000	1634
18	8	67	873	0	0	8	59	59	*1059*	157.5	0	1000	1873		1761	0
19	8	932	0	1000	0	8	924	924	*1686*	619.5	0	0	1000		1761	0
20	8	924	1000	0	0	8	916	916	*1678*	1077.5	0	0	1000		761	300
21	8	1916	0	0	0	8	1908	1908	*1670*	2031.5	0	0	0		1061	300
22	8	1908	0	0	0	8	1900	1900	*1967*	2981.5	0	0	0		1361	0
23	8	1900	0	0	0	8	1892	1892	*2167*	3927.5	0	0	0		1361	0
24	8	1892	0	0	0	8	1884	1884	*3159*	4869.5	0	0	0		1361	200
25	8	1884	0	0	0	8	1876	1876	*3151*	5807.5	0	0	0		1561	200
26	8	1876	0	0	0	8	1868	1868	*3349*	6741.5	0	0	0		1761	200
27	8	1868	0	0	0	8	1860	1860	*3591*	7671.5	200	0	0		1961	500
28	8	1860	0	0	0	8	1852	1852	*3733*	8597.5	200	200	200		2461	200
29	8	1852	0	200	0	8	1844	1844	*3736*	9519.5	200	200	400		2661	200
30	8	1844	200	200	0	8	1836	1836	*4382*	10437.5	200	200	600		2661	200
31	8	2036	200	200	0	8	2028	2028	*4578*	11451.5	200	200	600		2661	200
32	8	2228	200	200	0	8	2220	2220	*4770*	12561.5	200	200	600		2661	400
33	8	2420	200	200	0	8	2412	2412	*4962*	13767.5	200	200	600		2861	200
34	8	2612	200	200	0	8	2604	2604	*5156*	15069.5	200	200	600		2861	1000
35	8	2804	200	200	0	8	2796	2796	*5348*	16467.5	200	200	600		3661	1000
36	8	2996	200	200	0	8	2988	2988	*5548*	17961.5	838	200	600		4461	1000
37	8	3188	200	200	0	8	3180	3180	*5732*	19551.5	1862	838	1238		5261	1000
38	8	3380	200	838	0	8	3372	3372	*5918*	21237.5	0	1862	2900		6061	1000
39	8	3572	838	1862	0	8	3564	3564	*6748*	23019.5	100	0	2700		6223	200
40	8	4402	1862	0	0	8	4394	4394	*8604*	25216.5	200	100	1962		4561	400

A&W ROOTBEER NO IT BEER GAME MODEL

MODEL WORKSHEET

STEP 3
Record your inventory or backlog

STEP 4
Advance the order slips and the brewery Brews

				A&W ROOTBEER Wholesaler				NO IT								A&W ROOTBEER
					Costs	$ 31,558.50										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	*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	5	4	12		16	4	4	0	12	12	*12*
5	4	0	8	8	*8*	28	6	5	13		16	4	2	0	12	12	*12*
6	5	0	6	6	*6*	31	50	6	15		16	2	2	0	11	11	*12*
7	6	990	0	-990	*-990*	1021	1200	50	61		13	2	20	0	7	7	*11*
8	9	985	0	-985	*-1985*	2006	1500	1200	1256		9	20	2	41	0	-41	*-34*
9	20	979	0	-979	*-1979*	2985	0	1500	2750		20	2	50	1221	0	-1221	*-1221*
10	2	980	0	-980	*-70*	3965	0	0	2741		2	50	20	2719	0	-2719	*-1719*
11	50	960	0	-960	*-1950*	4925	0	0	2721		50	20	5	2669	0	-2669	*-1669*
12	20	958	0	-958	*-1958*	5883	0	0	2719		20	5	10	2649	0	-2649	*-1642*
13	5	908	0	-908	*-1908*	6791	0	0	2669		5	10	1000	2644	0	-2644	*-1637*
14	10	888	0	-888	*-1888*	7679	0	0	2649		10	1000	3000	2634	0	-2634	*-1627*
15	1000	883	0	-883	*-1883*	8562	0	0	2644		1000	3000	2965	1634	0	-1634	*-627*
16	1634	873	0	-873	*-1873*	9435	0	0	2634		3000	2965	1000	0	1366	1366	*1377*
17	0	0	127	127	*-873*	9498.5	300	0	1634		4331	1000	1000	0	4331	4331	*4438*
18	0	0	1761	1761	*-246*	10379	300	300	300		5331	1000	0	0	5331	5331	*5038*
19	300	0	761	761	*-1246*	10759.5	0	300	600		6331	0	0	0	6031	6031	*5038*
20	300	0	761	761	*-1946*	11140	0	0	600		6031	0	0	0	5731	5731	*5074*
21	0	0	1061	1061	*-1946*	11670.5	200	0	300		5731	0	0	0	5731	5731	*4738*
22	0	0	1361	1361	*-1646*	12351	200	200	200		5731	0	0	0	5731	5731	*3738*
23	200	0	1361	1361	*-646*	13031.5	200	200	400		5731	0	0	0	5531	5531	*3738*
24	200	0	1361	1361	*-646*	13712	500	200	600		5531	0	0	0	5331	5331	*3538*
25	200	0	1561	1561	*-446*	14492.5	200	500	900		5331	0	0	0	5131	5131	*3338*
26	500	0	1761	1761	*-246*	15373	200	200	900		5131	0	0	0	4631	4631	*3128*
27	200	0	1961	1961	*-46*	16353.5	200	200	900		4631	0	0	0	4431	4431	*2638*
28	200	0	2461	2461	*454*	17584	200	200	600		4431	0	0	0	4231	4231	*2438*
29	200	0	2461	2461	*0*	18814.5	400	200	600		4231	0	0	0	4031	4031	*2278*
30	200	0	2461	2461	*0*	20045	200	400	800		4031	0	0	0	3831	3831	*2038*
31	400	0	2461	2461	*0*	21275.5	1000	200	800		3831	0	0	0	3431	3431	*1838*
32	200	0	2461	2461	*0*	22506	1000	1000	1600		3431	0	0	0	3231	3231	*1438*
33	1000	0	2661	2661	*200*	23836.5	1000	1000	2200		3231	0	0	0	2231	2231	*1238*
34	1000	0	2661	2661	*200*	25167	1000	1000	3000		2231	0	3000	0	1231	1231	*-524*
35	1000	0	3461	3461	*1000*	26897.5	1000	1000	3000		1231	3000	1560	0	231	231	*-1762*
36	1000	0	4261	4261	*1038*	29028	200	1000	3000		3231	1560	0	0	2231	2231	*0*
37	1000	0	5061	5061	*838*	31558.5	400	200	2200		3791	0	0	0	2791	2791	*1238*
38	200	0	5223	5223	*1832*	34170	200	400	1600		2791	0	100	0	2591	2591	*1038*
39	400	0	4361	4361	*1000*	36350.5	100	200	800		2591	100	100	0	2191	2191	*1638*
40	200	0	4561	4561	*1200*	38831	100	100	700		2291	100	100	0	2091	2091	*1438*

A&W ROOTBEER NO IT BEER GAME MODEL

MODEL WORKSHEET

STEP 5
Place and record your orders

	Distributor		NO IT								A&W ROOTBEER		Factory	NO IT		
	$ 59,638.50											Costs	$ 58,622.00			
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	2	4	12		16	4	4	0	12	12	*12*	18	10	8	
4	24	2	2	10		16	4	10	0	12	12	*12*	24	50	14	
5	30	20	2	8		16	10	50	0	14	14	*14*	31	8	60	
6	35.5	2	20	24		24	50	8	0	22	22	*26*	42	2	58	
7	39	50	2	24		72	8	2	0	52	52	*52*	68	10	10	
8	80	1000	50	72		60	2	10	0	58	58	*58*	97	5	12	
9	1301	1000	1000	1052		60	10	5	0	10	10	*10*	102	10	15	
10	4020	2000	1000	2050		20	5	10	980	0	-980	*-980*	1082	1000	15	
11	6689	1000	2000	4000		5	10	1000	1975	0	-1975	*-1975*	3057	3000	1010	
12	9338	1000	1000	4980		10	1000	3000	3965	0	-3965	*-3965*	7022	8000	4000	
13	11982	1000	1000	5975		1000	3000	8000	3965	0	-3965	*-3965*	10987	1000	11000	
14	14816	1000	1000	6965		3000	8000	1000	1965	0	-1965	*-1965*	12952	500	9000	
15	16250	1000	1000	6965		8000	1000	500	0	5035	5035	*5035*	15469.5	10	1500	
16	16933	0	1000	4965		6035	500	10	0	5035	5035	*5035*	17987	5	510	
17	19098.5	0	0	2000		5535	10	5	0	4535	4535	*5535*	20254.5	10	15	
18	21764	0	0	1000		4545	5	10	0	4545	4545	*5535*	22527	0	15	
19	24779.5	0	0	0		4550	10	0	0	4550	4550	*5550*	24802	0	10	
20	27645	0	0	0		4560	0	0	0	4560	4560	*5560*	27082	0	0	
21	30510.5	0	0	0		4560	0	0	0	4560	4560	*5560*	29362	0	0	
22	33376	0	0	0		4560	0	0	0	4560	4560	*5560*	31642	0	0	
23	36141.5	0	0	0		4560	0	0	0	4560	4560	*5560*	33922	0	0	
24	38807	0	0	0		4560	0	0	0	4560	4560	*5560*	36202	0	0	
25	41372.5	0	0	0		4560	0	0	0	4560	4560	*5560*	38482	0	0	
26	43688	0	0	0		4560	0	0	0	4560	4560	*5560*	40762	0	0	
27	45903.5	0	0	0		4560	0	0	0	4560	4560	*5560*	43042	0	0	
28	48019	0	0	0		4560	0	0	0	4560	4560	*5560*	45322	0	0	
29	50034.5	0	0	0		4560	0	0	0	4560	4560	*5560*	47602	0	0	
30	51950	0	0	0		4560	0	0	0	4560	4560	*5560*	49882	0	0	
31	53865.5	0	0	0		4560	0	0	0	4560	4560	*5560*	52162	0	0	
32	55281	3000	0	0		4560	0	0	0	4560	4560	*5560*	54442	0	0	
33	56396.5	1600	3000	3000		4560	0	0	0	4560	4560	*5560*	56722	0	0	
34	57012	0	1600	4600		4560	0	0	0	1560	1560	*2560*	57502	0	0	
35	57127.5	1000	0	4600		1560	0	0	40	0	-40	*1560*	57542	100	0	
36	58243	0	1000	2600		0	0	100	40	0	-40	*1560*	57582	100	100	
37	59838.5	762	0	1040		0	100	100	1040	0	-1040	*560*	58822	100	200	
38	60934	0	762	1802		100	100	100	940	0	-940	*660*	59562	0	200	
39	62029.5	500	0	1802		100	100	0	1802	0	-1802	*0*	61164	300	100	
40	63075	0	500	2202		100	0	300	1502	0	-1502	*98*	62666	100	300	

A&W ROOTBEER NO IT BEER GAME MODEL MODEL DATA

A&W ROOTBEER 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	8	12	4	12	2	12	10	12
4	6	12	5	12	2	12	50	12
5	1000	8	6	8	20	12	8	14
6	0	4	50	6	2	12	2	26
7	0	4	1200	-990	50	11	10	52
8	10	2	1500	-1985	1000	-34	5	58
9	0	4	0	-1979	1000	-1221	10	10
10	0	1	0	-70	2000	-1719	1000	-980
11	0	-1	0	-1950	1000	-1669	3000	-1975
12	0	0	0	-1958	1000	-1642	8000	-3965
13	0	12	0	-1908	1000	-1637	1000	-3965
14	0	6	0	-1888	1000	-1627	500	-1965
15	0	48	0	-1883	1000	-627	10	5035
16	0	65	0	-1873	0	1377	5	5035
17	1000	67	300	-873	0	4438	10	5535
18	0	1059	300	-246	0	5038	0	5535
19	0	1686	0	-1246	0	5038	0	5550
20	0	1678	0	-1946	0	5074	0	5560
21	0	1670	200	-1946	0	4738	0	5560
22	0	1967	200	-1646	0	3738	0	5560
23	0	2167	200	-646	0	3738	0	5560
24	0	3159	500	-646	0	3538	0	5560
25	0	3151	200	-446	0	3338	0	5560
26	0	3349	200	-246	0	3128	0	5560
27	200	3591	200	-46	0	2638	0	5560
28	200	3733	200	454	0	2438	0	5560
29	200	3736	400	0	0	2278	0	5560
30	200	4382	200	0	0	2038	0	5560
31	200	4578	1000	0	0	1838	0	5560
32	200	4770	1000	0	3000	1438	0	5560
33	200	4962	1000	200	1600	1238	0	5560
34	200	5156	1000	200	0	-524	0	2560
35	200	5348	1000	1000	1000	-1762	100	1560
36	838	5548	200	1038	0	0	100	1560
37	1862	5732	400	838	762	1238	100	560
38	0	5918	200	1832	0	1038	0	660
39	100	6748	100	1000	500	1638	300	0
40	200	8604	100	1200	0	1438	100	98

BIGBASS ALE 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	-0.630646	7.09485	-3.09485	9.57809775	12	12	12
2	4	0.20	4	-0.733741	7.190789	-3.190789	10.181134	12	12	12
3	4	0.39	8	0.02722	8.14088	-0.14088	0.01984705	12	12	12
4	4	0.57	4	-1.189107	6.740401	-2.740401	7.50979743	12	12	16
5	8	0.74	10	-0.815823	7.974985	2.025015	4.10068559	8	8	16
6	8	1.10	10	-0.954384	8.342454	1.6575461	2.74745913	4	4	22
7	8	1.44	12	1.161618	10.61985	1.3801461	1.90480313	4	4	24
8	8	1.77	14	-0.64803	9.099238	4.9007615	24.0174635	0	0	32
9	8	2.08	15	0.059688	9.40784	5.5921598	31.2722486	2	2	36
10	8	2.37	10	1.058211	9.900854	0.0991462	0.00982997	4	4	41
11	8	2.65	8	-0.189165	8.424822	-0.424822	0.18047407	8	8	39
12	8	2.92	8	1.493475	10.21014	-2.21014	4.88471795	10	10	37
13	8	3.17	8	-0.788551	8.364207	-0.364207	0.13264694	8	8	39
14	8	3.41	10	1.477576	10.52387	-0.523872	0.27444239	12	12	35
15	8	3.64	8	-0.418337	8.510937	-0.510937	0.26105643	14	14	35
16	8	3.86	6	-0.981807	8.491001	-2.491001	6.20508711	10	10	39
17	8	4.06	8	2.090469	11.78798	-3.787977	14.3487665	12	12	35
18	8	4.26	0	0.747362	10.88569	-10.88569	118.498347	9	9	38
19	8	4.45	0	-0.793374	9.687149	-9.687149	93.8408642	16	16	23
20	8	4.62	0	-0.058517	11.16325	-11.16325	124.618246	18	18	13
21	8	4.79	1	2.182299	14.54483	-13.54483	183.462535	15	15	8
22	8	4.95	10	-0.366727	12.79225	-2.792254	7.79668164	15	15	1
23	8	5.10	50	1.814292	15.59637	34.403631	1183.60981	7	7	11
24	8	5.25	10	-0.528759	10.05752	-0.057524	0.00330901	-1	0	61
25	8	5.38	10	-0.849672	9.054905	0.9450952	0.89320502	-8	0	70
26	8	5.51	10	-1.377354	8.657409	1.3425912	1.80256119	-8	0	70
27	8	5.64	10	1.195236	9.777705	1.2222951	1.49400537	36	36	30
28	8	5.76	0	-0.447227	6.907533	-6.907533	47.7140086	38	38	30
29	8	5.87	10	0.649161	8.68004	1.3199603	1.74229515	40	40	20
30	8	5.97	10	-1.494768	6.296994	3.7030064	13.7122567	42	42	20
31	8	6.07	10	0.749205	8.296568	1.7034316	2.90167937	44	44	20
32	8	6.17	10	1.205299	9.319877	0.6801233	0.46256767	36	36	30
33	8	6.26	10	0.05293	7.913322	2.0866781	4.35422528	38	38	30
34	8	6.35	10	0.150172	7.751846	2.248154	5.05419853	40	40	30
35	8	6.43	10	-0.771264	6.567386	3.4326144	11.7828418	42	42	30
36	9	6.51	10	0.630635	7.702168	2.2978315	5.28002961	44	44	30
37	10	6.63	10	0.139773	6.99006	3.0099398	9.0597375	46	46	30
38	11	6.80	10	-1.279609	5.393019	4.6069806	21.2242703	48	48	30
39	12	7.01	10	0.025043	6.561432	3.4385685	11.8237531	50	50	30
40	13	7.26	0	1.063048	7.502565	-7.502565	56.2883244	52	52	30
	mean of the disturbance			0.059913		-0.165022	mean of the standard errors			
	std dev of the disturbance			1.03527						

		constraints		
Σ (AO-Ot)2	2025.048			
θ	0.05	>=0	<=1	
αs	0.17	>=0	<=1	
β	0.53	>=0	<=1	
S'	63.07	>=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

BIGBASS ALE 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	1.464071	4	-0.421113	5.38796	-1.38796	1.92643273	12	12	12
2	4	2.392266	4	-0.287577	6.449691	-2.449691	6.00098483	12	12	12
3	4	2.980725	8	1.173116	8.498842	-0.498842	0.24884371	12	12	12
4	8	3.353798	8	0.545947	8.041116	-0.041116	0.00169051	12	12	16
5	4	5.05439	12	0.526294	11.22978	0.7702225	0.5932427	8	8	20
6	10	4.668465	8	0.39935	10.30965	-2.309648	5.33446493	8	8	28
7	10	6.619901	16	-0.345221	12.37219	3.6278114	13.1610154	6	6	28
8	12	7.857077	12	-0.976897	13.4261	-1.426103	2.03377094	4	4	36
9	14	9.37346	16	-0.008371	16.66487	-0.664874	0.44205709	2	2	38
10	15	11.06686	20	-1.541903	17.27315	2.7268481	7.4357008	-4	0	46
11	10	12.50646	24	0.545947	20.0879	3.9121048	15.3045641	-13	0	60
12	8	11.58905	20	0.526294	18.53994	1.4600566	2.13176514	-11	0	72
13	8	10.27539	16	0.39935	16.59027	-0.590267	0.3484148	-9	0	82
14	8	9.442559	16	-0.345221	14.40197	1.5980295	2.5536984	-13	0	94
15	10	8.914557	20	-0.976897	12.93685	7.063154	49.8881451	-11	0	100
16	8	9.311848	20	-0.008371	13.53905	6.4609515	41.7438945	-16	0	115
17	6	8.831689	12	-1.541903	11.27082	0.7291819	0.53170629	-9	0	120
18	8	7.795241	6	0.545947	12.2204	-6.220405	38.6934356	-5	0	122
19	0	7.870186	6	0.526294	12.22479	-6.22479	38.7480115	-8	0	123
20	0	4.989559	1	0.39935	1.026562	-0.026562	0.00070553	22	22	99
21	0	3.163292	1	-0.345221	0	1	1	82	82	60
22	1	2.005471	1	-0.976897	0	1	1	82	82	41
23	10	1.637451	1	-0.008371	0	1	1	101	101	22
24	50	4.698292	1	-1.541903	0	1	1	111	111	3
25	10	21.27952	4	0.545947	5.236726	-1.236726	1.52949209	82	82	3
26	10	17.15101	4	0.526294	4.786391	-0.786391	0.6184115	53	53	6
27	10	14.53362	8	0.39935	5.739869	2.2601306	5.10819025	44	44	9
28	10	12.87423	8	-0.345221	6.830105	1.1698946	1.36865338	35	35	16
29	0	11.82221	12	-0.536626	7.950078	4.0499221	16.4018693	29	29	20
30	10	7.495074	1	-0.722768	1.318183	-0.318183	0.1012406	33	33	28
31	10	8.411921	2	-0.449632	3.720197	-1.720197	2.95907702	31	31	21
32	10	8.993186	4	-0.814852	5.097364	-1.097364	1.20420817	29	29	15
33	10	9.361698	8	-0.400832	5.43148	2.5685198	6.59729414	31	31	7
34	10	9.595328	12	1.073483	10.63361	1.3663851	1.86700814	22	22	14
35	10	9.743445	20	0.60985	13.23173	6.768272	45.8095063	14	14	24
36	10	9.837349	10	1.847532	16.31582	-6.315821	39.8895912	8	8	40
37	10	9.896882	12	-0.722768	14.55892	-2.558915	6.54804598	6	6	42
38	10	9.934625	8	-0.449632	14.01412	-6.014118	36.1696149	8	8	42
39	10	9.958553	6	-0.814852	10.00534	-4.005337	16.0427212	18	18	30
40	10	9.973724	10	-0.400832	10.63816	-0.638157	0.4072441	18	18	26
	mean of the disturbance			-0.110085		0.6723534	mean of the standard errors			
	std dev of the disturbance			0.727282						

Σ (AO-Ot)2	413.7447		constraints	
θ	0.37		>=0	<=1
αs	0.43		>=0	<=1
β	0.12		>=0	<=1
S'	23.58		>=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

BIGBASS ALE 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	0.649626	4	-0.872852	4.626215	-0.626215	0.39214486	12	12	12
2	4	1.193748	4	0.576627	6.619816	-2.619816	6.86343699	12	12	12
3	4	1.649501	6	0.840341	7.339283	-1.339283	1.79367956	12	12	12
4	8	2.031238	8	-0.399647	6.481031	1.518969	2.30726694	12	12	14
5	8	3.000603	6	-0.733716	7.445515	-1.445515	2.08951301	8	8	18
6	12	3.812537	12	0.7466	10.06696	1.9330476	3.73667299	4	4	20
7	8	5.142234	10	-1.687145	9.292091	0.7079091	0.50113535	-2	0	26
8	16	5.606354	4	-1.471725	9.97163	-5.97163	35.6603663	-2	0	28
9	12	7.294349	10	-1.1478	11.98355	-1.983551	3.93447474	-12	0	26
10	16	8.058577	5	0.11308	14.00866	-9.008659	81.1559303	-12	0	24
11	20	9.348315	24	0.569681	15.755	8.2450019	67.9800564	-18	0	19
12	24	11.07822	30	-2.549727	14.36549	15.634507	244.437823	-34	0	39
13	20	13.1768	24	-1.45332	17.56048	6.4395201	41.4674195	-48	0	59
14	16	14.28493	24	-0.066303	20.05563	3.9443708	15.5580607	-63	0	78
15	16	14.56347	12	-1.444884	18.95559	-6.955586	48.3801816	-64	0	87
16	20	14.79677	12	0.339698	20.97347	-8.97347	80.5231646	-70	0	89
17	20	15.64181	24	-0.969416	20.50939	3.4906055	12.1843269	-85	0	96
18	12	16.34961	40	0.472842	22.65945	17.34055	300.694659	-75	0	90
19	6	15.6432	24	1.112354	22.59256	1.4074414	1.98089139	-47	0	90
20	6	14.07708	12	-1.564503	18.34958	-6.349583	40.317209	-33	0	94
21	1	12.76531	12	1.139156	19.74147	-7.741472	59.9303822	-19	0	86
22	1	10.85455	12	0.467361	14.69001	-2.690011	7.23615847	30	30	48
23	1	9.254109	0	0.764231	11.8228	-11.8228	139.778602	49	49	40
24	1	7.913588	12	-0.065832	8.417765	3.5822347	12.8324058	64	64	24
25	1	6.790777	10	-1.687145	4.768377	5.2316228	27.3698776	75	75	24
26	4	5.850317	10	-1.471725	3.138073	6.861927	47.0860416	86	86	22
27	4	5.549814	24	-1.1478	3.490682	20.509318	420.632109	82	82	32
28	8	5.298114	10	0.11308	3.841488	6.1585119	37.927269	90	90	44
29	8	5.736918	1	0.569681	4.572299	-3.572299	12.7613231	92	92	44
30	12	6.104457	2	-2.549727	1.655837	0.3441627	0.11844799	94	94	35
31	1	7.061931	1	-1.45332	2.722157	-1.722157	2.96582448	106	106	13
32	2	6.077434	1	-0.292763	2.157547	-1.157547	1.33991426	115	115	4
33	4	5.415233	0	-0.903769	0.966636	-0.966636	0.93438438	114	114	4
34	8	5.18539	0	2.309145	4.1143	-4.1143	16.9274668	112	112	2
35	12	5.642501	0	-1.276827	1.561516	-1.561516	2.43833363	105	105	1
36	20	6.675	1	-0.88612	3.889987	-2.889987	8.35202394	94	94	0
37	10	8.839065	5	0.100495	8.686602	-3.686602	13.591037	74	74	1
38	12	9.027609	5	-0.05192	9.545698	-4.545698	20.6633701	64	64	6
39	8	9.510344	5	0.052289	11.1202	-6.120204	37.4569005	52	52	11
40	6	9.265055	5	-0.903769	10.49493	-5.494933	30.1942932	45	45	15
	mean of the disturbance			-0.430745		0.6493615	mean of the standard errors			
	std dev of the disturbance			1.139507						

Σ (AO-Ot)2	1892.495
θ	0.16
αs	0.08
β	0.00
S'	70.93

GRG NonLinear

constraints		
>=0	<=1	
>=0	<=1	
>=0	<=1	
>=0	<=100	INT

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

BIGBASS ALE 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	1.404799	4	-0.010651	3.62431	0.37569	0.14114295	12	12	8
2	4	2.316233	4	-1.890095	2.6563	1.3437003	1.80553058	12	12	8
3	4	2.907571	4	-1.827366	3.310368	0.689632	0.47559224	12	12	8
4	6	3.291232	4	-0.178461	5.342934	-1.342934	1.80347121	12	12	8
5	8	4.24255	8	1.171374	8.054958	-0.054958	0.00302039	10	10	8
6	6	5.562166	10	1.063818	9.808989	0.1910108	0.03648514	6	6	12
7	12	5.715933	10	0.547194	9.437348	0.5626522	0.31657755	4	4	18
8	10	7.922895	10	-0.010651	11.76832	-1.768322	3.12696144	0	0	20
9	4	8.652374	10	0.716779	13.22523	-3.22523	10.402108	0	0	20
10	10	7.018462	4	1.407921	11.04985	-7.049846	49.7003317	6	6	20
11	5	8.065577	10	-0.972268	10.13643	-0.136429	0.0186128	6	6	14
12	24	6.988947	5	-0.617069	8.38782	-3.38782	11.4773265	11	11	14
13	30	12.96322	30	-0.186536	16.98248	13.017522	169.455869	-9	0	15
14	24	18.94653	40	2.163618	23.91709	16.082911	258.660023	-29	0	35
15	24	20.72131	20	0.37323	21.45348	-1.453483	2.11261155	-48	0	70
16	12	21.87278	20	1.996316	24.92747	-4.92747	24.2799626	-42	0	60
17	12	18.40547	50	-0.610905	20.25178	29.748216	884.956364	-14	0	40
18	24	16.15587	20	0.932066	17.44688	2.5531238	6.5184409	-6	0	70
19	40	18.91072	20	-0.766057	18.50361	1.4963899	2.23918288	-10	0	70
20	24	26.31727	10	-0.23376	28.54074	-18.54074	343.758872	0	0	40
21	12	25.50345	10	-0.804417	27.85568	-17.85568	318.825318	-4	0	30
22	12	20.76104	20	-0.957107	22.83827	-2.838268	8.05576624	4	4	20
23	12	17.68417	20	1.090767	21.52071	-1.520712	2.31256373	2	2	30
24	0	15.68789	10	-0.622917	17.52219	-7.522195	56.5834111	0	0	40
25	12	10.17831	10	0.036713	9.262958	0.7370421	0.5432311	20	20	30
26	10	10.81808	10	1.06891	9.990875	0.0091253	8.327E-05	28	28	20
27	10	10.53077	10	-1.550528	7.084125	2.9158747	8.50232517	28	28	20
28	24	10.34437	10	1.388228	9.836474	0.1635257	0.02674067	28	28	20
29	10	15.14022	20	-0.812533	15.30767	4.6923335	22.0179941	14	14	20
30	1	13.33498	10	-0.407059	13.20847	-3.208469	10.2942745	14	14	30
31	2	9.002937	10	-0.392509	7.042059	2.9579409	8.74941419	23	23	30
32	1	6.543507	0	0.728624	2.705348	-2.705348	7.3189081	41	41	20
33	1	4.596629	0	-0.677085	0	0	0	50	50	10
34	0	3.333494	0	-1.067143	0	0	0	59	59	0
35	0	2.162772	0	-0.744548	0	0	0	59	59	0
36	0	1.403207	0	1.286577	0	0	0	59	59	0
37	1	0.910401	0	0.359097	0	0	0	59	59	0
38	5	0.941868	0	0.212595	0	0	0	58	58	0
39	5	2.367083	0	0.580896	0	0	0	53	53	0
40	5	3.291763	0	0.491378	0	0	0	48	48	0
	mean of the disturbance			-0.018689		-3.45E-05	mean of the standard errors			
	std dev of the disturbance			1.036958						

Σ (AO-Ot)2	2214.519		constraints		
θ	0.35		>=0	<=1	
αs	0.21		>=0	<=1	
β	0.34		>=0	<=1	
S'	25.58		>=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:

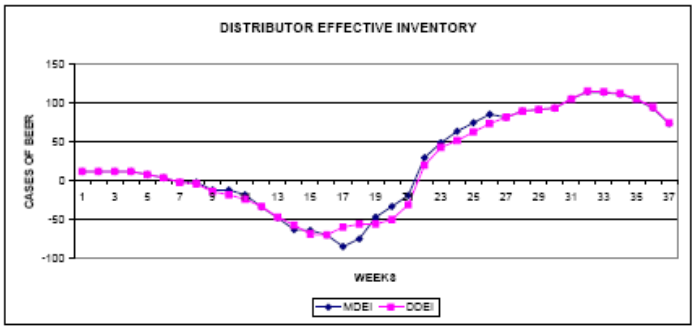
St = MAX(0,EI)

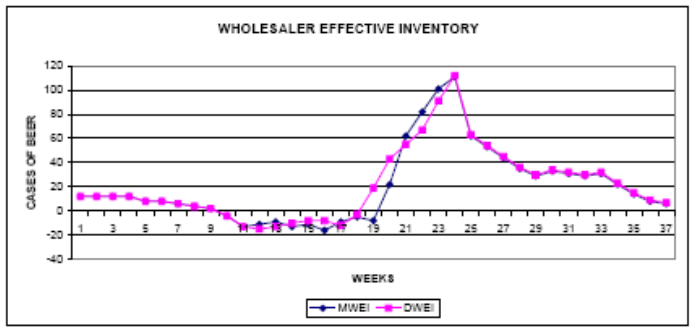
Supply Line:

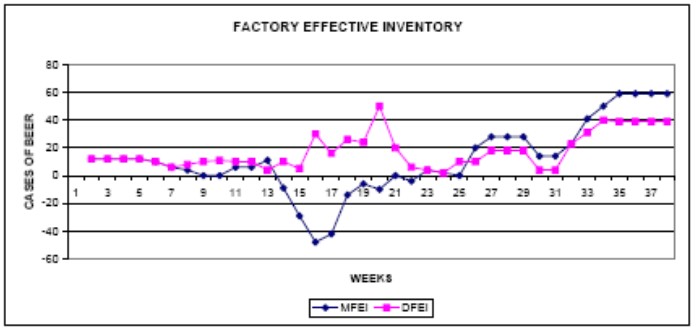
SLt = FSL = FPD1+FPD2

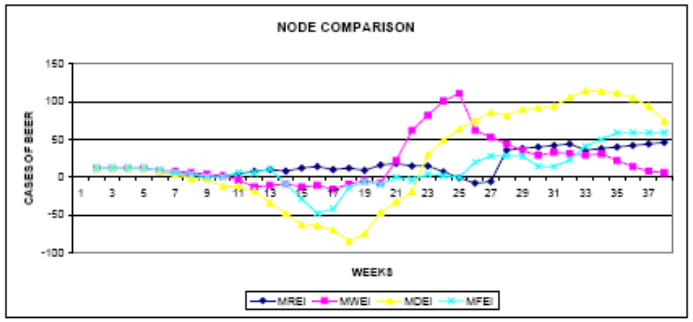
BIGBASS ALE BEER GAME MODEL

MODEL CHARTS



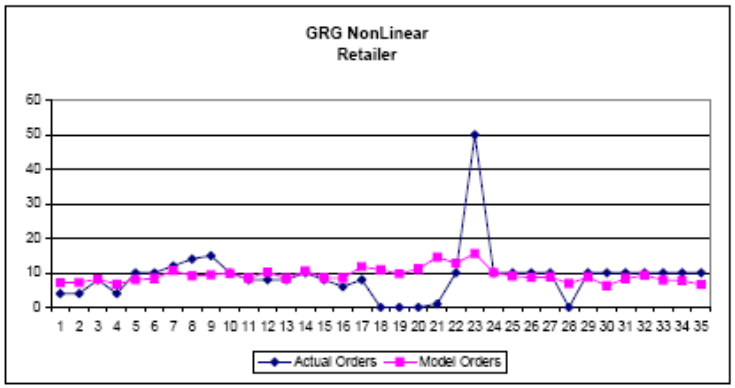


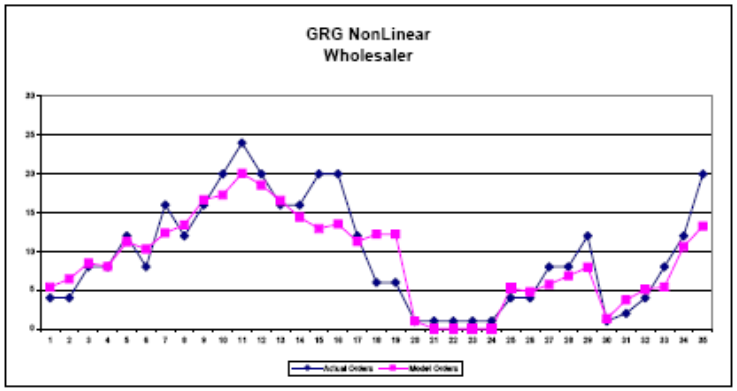


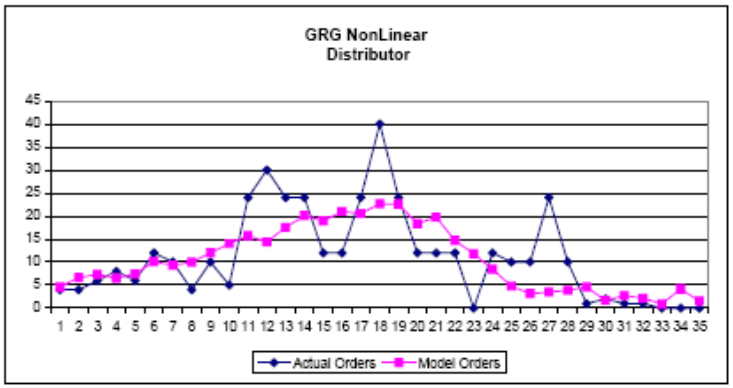


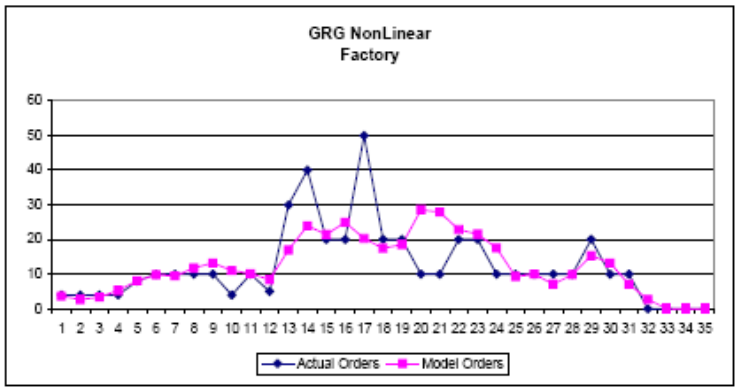
BIGBASS ALE BEER GAME MODEL

ORDER CHARTS









BIGBASS ALE 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

	BIG BASS ALE	NO IT							BIG BASS ALE	Retailer	NO IT					
	Team Costs	$ 2,888.00							Costs	$ 425.00						
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	4	8	16		16	4
5	8	16	4	8	0	8	8	8	*8*	28	10	4	16		16	4
6	8	12	8	4	0	8	4	4	*4*	30	10	10	22		12	8
7	8	12	4	10	0	8	4	4	*4*	32	12	10	24		16	8
8	8	8	10	10	0	8	0	0	*0*	32	14	12	32		14	10
9	8	10	10	12	0	8	2	2	*2*	33	15	14	36		14	8
10	8	12	12	10	0	8	4	4	*4*	35	10	15	41		10	6
11	8	16	10	6	0	8	8	8	*8*	39	8	10	39		6	12
12	8	18	6	12	0	8	10	10	*10*	44	8	8	37		12	10
13	8	16	12	10	0	8	8	8	*8*	48	8	8	39		10	4
14	8	20	10	4	0	8	12	12	*8*	54	10	8	35		4	10
15	8	22	4	10	0	8	14	14	*10*	61	8	10	35		10	5
16	8	18	10	5	0	8	10	10	*13*	66	6	8	39		5	15
17	8	20	5	15	0	8	12	12	*15*	72	8	6	35		15	10
18	8	17	15	10	0	8	9	9	*17*	76.5	0	8	38		10	5
19	8	24	10	5	0	8	16	16	*13*	84.5	0	0	23		5	30
20	8	26	5	8	0	8	18	18	*31*	93.5	0	0	13		30	40
21	8	23	8	0	0	8	15	15	*23*	101	1	0	8		62	20
22	8	23	0	0	0	8	15	15	*15*	108.5	10	1	1		82	20
23	8	15	0	1	0	8	7	7	*7*	112	50	10	11		102	20
24	8	7	1	10	1	7	0	-1	*-1*	113	10	50	61		121	1
25	8	1	10	50	8	1	0	-8	*-8*	121	10	10	70		112	1
26	8	10	50	10	6	10	0	-6	*-6*	127	10	10	70		63	1
27	8	50	10	10	0	14	36	36	*36*	145	10	10	30		54	1
28	8	46	10	10	0	8	38	38	*38*	164	0	10	30		45	4
29	8	48	10	10	0	8	40	40	*40*	184	10	0	20		39	4
30	8	50	10	0	0	8	42	42	*42*	205	10	10	20		33	8
31	8	52	0	10	0	8	44	44	*44*	227	10	10	20		41	8
32	8	44	10	10	0	8	36	36	*36*	245	10	10	30		39	12
33	8	46	10	10	0	8	38	38	*38*	264	10	10	30		41	1
34	8	48	10	10	0	8	40	40	*40*	284	10	10	30		32	2
35	8	50	10	10	0	8	42	42	*42*	305	10	10	30		24	4
36	8	52	10	10	0	8	44	44	*44*	327	10	10	30		18	8
37	8	54	10	10	0	8	46	46	*46*	350	10	10	30		16	12
38	8	56	10	10	0	8	48	48	*48*	374	10	10	30		18	20
39	8	58	10	10	0	8	50	50	*50*	399	10	10	30		28	10
40	8	60	10	10	0	8	52	52	*52*	425	0	10	30		28	12

BIGBASS ALE BEER GAME MODEL

MODEL WORKSHEET

STEP 3
Record your inventory or backlog

STEP 4
Advance the order slips and the brewery Brews

BIG BASS ALE Wholesaler — NO IT — BIG BASS ALE

Costs $ 546.50 — 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	*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	8	4	12	16	4	4	0	12	12	*12*
4	4	0	12	12	*12*	24	8	8	16	16	4	4	0	12	12	*12*
5	8	0	8	8	*8*	28	12	8	20	16	4	6	0	8	8	*8*
6	8	0	8	8	*8*	32	8	12	28	12	6	8	0	4	4	*4*
7	10	0	6	6	*6*	36	16	8	28	10	8	6	2	0	-2	*-2*
8	8	0	4	4	*4*	37	12	16	36	8	6	12	2	0	-2	*-4*
9	6	0	2	2	*2*	38	16	12	38	6	12	10	12	0	-12	*-14*
10	12	4	0	-4	*-4*	42	20	16	46	12	10	4	12	0	-12	*-18*
11	10	13	0	-13	*-13*	55	24	20	60	10	4	10	18	0	-18	*-24*
12	4	11	0	-11	*-15*	66	20	24	72	4	10	5	34	0	-34	*-33*
13	10	9	0	-9	*-13*	75	16	20	82	10	5	15	48	0	-48	*-47*
14	5	13	0	-13	*-10*	88	16	16	94	5	15	10	63	0	-63	*-57*
15	15	11	0	-11	*-8*	99	20	16	100	15	10	5	64	0	-64	*-69*
16	10	16	0	-16	*-8*	115	20	20	115	10	5	30	70	0	-70	*-70*
17	5	9	0	-9	*-12*	124	12	20	120	5	30	40	85	0	-85	*-60*
18	30	5	0	-5	*-3*	129	6	12	122	30	40	20	75	0	-75	*-56*
19	40	9	0	-9	*19*	137	6	6	123	40	20	20	47	0	-47	*-56*
20	20	0	22	22	*43*	148	1	6	99	20	20	50	33	0	-33	*-50*
21	20	0	62	62	*55*	179	1	1	60	20	50	20	19	0	-19	*-31*
22	20	0	82	82	*67*	220	1	1	41	50	20	16	0	30	30	*20*
23	1	0	101	101	*91*	270.5	1	1	22	50	16	12	0	49	49	*43*
24	1	0	111	111	*112*	326	1	1	3	65	12	12	0	64	64	*52*
25	1	0	62	62	*63*	357	4	1	3	76	12	0	0	75	75	*63*
26	1	0	53	53	*54*	383.5	4	4	6	87	0	12	0	86	86	*74*
27	4	0	44	44	*45*	405.5	8	4	9	86	12	10	0	82	82	*82*
28	4	0	35	35	*36*	423	8	8	16	94	10	10	0	90	90	*90*
29	8	0	29	29	*30*	437.5	12	8	20	100	10	24	0	92	92	*92*
30	8	0	33	33	*34*	454	1	12	28	102	24	10	0	94	94	*94*
31	12	0	31	31	*32*	469.5	2	1	21	118	10	1	0	108	106	*106*
32	1	0	29	29	*30*	484	4	2	15	116	1	2	0	115	115	*116*
33	2	0	31	31	*32*	499.5	8	4	7	116	2	1	0	114	114	*115*
34	4	0	22	22	*23*	510.5	12	8	14	116	1	1	0	112	112	*113*
35	8	0	14	14	*15*	517.5	20	12	24	113	1	0	0	105	105	*106*
36	12	0	8	8	*9*	521.5	10	20	40	106	0	0	0	94	94	*95*
37	20	0	6	6	*7*	524.5	12	10	42	94	0	0	0	74	74	*75*
38	10	0	8	8	*9*	528.5	8	12	42	74	0	1	0	64	64	*65*
39	12	0	18	18	*19*	537.5	6	8	30	64	1	5	0	52	52	*53*
40	8	0	18	18	*19*	546.5	10	6	26	53	5	5	0	45	45	*46*

BIGBASS ALE BEER GAME MODEL

MODEL WORKSHEET

STEP 5
Place and record your orders

	Distributor		NO IT								BIG BASS ALE	Factory	NO IT		
	$ 1,385.50										Costs	$ 531.00			
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	6	4	12		16	4	4	0	12	12	*12*	18	4	8
4	24	8	6	14		16	4	4	0	12	12	*12*	24	4	8
5	28	6	8	18		16	4	4	0	10	10	*10*	29	8	8
6	30	12	6	20		14	4	8	0	6	6	*6*	32	10	12
7	32	10	12	26		10	8	10	0	4	4	*8*	34	10	18
8	34	4	10	28		12	10	10	0	0	0	*10*	34	10	20
9	46	10	4	26		10	10	10	0	0	0	*11*	34	10	20
10	58	5	10	24		10	10	10	0	6	6	*10*	37	4	20
11	76	24	5	19		16	10	4	0	6	6	*10*	40	10	14
12	110	30	24	39		16	4	10	0	11	11	*4*	45.5	5	14
13	158	24	30	59		15	10	5	9	0	-9	*10*	54.5	30	15
14	221	24	24	78		10	5	30	29	0	-29	*5*	83.5	40	35
15	285	12	24	87		5	30	40	48	0	-48	*30*	131.5	20	70
16	355	12	12	89		30	40	20	42	0	-42	*16*	173.5	20	60
17	440	24	12	96		40	20	20	14	0	-14	*26*	187.5	50	40
18	515	40	24	90		20	20	50	6	0	-6	*24*	193.5	20	70
19	562	24	40	90		20	50	20	10	0	-10	*50*	203.5	20	70
20	595	12	24	94		50	20	20	0	0	0	*20*	203.5	10	40
21	614	12	12	86		20	20	10	4	0	-4	*6*	207.5	10	30
22	629	12	12	48		20	10	10	0	4	4	*4*	209.5	20	20
23	653.5	0	12	40		14	10	20	0	2	2	*2*	210.5	20	30
24	685.5	12	0	24		12	20	20	0	0	0	*10*	210.5	10	40
25	723	10	12	24		20	20	10	0	20	20	*10*	220.5	10	30
26	766	10	10	22		40	10	10	0	28	28	*18*	234.5	10	20
27	807	24	10	32		38	10	10	0	28	28	*18*	248.5	10	20
28	852	10	24	44		38	10	10	0	28	28	*18*	262.5	10	20
29	898	1	10	44		38	10	10	0	14	14	*4*	269.5	20	20
30	945	2	1	35		24	10	20	0	14	14	*4*	276.5	10	30
31	998	1	2	13		24	20	10	0	23	23	*23*	288	10	30
32	1055.5	1	1	4		43	10	10	0	41	41	*31*	308.5	0	20
33	1112.5	0	1	4		51	10	0	0	50	50	*40*	333.5	0	10
34	1168.5	0	0	2		60	0	0	0	59	59	*39*	363	0	0
35	1221	0	0	1		59	0	0	0	59	59	*39*	392.5	0	0
36	1268	1	0	0		59	0	0	0	59	59	*39*	422	0	0
37	1305	5	1	1		59	0	0	0	59	59	*39*	451.5	0	0
38	1337	5	5	6		59	0	0	0	58	58	*38*	480.5	0	0
39	1363	5	5	11		58	0	0	0	53	53	*33*	507	0	0
40	1385.5	5	5	15		53	0	0	0	48	48	*28*	531	0	0

BIGBASS ALE BEER GAME MODEL

MODEL DATA

BIG BASS ALE								
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	8	12	8	12	6	12	4	12
4	4	12	8	12	8	12	4	12
5	10	8	12	8	6	8	8	10
6	10	4	8	8	12	4	10	6
7	12	4	16	6	10	-2	10	8
8	14	0	12	4	4	-4	10	10
9	15	2	16	2	10	-14	10	11
10	10	4	20	-4	5	-18	4	10
11	8	8	24	-13	24	-24	10	10
12	8	10	20	-15	30	-33	5	4
13	8	8	16	-13	24	-47	30	10
14	10	8	16	-10	24	-57	40	5
15	8	10	20	-8	12	-69	20	30
16	6	13	20	-8	12	-70	20	16
17	8	15	12	-12	24	-60	50	26
18	0	17	6	-3	40	-56	20	24
19	0	13	6	19	24	-56	20	50
20	0	31	1	43	12	-50	10	20
21	1	23	1	55	12	-31	10	6
22	10	15	1	67	12	20	20	4
23	50	7	1	91	0	43	20	2
24	10	-1	1	112	12	52	10	10
25	10	-8	4	63	10	63	10	10
26	10	-6	4	54	10	74	10	18
27	10	36	8	45	24	82	10	18
28	0	38	8	36	10	90	10	18
29	10	40	12	30	1	92	20	4
30	10	42	1	34	2	94	10	4
31	10	44	2	32	1	106	10	23
32	10	36	4	30	1	116	0	31
33	10	38	8	32	0	115	0	40
34	10	40	12	23	0	113	0	39
35	10	42	20	15	0	106	0	39
36	10	44	10	9	1	95	0	39
37	10	46	12	7	5	75	0	39
38	10	48	8	9	5	65	0	38
39	10	50	6	19	5	53	0	33
40	0	52	10	19	5	46	0	28

BIRA 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	-0.85059	3.772764	0.2272356	0.05163603	12	12	12
2	4	0.35	4	0.012569	4.981587	-0.981587	0.96351264	12	12	12
3	4	0.66	4	-1.298985	3.985824	0.0141756	0.00020095	12	12	12
4	4	0.95	4	-0.647086	4.926226	-0.926226	0.85789518	12	12	12
5	8	1.21	8	-0.038857	8.61726	-0.61726	0.38100961	8	8	12
6	8	1.80	8	1.267232	13.32904	-5.32904	28.3986643	4	4	16
7	8	2.34	8	-0.133076	15.28374	-7.283743	53.0529186	0	0	20
8	8	2.83	8	-0.85059	15.05571	-7.055708	49.7830178	-4	0	24
9	8	3.27	8	0.012569	16.36805	-8.368048	69.9907586	-4	0	24
10	8	3.66	8	-1.298985	15.46303	-7.46303	55.6968206	-4	0	24
11	8	4.05	8	-0.647086	16.48816	-8.488162	72.0488981	-8	0	28
12	8	4.40	8	-0.038857	17.43737	-9.43737	89.0639604	-12	0	32
13	8	4.71	8	1.267232	19.05497	-11.05497	122.21243	-14	0	34
14	8	4.99	8	-0.133076	17.93926	-9.939259	98.7888693	-14	0	34
15	8	5.25	8	-0.85059	17.48175	-9.481746	89.9034979	-16	0	36
16	8	5.49	12	0.012569	18.58244	-6.582438	43.328485	-23	0	43
17	8	5.71	17	-1.298985	17.48789	-0.487889	0.23803574	-29	0	53
18	8	5.90	23	-0.647086	18.33804	4.6619585	21.7338573	-32	0	65
19	8	6.09	26	-0.038857	19.12739	6.8726089	47.2327535	-30	0	78
20	8	6.25	26	1.267232	20.59895	5.4010506	29.1713472	-37	0	103
21	8	6.40	34	-0.133076	19.34981	14.650188	214.628021	-45	0	129
22	8	6.54	40	-0.343729	19.27727	20.722734	429.431701	-51	0	161
23	8	6.67	48	0.657708	20.40487	27.595125	761.490938	-49	0	191
24	8	6.78	36	0.521788	20.38422	15.615778	243.86246	-37	0	219
25	8	6.89	34	-0.497391	19.47035	14.529648	211.110674	-35	0	245
26	8	6.98	22	-0.615993	19.44796	2.5520423	6.51291978	-13	0	249
27	8	7.07	20	-0.708258	19.44359	0.5564135	0.30959597	-21	0	271
28	8	7.15	8	-0.351856	19.88029	-11.88029	141.141211	-19	0	281
29	8	7.22	8	0.68355	18.87463	-10.87463	118.257529	3	3	259
30	8	7.29	8	-0.340646	9.459751	-1.459751	2.13087396	15	15	247
31	8	7.35	8	-1.306155	3.621812	4.3781878	19.1686286	22	22	240
32	8	7.41	8	-0.579732	0	8	64	34	34	228
33	8	7.46	8	0.118203	0	8	64	106	106	156
34	8	7.51	0	0.298385	0	0	0	238	238	24
35	8	7.55	0	0.702716	0	0	0	238	238	16
36	9	7.59	0	0.127737	0	0	0	238	238	8
37	10	7.71	0	-1.110225	0	0	0	238	238	0
38	11	7.91	0	-0.885453	0	0	0	230	230	0
39	12	8.18	0	-0.343729	0	0	0	222	222	0
40	13	8.51	0	0.657708	0	0	0	214	214	0
	mean of the disturbance			-0.19508		0.4590857	mean of the standard errors			
	std dev of the disturbance			0.713938						

Σ (AO-Ot)2	3148.933		constraints		
θ	0.09		>=0	<=1	
αs	0.70		>=0	<=1	
β	0.00		>=0	<=1	
S'	18.56		>=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

BIRA 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	4	4	-0.962895	8.531572	-4.531572	20.5351455	12	12	12
2	4	4	4	0.556882	10.05135	-6.05135	36.6188319	12	12	12
3	4	4	4	-0.922765	8.571702	-4.571702	20.9004629	12	12	12
4	4	4	4	0.517852	10.01232	-6.01232	36.147991	12	12	12
5	4	4	0	0.022157	9.516625	-9.516625	90.5661476	12	12	12
6	8	4	4	-0.500268	8.9942	-4.9942	24.9420303	12	12	8
7	8	8	6	-0.067422	17.42705	-11.42705	130.577358	8	8	8
8	8	8	8	-0.989983	20.50448	-12.50448	156.362137	4	4	10
9	8	8	10	0.37289	25.86736	-15.86736	251.773019	-4	0	18
10	8	8	8	-0.399143	25.09532	-17.09532	292.250122	-8	0	24
11	8	8	20	-1.52272	23.97175	-3.971747	15.774774	-10	0	26
12	8	8	18	-0.695611	24.79886	-6.798856	46.2244438	-10	0	38
13	8	8	16	-0.234314	25.26015	-9.260153	85.7504329	-12	0	50
14	8	8	12	-0.776667	24.7178	-12.7178	161.742457	-19	0	65
15	8	8	20	-2.234335	23.26013	-3.260133	10.6284663	-25	0	75
16	8	8	0	-1.102943	24.39152	-24.39152	594.946489	-28	0	90
17	12	8	30	-1.843984	23.65048	6.3495166	40.3163609	-26	0	80
18	17	12	40	-0.563608	28.93086	11.069141	122.52588	-37	0	109
19	23	17	40	-0.086511	34.40796	5.592044	31.2709562	-54	0	149
20	26	23	40	-0.971991	39.52248	0.4776233	0.22802849	-75	0	187
21	26	26	30	-1.655518	41.83895	-11.83895	140.160724	-91	0	217
22	34	26	30	-0.256277	43.23819	-13.23819	175.249678	-97	0	227
23	40	34	90	-0.888009	50.60646	39.393542	1551.85113	-121	0	247
24	48	40	100	-0.952231	56.54224	43.457764	1888.57721	-131	0	307
25	36	48	100	-1.66528	63.92919	36.170812	1308.32767	-179	0	407
26	34	36	0	-1.286763	52.2077	-52.2077	2725.64442	-205	0	497
27	22	34	50	1.437968	52.93244	-2.932436	8.59917954	-209	0	467
28	20	22	100	0.544036	40.0385	59.961496	3595.38101	-211	0	497
29	8	20	100	0.075745	37.57021	62.429787	3897.47832	-216	0	582
30	8	8	20	0.808346	28.30281	-8.302813	39.7254514	-204	0	662
31	8	8	0	-0.085129	25.40934	-25.40934	645.634477	-132	0	602
32	8	8	0	0.85955	0	0	0	60	60	402
33	8	8	8	-0.198116	0	8	64	152	152	302
34	8	8	0	-1.102943	0	0	0	344	344	110
35	0	8	0	0.719802	0	0	0	438	438	8
36	0	0	0	-0.498943	0	0	0	438	438	8
37	0	0	0	-1.505276	0	0	0	446	446	0
38	0	0	0	0.445437	0	0	0	446	446	0
39	0	0	8	-2.279567	0	8	64	446	446	0
40	0	0	0	-1.463746	0	0	0	446	446	8
	mean of the disturbance			-0.458577		0.2285714	mean of the standard errors			
	std dev of the disturbance			0.863363						

Σ (AO-Ot)2	18274.71		constraints		
θ	1.00		>=0	<=1	
αs	1.00		>=0	<=1	
β	0.00		>=0	<=1	
S'	17.49		>=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

BIRA 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	-0.949545	15.35685	-11.35685	128.978093	12	12	12
2	4	4	4	-1.043583	15.26281	-11.26281	126.850995	12	12	12
3	4	4	2	0.98197	17.28837	-15.28837	233.734175	12	12	12
4	4	4	3	0.08998	16.39638	-13.39638	179.462932	12	12	10
5	4	4	2	-0.098569	16.20783	-14.20783	201.862394	12	12	9
6	0	4	3	0.203863	16.51026	-13.51026	182.527138	12	12	7
7	4	0	2	-0.969328	9.33707	-7.33707	53.8325911	14	14	8
8	6	4	1	-0.899462	14.40693	-13.40693	179.745905	13	13	7
9	8	6	2	-0.86262	20.44378	-18.44378	340.172932	9	9	6
10	10	8	5	-0.083088	28.22331	-23.22331	539.32208	4	4	5
11	8	10	10	0.364203	34.6706	-24.6706	608.6385	-4	0	8
12	20	8	10	0.132532	32.43893	-22.43893	503.505555	-11	0	17
13	18	20	25	-0.925719	43.38068	-18.38068	337.849348	-29	0	25
14	16	18	50	2.300052	44.60645	5.3935503	29.0903844	-42	0	45
15	12	16	10	-0.16191	40.14449	-30.14449	908.690142	-48	0	85
16	20	12	25	-0.414381	35.89202	-10.89202	118.636015	-59	0	94
17	0	20	50	-0.525809	43.78059	6.2194119	38.6810844	-79	0	119
18	30	0	20	-0.375859	23.93054	-3.930539	15.4491331	-77	0	167
19	40	30	10	0.732375	55.03877	-45.03877	2028.49098	-97	0	177
20	40	40	40	-0.608663	63.69773	-23.69773	561.582629	-117	0	167
21	40	40	50	-0.480372	63.82603	-13.82603	191.158981	-147	0	197
22	30	40	50	0.232156	64.53855	-14.53855	211.369521	-157	0	217
23	30	30	100	-0.336858	53.96954	46.030461	2118.80332	-187	0	267
24	90	30	200	1.716593	56.02299	143.97701	20729.3794	-207	0	357
25	100	90	200	-0.575449	113.7309	86.269052	7442.3493	-267	0	527
26	100	100	200	-0.704748	123.6016	76.398351	5836.70807	-347	0	707
27	0	100	100	0.571427	124.8778	-24.87782	618.906143	-432	0	992
28	50	0	100	0.708618	25.01502	74.984984	5622.74788	-412	0	972
29	100	50	200	0.084294	74.39069	125.60931	15777.6985	-392	0	992
30	100	100	50	0.080044	124.3864	-74.38644	5533.34264	-282	0	992
31	20	100	50	-0.82437	123.482	-73.48203	5399.60827	-282	0	942
32	0	20	0	-1.162488	43.14391	-43.14391	1861.39691	-102	0	792
33	0	0	0	0.201393	0	0	0	98	98	592
34	8	0	0	-1.211254	0	0	0	198	198	492
35	0	8	0	0.708618	0	0	0	240	240	442
36	0	0	0	0.084294	0	0	0	340	340	342
37	0	0	0	0.080044	0	0	0	390	390	292
38	0	0	0	-0.82437	0	0	0	390	390	292
39	0	0	0	-1.162488	0	0	0	390	390	292
40	8	0	0	0.201393	0	0	0	390	390	292
	mean of the disturbance			-0.117313		-5.38E-14	mean of the standard errors			
	std dev of the disturbance			0.802713						

Σ (AO-Ot)2	78660.67		constraints		
θ	1.00		>=0	<=1	
αs	1.00		>=0	<=1	
β	0.00		>=0	<=1	
S'	24.31		>=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

BIRA GENERAL BEER GAME MODEL

FME - GRG NonLinear

FACTOR	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	3.044252	4	0.170033	1.183958	2.8160417	7.93009096	12	12	8
2	4	3.771636	4	-1.940944	0	4	16	12	12	8
3	4	3.945435	4	-1.276946	0.638163	3.3618367	11.3019459	12	12	8
4	2	3.986963	6	1.052394	3.00903	2.9909702	8.94590247	12	12	8
5	3	2.474759	5	0.499216	0.537583	4.4624174	19.9131687	14	14	10
6	2	2.8745	0	0.496079	0.731155	-0.731155	0.53458713	15	15	11
7	3	2.208951	0	-0.655034	0	0	0	19	19	5
8	2	2.810989	0	-1.956911	0	0	0	21	21	0
9	1	2.193775	0	0.98275	1.247715	-1.247715	1.55679299	19	19	0
10	2	1.285237	0	0.158116	0	0	0	18	18	0
11	5	1.829217	0	-1.461789	0	0	0	16	16	0
12	10	4.242382	0	-1.475125	1.650578	-1.650578	2.72440792	11	11	0
13	10	8.624292	2	0.609476	9.132252	-7.132252	50.8690189	1	1	0
14	25	9.671292	10	0.888299	10.35656	-0.356558	0.12713377	-9	0	2
15	50	21.3374	20	-1.200765	18.91844	1.0815572	1.16976594	-34	0	12
16	10	43.15144	10	-0.810023	39.29593	-29.29593	858.251572	-82	0	30
17	25	17.92111	30	1.151933	16.02755	13.972449	195.229318	-82	0	30
18	50	23.30859	0	-1.692186	17.55575	-17.55575	308.204419	-87	0	40
19	20	43.62243	10	-0.619454	39.95749	-29.95749	897.451172	-127	0	30
20	10	25.64427	30	1.490068	26.11918	3.880821	15.0607713	-117	0	10
21	40	13.738	20	0.640882	10.31823	9.6817749	93.7367648	-127	0	40
22	50	33.72503	15	-2.520194	26.12902	-11.12902	123.855187	-157	0	50
23	50	46.11131	20	-0.289049	42.26919	-22.26919	495.916689	-177	0	35
24	100	49.07085	80	-1.935508	43.58227	36.417732	1326.25122	-207	0	35
25	200	87.83114	200	1.367166	79.04667	120.95333	14629.7074	-292	0	100
26	200	173.1987	100	0.688141	145.4623	-45.46227	2066.81826	-472	0	280
27	200	193.5962	200	-1.183342	161.9579	38.042063	1447.19856	-592	0	300
28	100	198.4699	200	-0.687928	167.3271	32.672938	1067.52085	-592	0	300
29	100	123.5281	100	0.200891	83.12246	16.877537	284.851264	-592	0	400
30	200	105.6217	50	-0.333486	74.83335	-24.83335	616.695303	-492	0	300
31	50	177.4495	100	-1.09712	161.125	-61.12497	3736.26165	-492	0	150
32	50	80.45241	50	1.042768	66.26773	-16.26773	264.639141	-442	0	150
33	0	57.27621	0	1.022413	43.07117	-43.07117	1855.12596	-442	0	150
34	0	13.68541	0	-1.595019	7.014573	-7.014573	49.2042287	-342	0	50
35	0	3.269951	0	0.731409	4.00136	-4.00136	16.0108807	-292	0	0
36	0	0.781312	0	-0.118727	0.662585	-0.662585	0.43901899	-292	0	0
37	0	0.186884	0	0.908096	1.09278	-1.09278	1.19416818	-292	0	0
38	0	0.044606	0	0.214076	0.258682	-0.258682	0.06691614	-292	0	0
39	0	0.010658	0	1.247528	1.258186	-1.258186	1.58303189	-292	0	0
40	0	0.002547	0	-2.520194	0	0	0	-292	0	0
	mean of the disturbance			-0.272537		-0.911132	mean of the standard errors			
	std dev of the disturbance			1.155806						

Σ (AO-Ot)2	30472.35		constraints		
θ	0.78		>=0	<=1	
αs	0.10		>=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:

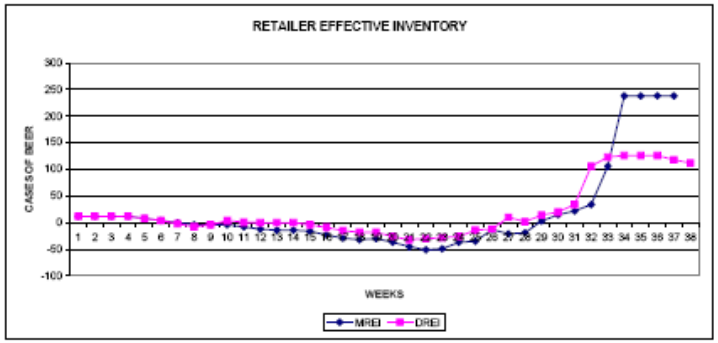
St = MAX(0,EI)

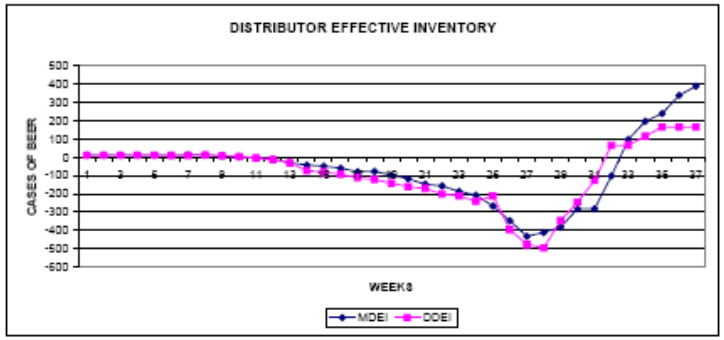
Supply Line:

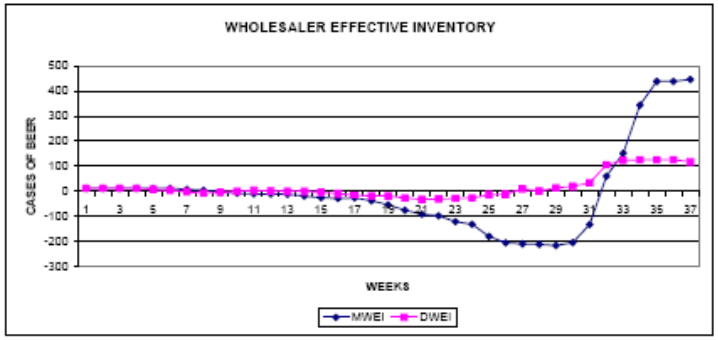
SLt = FSL = FPD1+FPD2

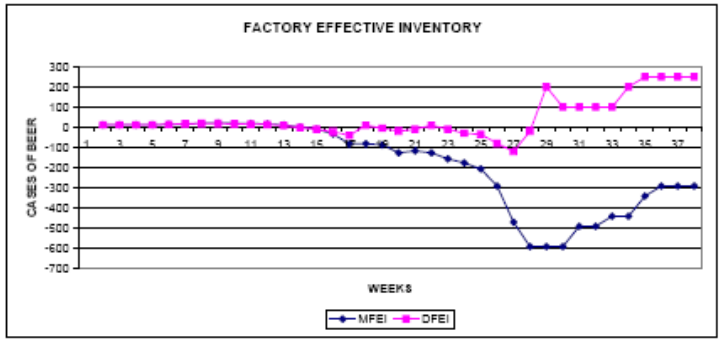
BIRA GENERAL BEER GAME MODEL

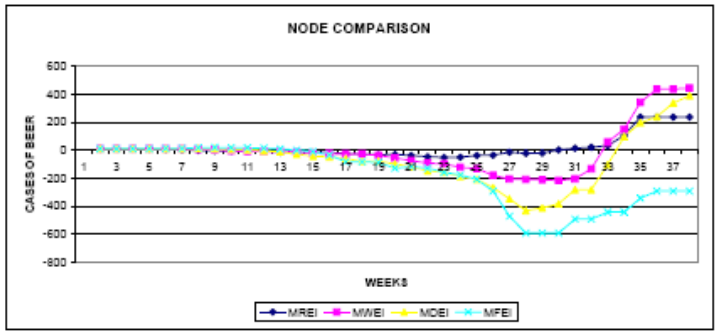
MODEL CHARTS





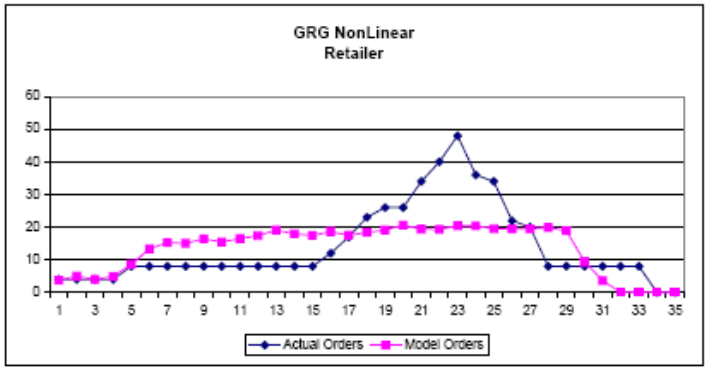


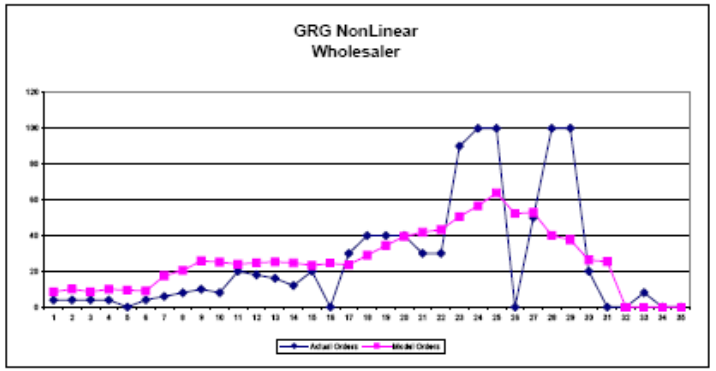


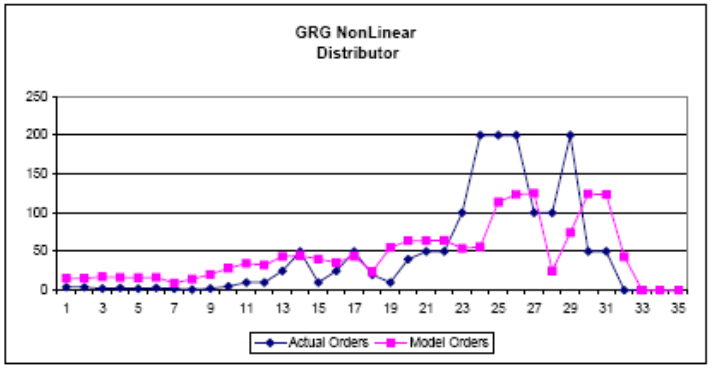


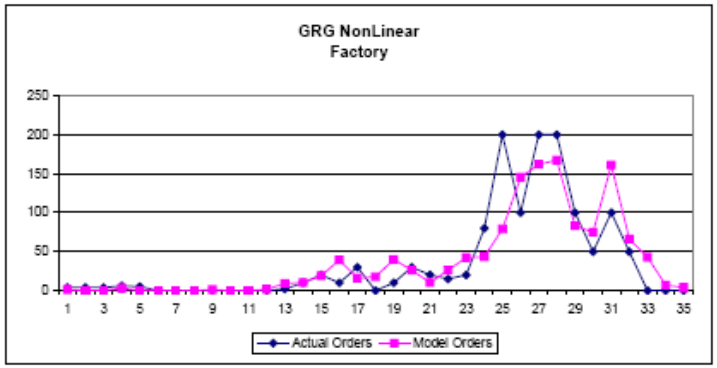
BIRA GENERAL BEER GAME MODEL

ORDER CHARTS









BIRA 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

	BIRA	IT							BIRA	Retailer	IT					
	Team Costs	$ 18,020.00							Costs	$ 1,426.00						
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	4	4	12		16	4
4	4	16	4	4	0	4	12	12	*12*	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	8	8	16		16	4
7	8	8	4	8	0	8	0	0	*-2*	30	8	8	20		16	4
8	8	4	8	8	4	4	0	-4	*-8*	34	8	8	24		12	0
9	8	8	8	4	4	8	0	-4	*-4*	38	8	8	24		4	4
10	8	8	4	4	4	8	0	-4	*4*	42	8	8	24		4	6
11	8	4	4	6	8	4	0	-8	*1*	50	8	8	28		6	8
12	8	4	6	8	12	4	0	-12	*0*	62	8	8	32		8	6
13	8	6	8	6	14	6	0	-14	*0*	76	8	8	34		6	1
14	8	8	6	1	14	8	0	-14	*0*	90	8	8	34		1	2
15	8	6	1	2	16	6	0	-16	*-4*	106	8	8	36		2	5
16	8	1	2	5	23	1	0	-23	*-9*	129	12	8	43		5	10
17	8	2	5	10	29	2	0	-29	*-15*	158	17	12	53		10	1
18	8	5	10	1	32	5	0	-32	*-18*	190	23	17	65		1	0
19	8	10	1	0	30	10	0	-30	*-18*	220	26	23	78		0	2
20	8	1	0	2	37	1	0	-37	*-26*	257	26	26	103		2	10
21	8	0	2	10	45	0	0	-45	*-32*	302	34	26	129		10	20
22	8	2	10	20	51	2	0	-51	*-30*	353	40	34	161		20	10
23	8	10	20	10	49	10	0	-49	*-28*	402	48	40	191		10	30
24	8	20	10	30	37	20	0	-37	*-26*	439	36	48	219		30	0
25	8	10	30	0	35	10	0	-35	*-14*	474	34	36	245		0	10
26	8	30	0	10	13	30	0	-13	*-12*	487	22	34	249		10	30
27	8	0	10	30	21	0	0	-21	*10*	508	20	22	271		30	20
28	8	10	30	20	19	10	0	-19	*2*	527	8	20	281		20	15
29	8	30	20	15	0	27	3	3	*14*	528.5	8	8	259		15	20
30	8	23	15	20	0	8	15	15	*20*	536	8	8	247		20	80
31	8	30	20	80	0	8	22	22	*34*	547	8	8	240		80	200
32	8	42	80	140	0	8	34	34	*106*	564	8	8	228		200	100
33	8	114	140	8	0	8	106	106	*123*	617	8	8	156		160	200
34	8	246	8	8	0	8	238	238	*126*	736	0	8	24		352	102
35	8	246	8	8	0	8	238	238	*126*	855	0	0	16		446	0
36	8	246	8	0	0	8	238	238	*126*	974	0	0	8		438	8
37	8	246	0	0	0	8	238	238	*118*	1093	0	0	0		446	0
38	8	238	0	0	0	8	230	230	*112*	1208	0	0	0		446	0
39	8	230	0	0	0	8	222	222	*112*	1319	0	0	0		446	0
40	8	222	0	0	0	8	214	214	*94*	1426	0	0	0		446	0

BIRA GENERAL BEER GAME MODEL

MODEL WORKSHEET

STEP 3
Record your inventory or backlog

STEP 4
Advance the order slips and the brewery Brews

					BIRA Costs	Wholesaler $ 3,754.00		IT								BIRA 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	*12*
5	4	0	12	12	*8*	30	0	4	12		16	4	2	0	12	12	*12*
6	4	0	12	12	*4*	36	4	0	8		16	2	3	0	12	12	*10*
7	0	0	8	8	*-2*	40	6	4	8		14	3	2	0	14	14	*10*
8	4	0	4	4	*-8*	42	8	6	10		17	2	3	0	13	13	*13*
9	6	4	0	-4	*-4*	46	10	8	18		15	3	2	0	9	9	*9*
10	8	8	0	-8	*0*	54	8	10	24		12	2	1	0	4	4	*4*
11	6	10	0	-10	*4*	64	20	8	26		6	1	2	4	0	-4	*-4*
12	1	10	0	-10	*2*	74	18	20	38		1	2	5	11	0	-11	*-12*
13	2	12	0	-12	*0*	86	16	18	50		2	5	10	29	0	-29	*-30*
14	5	19	0	-19	*0*	105	12	16	65		5	10	1	42	0	-42	*-73*
15	10	25	0	-25	*-4*	130	20	12	75		10	1	0	48	0	-48	*-81*
16	1	28	0	-28	*-9*	158	0	20	90		1	0	2	59	0	-59	*-93*
17	0	26	0	-26	*-15*	184	30	0	80		0	2	10	79	0	-79	*-111*
18	2	37	0	-37	*-18*	221	40	30	109		2	10	20	77	0	-77	*-121*
19	10	54	0	-54	*-18*	275	40	40	149		10	20	10	97	0	-97	*-141*
20	20	75	0	-75	*-26*	350	40	40	187		20	10	30	117	0	-117	*-161*
21	10	91	0	-91	*-32*	441	30	40	217		10	30	0	147	0	-147	*-171*
22	30	97	0	-97	*-30*	538	30	30	227		30	0	10	157	0	-157	*-201*
23	0	121	0	-121	*-28*	659	90	30	247		0	10	30	187	0	-187	*-211*
24	10	131	0	-131	*-26*	790	100	90	307		10	30	20	207	0	-207	*-241*
25	30	179	0	-179	*-14*	969	100	100	407		30	20	15	267	0	-267	*-211*
26	20	205	0	-205	*-12*	1174	0	100	497		20	15	20	347	0	-347	*-396*
27	15	209	0	-209	*10*	1383	50	0	467		15	20	80	432	0	-432	*-476*
28	20	211	0	-211	*2*	1594	100	50	497		20	80	200	412	0	-412	*-496*
29	80	216	0	-216	*14*	1810	100	100	582		80	200	100	382	0	-382	*-346*
30	200	204	0	-204	*20*	2014	20	100	662		200	100	200	282	0	-282	*-246*
31	100	132	0	-132	*34*	2146	0	20	602		100	200	200	282	0	-282	*-126*
32	200	0	60	60	*106*	2176	0	0	402		200	200	100	102	0	-102	*66*
33	102	0	152	152	*123*	2252	8	0	302		200	100	50	0	98	98	*66*
34	0	0	344	344	*126*	2424	0	8	110		198	50	100	0	198	198	*116*
35	8	0	438	438	*126*	2643	0	0	8		248	100	50	0	240	240	*166*
36	0	0	438	438	*126*	2862	0	0	8		340	50	0	0	340	340	*166*
37	0	0	446	446	*118*	3085	0	0	0		390	0	0	0	390	390	*166*
38	0	0	446	446	*112*	3308	0	0	0		390	0	0	0	390	390	*166*
39	0	0	446	446	*112*	3531	8	0	0		390	0	0	0	390	390	*166*
40	0	0	446	446	*94*	3754	0	8	8		390	0	0	0	390	390	*166*

BIRA GENERAL BEER GAME MODEL

MODEL WORKSHEET

STEP 5
Place and record your orders

	Distributor		IT									BIRA	Factory	IT	
	$ 5,041.00											Costs	$ 7,799.00		
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	2	4	12		16	4	4	0	12	12	*12*	18	4	8
4	24	3	2	10		16	4	4	0	12	12	*12*	24	6	8
5	30	2	3	9		16	4	6	0	14	14	*14*	31	5	10
6	36	3	2	7		18	6	5	0	15	15	*17*	38.5	0	11
7	43	2	3	8		21	5	0	0	19	19	*20*	48	0	5
8	49.5	1	2	7		24	0	0	0	21	21	*18*	58.5	0	0
9	54	2	1	6		21	0	0	0	19	19	*16*	68	0	0
10	56	5	2	5		19	0	0	0	18	18	*15*	77	0	0
11	60	10	5	8		18	0	0	0	16	16	*13*	85	0	0
12	71	10	10	17		16	0	0	0	11	11	*8*	90.5	0	0
13	100	25	10	25		11	0	0	0	1	1	*-2*	91	2	0
14	142	50	25	45		1	0	2	9	0	-9	*-10*	100	10	2
15	190	10	50	85		0	2	10	34	0	-34	*-23*	134	20	12
16	249	25	10	94		2	10	20	82	0	-82	*-40*	216	10	30
17	328	50	25	119		10	20	10	82	0	-82	*10*	298	30	30
18	405	20	50	167		20	10	30	87	0	-87	*-5*	385	0	40
19	502	10	20	177		10	30	0	127	0	-127	*-20*	512	10	30
20	619	40	10	167		30	0	10	117	0	-117	*-10*	629	30	10
21	786	50	40	197		0	10	30	127	0	-127	*10*	756	20	40
22	923	50	50	217		10	30	20	157	0	-157	*-10*	913	15	50
23	1110	100	50	267		30	20	15	177	0	-177	*-30*	1090	20	35
24	1317	200	100	357		20	15	20	207	0	-207	*-35*	1297	80	35
25	1584	200	200	527		15	20	80	292	0	-292	*-80*	1589	200	100
26	1931	200	200	707		20	80	200	472	0	-472	*-120*	2061	100	280
27	2363	100	200	892		80	200	100	592	0	-592	*-20*	2653	200	300
28	2775	100	100	972		200	100	200	592	0	-592	*200*	3245	200	300
29	3157	200	100	992		100	200	200	592	0	-592	*100*	3837	100	400
30	3439	50	200	992		200	200	100	492	0	-492	*100*	4329	50	300
31	3721	50	50	942		200	100	50	492	0	-492	*100*	4821	100	150
32	3823	0	50	792		100	50	100	442	0	-442	*100*	5263	50	150
33	3872	0	0	592		50	100	50	442	0	-442	*200*	5705	0	150
34	3971	0	0	492		100	50	0	342	0	-342	*250*	6047	0	50
35	4091	0	0	442		50	0	0	292	0	-292	*250*	6339	0	0
36	4281	0	0	342		0	0	0	292	0	-292	*250*	6631	0	0
37	4456	0	0	292		0	0	0	292	0	-292	*250*	6923	0	0
38	4651	0	0	292		0	0	0	292	0	-292	*250*	7215	0	0
39	4846	0	0	292		0	0	0	292	0	-292	*250*	7507	0	0
40	5041	0	0	292		0	0	0	292	0	-292	*250*	7799	0	0

BIRA GENERAL BEER GAME MODEL

MODEL DATA

BIRA 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	2	12	4	12
4	4	12	4	12	3	12	6	12
5	8	8	0	8	2	12	5	14
6	8	4	4	4	3	10	0	17
7	8	-2	6	-2	2	10	0	20
8	8	-8	8	-8	1	13	0	18
9	8	-4	10	-4	2	9	0	16
10	8	4	8	0	5	4	0	15
11	8	1	20	4	10	-4	0	13
12	8	0	18	2	10	-12	0	8
13	8	0	16	0	25	-30	2	-2
14	8	0	12	0	50	-73	10	-10
15	8	-4	20	-4	10	-81	20	-23
16	12	-9	0	-9	25	-93	10	-40
17	17	-15	30	-15	50	-111	30	10
18	23	-18	40	-18	20	-121	0	-5
19	26	-18	40	-18	10	-141	10	-20
20	26	-26	40	-26	40	-161	30	-10
21	34	-32	30	-32	50	-171	20	10
22	40	-30	30	-30	50	-201	15	-10
23	48	-28	90	-28	100	-211	20	-30
24	36	-26	100	-26	200	-241	80	-35
25	34	-14	100	-14	200	-211	200	-80
26	22	-12	0	-12	200	-396	100	-120
27	20	10	50	10	100	-476	200	-20
28	8	2	100	2	100	-496	200	200
29	8	14	100	14	200	-346	100	100
30	8	20	20	20	50	-246	50	100
31	8	34	0	34	50	-126	100	100
32	8	106	0	106	0	66	50	100
33	8	123	8	123	0	66	0	200
34	0	126	0	126	0	116	0	250
35	0	126	0	126	0	166	0	250
36	0	126	0	126	0	166	0	250
37	0	118	0	118	0	166	0	250
38	0	112	0	112	0	166	0	250
39	0	112	8	112	0	166	0	250
40	0	94	0	94	0	166	0	250

BLACK LABEL 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	0.414942	4.029143	-0.029143	0.00084932	12	12	12
2	4	0.01	4	-0.905675	2.719486	1.2805138	1.63971556	12	12	12
3	4	0.02	4	-0.268571	3.36752	0.6324796	0.40003046	12	12	12
4	4	0.03	4	-0.06252	3.584472	0.4155278	0.17266334	12	12	12
5	8	0.04	10	0.999714	6.902287	3.0977128	9.59582445	8	8	12
6	8	0.07	14	2.123982	9.860405	4.1395951	17.1362474	4	4	18
7	8	0.09	8	-0.7988	8.482972	-0.482972	0.23326209	0	0	28
8	8	0.11	8	1.318595	10.33361	-2.333607	5.44571972	-4	0	32
9	8	0.13	8	0.141706	9.322561	-1.322561	1.74916651	-2	0	30
10	8	0.15	6	-1.719609	7.55492	-1.55492	2.41777516	-1	0	29
11	8	0.17	6	0.095739	9.17544	-3.17544	10.083421	-6	0	32
12	8	0.20	8	-1.032839	8.35675	-0.35675	0.12727026	-4	0	28
13	8	0.22	8	-0.432881	9.266534	-1.266534	1.60410834	0	0	24
14	8	0.24	8	-0.903462	8.328214	-0.328214	0.10772428	1	1	23
15	8	0.26	8	-1.066046	8.675966	-0.675966	0.45693009	0	0	24
16	8	0.28	10	0.664489	10.42771	-0.427712	0.18293768	0	0	24
17	8	0.30	8	1.037115	10.67727	-2.67727	7.16777206	0	0	26
18	8	0.32	6	-0.682955	8.978295	-2.978295	8.87024161	0	0	26
19	8	0.34	8	-0.024841	9.729557	-1.729557	2.99136582	-1	0	25
20	8	0.36	6	-1.2028	8.356245	-2.356245	5.55189214	-4	0	28
21	8	0.39	10	-1.928024	7.724054	2.2759464	5.17993208	-5	0	27
22	8	0.41	17	-0.160367	9.079913	7.9200866	62.7277718	-9	0	33
23	8	0.43	8	-0.507779	8.104315	-0.104315	0.01088153	-9	0	42
24	8	0.45	10	-2.553957	6.223108	3.7768921	14.2649143	-7	0	40
25	8	0.47	10	-1.221006	7.576752	2.423248	5.8721309	-5	0	40
26	8	0.49	6	1.318595	10.13699	-4.13699	17.1146872	-3	0	40
27	8	0.51	18	0.141706	8.69224	9.3077602	86.6344003	-9	0	44
28	8	0.53	6	-0.535338	7.098285	-1.098285	1.20622962	-12	0	57
29	8	0.55	8	-1.33014	6.612392	1.3876083	1.92545686	-10	0	53
30	8	0.57	6	-1.255095	7.428953	-1.428953	2.04190545	0	0	43
31	8	0.59	2	-0.95251	6.917979	-4.917979	24.1885195	2	2	39
32	8	0.61	0	-0.343605	6.023576	-6.023576	36.2834717	6	6	29
33	8	0.63	0	0.719445	5.238417	-5.238417	27.4410129	11	11	16
34	8	0.65	6	-0.262569	4.853475	1.1465251	1.31451987	11	11	8
35	8	0.67	8	-1.025477	5.233057	2.7669434	7.6559759	9	9	8
36	9	0.69	10	1.626613	10.83963	-0.839629	0.70497632	3	3	14
37	10	0.72	8	-1.417895	8.780314	-0.780314	0.60889	-5	0	24
38	11	0.74	16	0.235125	10.31455	5.6854465	32.3243014	-7	0	26
39	12	0.77	6	-1.738969	7.214805	-1.214805	1.4757501	-15	0	42
40	13	0.80	10	0.225949	8.777835	1.2221649	1.49388694	-23	0	48
	mean of the disturbance			-0.348595		-0.116367	mean of the standard errors			
	std dev of the disturbance			1.005787						

Σ (AO-Ot)2	406.4023	constraints		
θ	0.00	>=0	<=1	
αs	0.56	>=0	<=1	
β	0.13	>=0	<=1	
S'	19.99	>=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

BLACK LABEL 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	2.854144	4	1.822831	4.813343	-0.813343	0.66152659	12	12	12
2	4	3.671754	4	0.116763	3.924883	0.0751166	0.0056425	12	12	12
3	4	3.905969	4	-0.007045	4.035292	-0.035292	0.0012455	12	12	12
4	4	3.973064	3	-0.065805	4.043626	-1.043626	1.08915523	12	12	12
5	4	3.992284	3	0.273051	4.459965	-1.459965	2.13149899	12	12	11
6	10	3.99779	10	-0.379599	3.871084	6.128916	37.5636112	12	12	10
7	14	8.280583	12	-0.597132	8.052806	3.9471943	15.5803428	6	6	16
8	8	12.36159	9	1.822831	14.49545	-5.495452	30.1999925	-5	0	25
9	8	9.249439	14	0.116763	9.32765	4.6723497	21.8308515	-10	0	31
10	8	8.357919	12	-0.007045	8.079271	3.9207293	15.3721186	-8	0	35
11	6	8.102531	6	-0.065805	7.765122	-1.765122	3.11565726	-4	0	35
12	6	6.602299	3	0.273051	6.778536	-3.778536	14.2773362	-1	0	32
13	8	6.172537	3	-0.379599	5.851535	-2.851535	8.13125172	4	4	24
14	8	7.476498	5	-0.597132	7.190457	-2.190457	4.79810246	6	6	17
15	8	7.850036	7	1.822831	10.11993	-3.119927	9.73394711	8	8	12
16	8	7.957041	4	0.116763	8.656768	-4.656768	21.6854864	4	4	15
17	10	7.987694	8	-0.007045	8.816044	-0.816044	0.6659275	-1	0	16
18	8	9.423547	10	-0.065805	10.01835	-0.018348	0.00033664	-6	0	19
19	6	8.407795	10	0.273051	9.166663	0.8333373	0.69445105	-7	0	22
20	8	6.689746	10	-0.379599	6.446385	3.5536147	12.6281772	-9	0	28
21	6	7.62466	6	-0.126092	7.518279	-1.518279	2.30517233	-9	0	30
22	10	6.465406	10	0.613381	7.331551	2.6684489	7.12061937	-5	0	26
23	17	8.987466	20	-0.190666	9.049565	10.950435	119.912031	-5	0	26
24	8	14.7047	10	-1.443767	12.93106	-2.931065	8.59113953	-12	0	36
25	10	9.920654	12	-1.897309	7.227374	4.7726264	22.7779623	-18	0	44
26	10	9.97727	8	0.578384	9.351841	-1.351841	1.82747455	-23	0	51
27	6	9.993489	4	-0.594482	8.31172	-4.31172	18.5909293	-23	0	49
28	18	7.14399	8	-1.91979	4.952597	3.0474029	9.28666444	-11	0	35
29	6	14.89014	6	-1.488827	13.24624	-7.24624	52.5079939	-19	0	33
30	8	8.546706	6	0.377047	9.118254	-3.118254	9.72350695	-13	0	27
31	6	8.156611	2	-0.186593	8.572361	-6.572361	43.1959321	-8	0	20
32	2	6.617791	0	-0.075413	7.4943	-7.4943	56.1645311	-6	0	14
33	0	3.322831	0	0.065956	4.690286	-4.690286	21.9987831	-2	0	8
34	0	0.951871	0	1.234076	3.526332	-3.526332	12.4350183	4	4	2
35	6	0.272677	6	0.365532	1.929773	4.0702266	16.5667445	6	6	0
36	8	4.359329	6	-1.536436	4.240919	1.7590815	3.09436766	0	0	6
37	10	6.957079	12	-1.172119	6.853407	5.1465927	26.4874161	-8	0	12
38	8	9.128313	20	-1.911878	7.585725	12.414275	154.114226	-18	0	24
39	16	8.323221	16	-0.126092	7.750736	8.249264	68.0503563	-20	0	38
40	6	13.80088	8	0.613381	13.38524	-5.385237	29.0007729	-30	0	48
		mean of the disturbance		-0.017492		-0.633277	mean of the standard errors			
		std dev of the disturbance		0.873125						

Σ (AO-Ot)2	883.9183		constraints	
θ	0.71		>=0	<=1	
αs	0.08		>=0	<=1	
β	0.75		>=0	<=1	
S'	22.76		>=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

BLACK LABEL 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	3.460844	4	1.08625	5.452753	-1.452753	2.11049027	12	12	12
2	4	3.927328	4	-0.804925	4.028062	-0.028062	0.00078749	12	12	12
3	4	3.990205	6	1.203887	6.09975	-0.09975	0.00995015	12	12	12
4	4	3.99868	6	0.506999	5.385286	0.6147137	0.37787288	12	12	14
5	3	3.999822	8	2.271175	7.124552	0.8754476	0.76640846	12	12	16
6	3	3.134765	8	-0.253342	3.570218	4.4297816	19.622965	13	13	20
7	10	3.018165	4	-0.1345	3.20844	0.7915597	0.6265668	16	16	22
8	12	9.058925	10	-0.855611	9.004786	0.9952339	0.99049055	12	12	20
9	9	11.60358	10	0.375936	13.20554	-3.205536	10.2754624	8	8	22
10	14	9.350934	15	1.713802	12.37736	2.6226351	6.87821481	7	7	24
11	12	13.37336	15	-0.224229	15.10707	-0.107065	0.01146296	-3	0	35
12	6	12.18511	6	-0.694365	13.38356	-7.383556	54.516899	-5	0	40
13	3	6.833886	4	-1.227646	7.550951	-3.550951	12.6092511	-1	0	36
14	3	3.516739	8	0.589981	5.254589	2.7454106	7.53727936	8	8	28
15	5	3.069851	6	0.151088	3.606066	2.3939339	5.7309197	15	15	26
16	7	4.73981	2	0.093855	4.707815	-2.707815	7.33226184	20	20	22
17	4	6.695351	5	-1.25068	5.284321	-0.284321	0.0808382	21	21	16
18	8	4.363304	0	0.040861	3.832268	-3.832268	14.6862755	25	25	13
19	10	7.509813	2	0.081064	7.322448	-5.322448	28.3284538	23	23	7
20	10	9.66435	5	-1.358395	8.938776	-3.938776	15.513954	15	15	7
21	10	9.954758	10	0.469453	11.62031	-1.620313	2.62541296	10	10	7
22	6	9.993902	20	1.573572	13.75988	6.2401223	38.9391258	0	0	17
23	10	6.538334	10	0.093855	8.590126	1.4098736	1.98774366	-4	0	35
24	20	9.533405	10	-1.25068	10.17553	-0.175533	0.03081172	-9	0	40
25	10	18.58922	30	0.040861	20.52289	9.4771141	89.8156919	-19	0	40
26	12	11.15773	15	0.081064	12.97529	2.0247066	4.0994368	-11	0	52
27	8	11.88647	10	-1.358395	12.19944	-2.199444	4.83755173	-13	0	57
28	4	8.523854	8	0.469453	10.69073	-2.690726	7.24000409	-9	0	55
29	8	4.809766	8	1.573572	7.447735	0.5522653	0.30499699	5	5	45
30	6	7.543033	6	0.093855	7.705722	-1.705722	2.90948665	17	17	33
31	6	6.207984	6	-1.25068	4.129465	1.8705349	3.49890095	26	26	24
32	2	6.028034	2	0.040861	4.842535	-2.842535	8.08000592	30	30	20
33	0	2.542935	6	0.081064	0.799858	5.2001422	27.0414791	36	36	14
34	0	0.34276	6	-1.358395	0	6	36	42	42	14
35	0	0.0462	0	0.469453	0	0	0	48	48	14
36	6	0.006227	0	1.573572	0	0	0	50	50	12
37	6	5.192105	0	0.093855	2.48699	-2.48699	6.18511863	45	45	11
38	12	5.891105	8	-1.25068	2.517392	5.482608	30.0589904	39	39	11
39	20	11.17859	10	-0.818093	9.483129	0.516871	0.26715586	27	27	19
40	16	18.8107	20	2.550714	22.60891	-2.608913	6.80642964	7	7	29
	mean of the disturbance			0.03086		0.1455972	mean of the standard errors			
	std dev of the disturbance			0.952632						

Σ (AO-Ot)2	488.7351		constraints		
θ	0.87		>=0	<=1	
αs	0.11		>=0	<=1	
β	0.12		>=0	<=1	
S'	21.43		>=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

BLACK LABEL GENERAL BEER GAME MODEL

FME - GRG NonLinear

FACTOR	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	-0.392893	6.364521	-2.364521	5.59095927	12	12	8
2	4	0	4	0.705288	7.462702	-3.462702	11.9903051	12	12	8
3	4	0	6	1.60031	8.357725	-2.357725	5.55886519	12	12	8
4	6	0	4	1.096093	7.853507	-3.853507	14.8495178	12	12	10
5	6	0	6	-0.5033	6.766231	-0.766231	0.58710927	10	10	10
6	8	0	6	-1.616913	5.652618	0.3473825	0.12067459	10	10	10
7	8	0	10	-2.090902	6.202861	3.7971388	14.4182633	6	6	12
8	4	0	10	-1.59047	7.215409	2.7845908	7.75394618	4	4	16
9	10	0	6	0.281239	8.575002	-2.575002	6.63063719	6	6	20
10	10	0	10	-0.522715	7.771049	2.2289515	4.96822462	6	6	16
11	15	0	10	0.445349	8.739113	1.2608875	1.58983728	6	6	16
12	15	0	16	-1.468489	8.361623	7.6383771	58.3448052	-3	0	20
13	6	0	16	-1.216959	8.613154	7.3868465	54.5655007	-8	0	26
14	4	0	10	0.682456	10.51257	-0.512569	0.26272653	-4	0	32
15	8	0	4	-1.878339	5.903308	-1.903308	3.62257994	8	8	26
16	6	0	6	0.035747	5.768929	0.2310711	0.05339385	16	16	14
17	2	0	4	-0.62431	4.084639	-0.084639	0.00716377	20	20	10
18	5	0	0	0.599205	4.796037	-4.796037	23.0019702	22	22	10
19	0	0	0	0.248966	4.18974	-4.18974	17.5539218	23	23	4
20	2	0	4	0.419571	3.336112	0.6638879	0.44074716	27	27	0
21	5	0	4	-1.457763	1.970894	2.0291056	4.11726939	25	25	4
22	10	0	10	0.359589	5.068538	4.9314619	24.3193169	20	20	8
23	20	0	20	-0.988893	5.256405	14.743595	217.373598	14	14	14
24	10	0	10	-0.537486	9.292627	0.7073732	0.50037687	-2	0	30
25	10	0	20	-0.768368	9.061744	10.938256	119.645441	-2	0	30
26	30	0	15	0.935035	8.716682	6.2833183	39.4800885	8	8	30
27	15	0	15	0.281239	10.11135	4.8886486	23.8988848	-12	0	35
28	10	0	7	-0.522715	9.307398	-2.307398	5.32408372	-7	0	30
29	8	0	8	0.445349	10.27546	-2.275462	5.17772538	-2	0	22
30	8	0	0	-1.468489	7.081332	-7.081332	50.1452626	5	5	15
31	6	0	3	-0.054951	8.750929	-5.750929	33.0731824	4	4	8
32	6	0	0	-0.540029	7.753734	-7.753734	60.1203896	6	6	3
33	2	0	0	-0.259103	9.57101	-9.57101	91.6042245	0	0	3
34	6	0	0	1.614426	11.18848	-11.18848	125.182097	1	1	0
35	6	0	0	-0.678373	9.151739	-9.151739	83.7543248	-5	0	0
36	0	0	0	-0.282247	9.547866	-9.547866	91.1617358	-11	0	0
37	0	0	10	-0.669629	9.160484	0.8395163	0.70478758	-11	0	0
38	0	0	8	-0.054951	9.775162	-1.775162	3.15119852	-11	0	10
39	8	0	20	-0.540029	9.290083	10.709917	114.702322	-11	0	18
40	10	0	20	-0.259103	9.57101	10.42899	108.763841	-9	0	28
	mean of the disturbance			-0.269474		-0.316719	mean of the standard errors			
	std dev of the disturbance			0.969131						

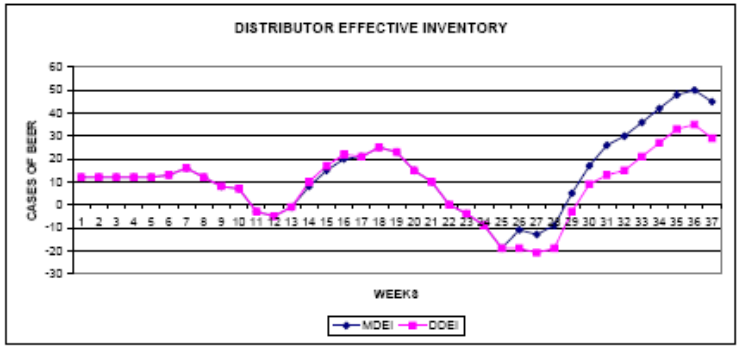
			constraints		
Σ (AO-Ot)2	1434.111				
θ	0.00		>=0	<=1	
αs	0.26		>=0	<=1	
β	0.00		>=0	<=1	
S'	38.39		>=0	<=100	INT

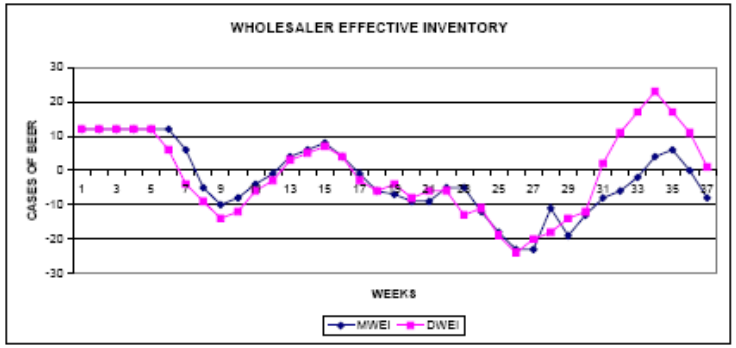
GRG NonLinear

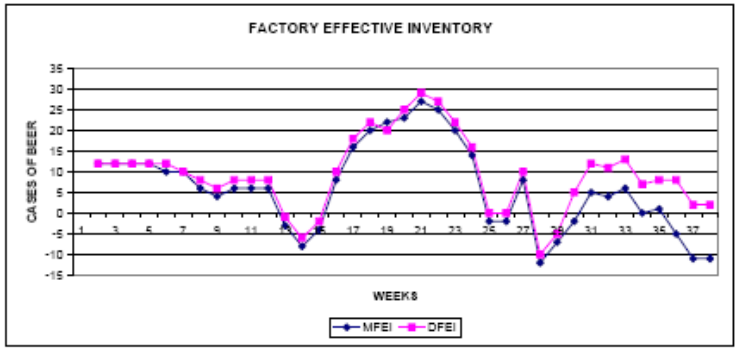
Incoming Orders:
IO = FIO
Expected Incoming Orders:
$eIO = \theta * IO_{(t-1)} + (1-\theta) * eIO_{(t-1)}$
Actual Orders:
AO = FPR
Disturbance:
normally distributed white noise
mean = 0
std dev = 1
Model Orders:
$Ot = MAX(0, eIO + \alpha s(s' - S_t - \beta SL_t) + \varepsilon$
Error Term:
$AO - O_t$
Squared errors:
$(AO - O_t)^2$
Effective Inventory:
EI = MFEI
Stock:
St = MAX(0,EI)
Supply Line:
SLt = FSL = FPD1+FPD2

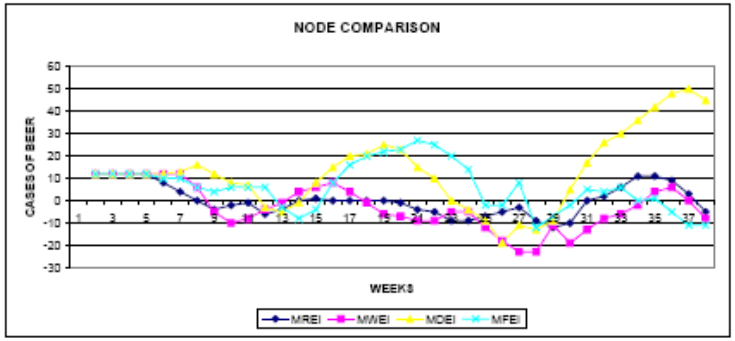
BLACK LABEL GENERAL BEER GAME MODEL

MODEL CHARTS



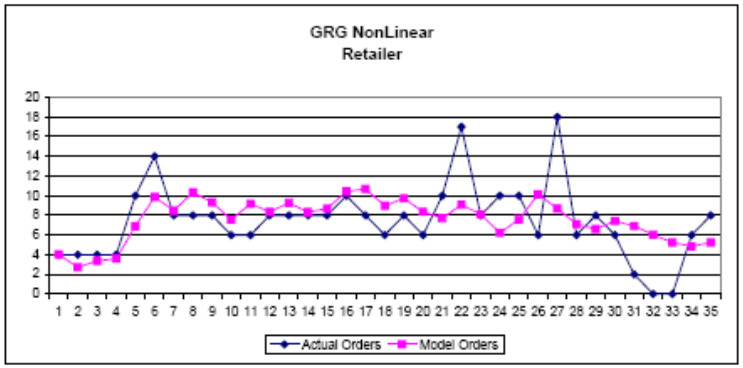


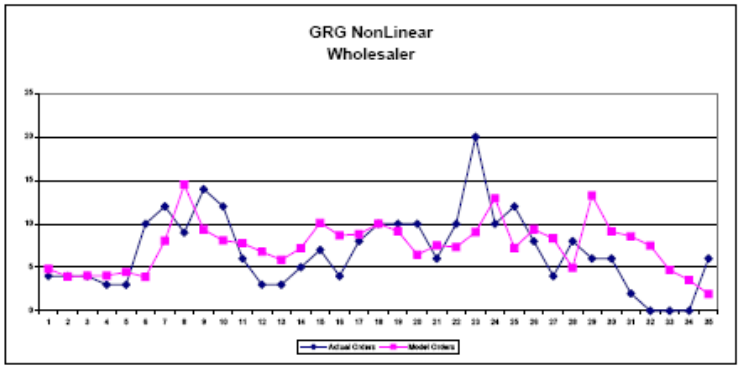


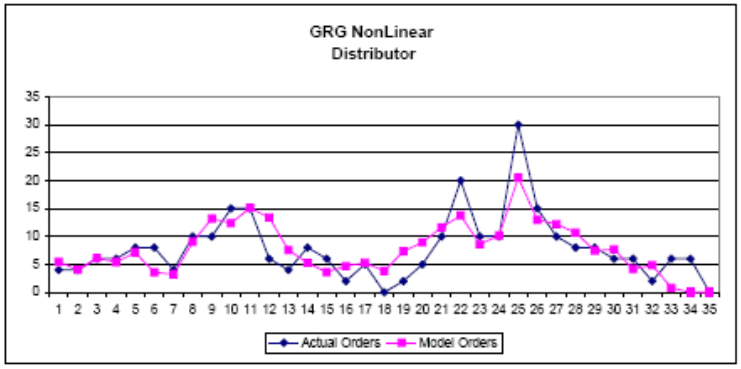


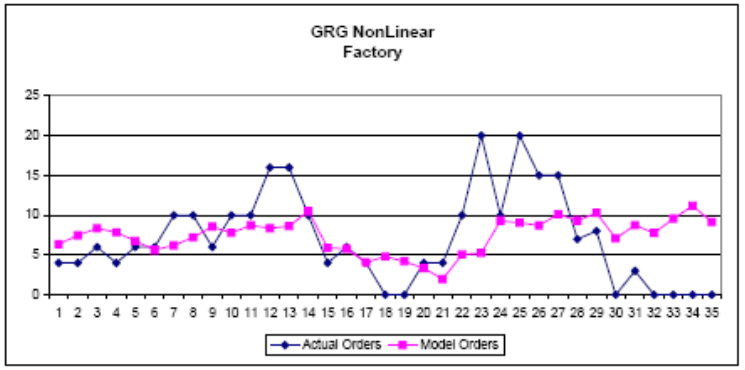
BLACK LABEL GENERAL BEER GAME MODEL

ORDER CHARTS









BLACK LABEL 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

	BLACK LABEL	IT							BLACK LABEL	Retailer	IT					
	Team Costs	$ 1,160.50							Costs	$ 192.50						
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	4	4	12		16	4
4	4	16	4	4	0	4	12	12	*12*	24	4	4	12		16	4
5	8	16	4	4	0	8	8	8	*8*	28	10	4	12		16	4
6	8	12	4	4	0	8	4	4	*4*	30	14	10	18		16	4
7	8	8	4	10	0	8	0	0	*0*	30	8	14	28		16	3
8	8	4	10	9	4	4	0	-4	*2*	34	8	8	32		9	3
9	8	10	9	3	2	10	0	-2	*4*	36	8	8	30		3	10
10	8	9	3	10	1	9	0	-1	*-1*	37	6	8	29		10	12
11	8	3	10	12	6	3	0	-6	*-6*	43	6	6	32		12	9
12	8	10	12	9	4	10	0	-4	*-4*	47	8	6	28		9	11
13	8	12	9	7	0	12	0	0	*0*	47	8	8	24		11	10
14	8	9	7	8	0	8	1	1	*1*	47.5	8	8	23		14	10
15	8	8	8	8	0	8	0	0	*1*	47.5	8	8	24		16	4
16	8	8	8	8	0	8	0	0	*1*	47.5	10	8	24		12	3
17	8	8	8	7	0	8	0	0	*1*	47.5	8	10	26		7	5
18	8	8	7	5	0	8	0	0	*0*	47.5	6	8	26		5	7
19	8	7	5	7	1	7	0	-1	*-1*	48.5	8	6	25		7	4
20	8	5	7	4	4	5	0	-4	*-4*	52.5	6	8	28		4	8
21	8	7	4	8	5	7	0	-5	*-5*	57.5	10	6	27		8	10
22	8	4	8	10	9	4	0	-9	*-9*	66.5	17	10	33		10	10
23	8	8	10	10	9	8	0	-9	*-9*	75.5	8	17	42		10	10
24	8	10	10	10	7	10	0	-7	*-7*	82.5	10	8	40		10	2
25	8	10	10	2	5	10	0	-5	*-5*	87.5	10	10	40		2	5
26	8	10	2	5	3	10	0	-3	*-3*	90.5	6	10	40		5	10
27	8	2	5	10	9	2	0	-9	*-9*	99.5	18	6	44		10	18
28	8	5	10	18	12	5	0	-12	*-12*	111.5	6	18	57		18	10
29	8	10	18	10	10	10	0	-10	*-10*	121.5	8	6	53		10	12
30	8	18	10	12	0	18	0	0	*2*	121.5	6	8	43		12	13
31	8	10	12	13	0	8	2	2	*4*	122.5	2	6	39		13	8
32	8	14	13	8	0	8	6	6	*6*	125.5	0	2	29		8	6
33	8	19	8	6	0	8	11	11	*16*	131	0	0	16		6	6
34	8	19	6	2	0	8	11	11	*10*	136.5	6	0	8		6	2
35	8	17	2	0	0	8	9	9	*2*	141	8	6	8		6	0
36	8	11	0	6	0	8	3	3	*-6*	142.5	10	8	14		6	0
37	8	3	6	0	5	3	0	-5	*-8*	147.5	8	10	24		0	0
38	8	6	0	0	7	6	0	-7	*-8*	154.5	16	8	26		0	6
39	8	0	0	6	15	0	0	-15	*-6*	169.5	6	16	42		6	6
40	8	0	6	6	23	0	0	-23	*-13*	192.5	10	6	48		6	12

BLACK LABEL GENERAL BEER GAME MODEL

MODEL WORKSHEET

STEP 3
Record your inventory or backlog

STEP 4
Advance the order slips and the brewery Brews

					BLACK LABEL Costs	Wholesaler $ 336.00		IT								BLACK LABEL 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	3	4	12		16	4	4	0	12	12	*12*
5	4	0	12	12	*12*	30	3	3	11		16	4	6	0	12	12	*12*
6	3	0	12	12	*6*	36	10	3	10		16	6	6	0	13	13	*13*
7	3	0	6	6	*-4*	39	12	10	16		19	6	8	0	16	16	*16*
8	10	5	0	-5	*-9*	44	9	12	25		22	8	8	0	12	12	*12*
9	12	10	0	-10	*-14*	54	14	9	31		20	8	4	0	8	8	*8*
10	9	8	0	-8	*-12*	62	12	14	35		16	4	10	0	7	7	*7*
11	11	4	0	-4	*-6*	66	6	12	35		11	10	10	3	0	-3	*-3*
12	10	1	0	-1	*-3*	67	3	6	32		10	10	12	5	0	-5	*-5*
13	10	0	4	4	*3*	69	3	3	24		10	12	10	1	0	-1	*-1*
14	4	0	6	6	*5*	72	5	3	17		12	10	10	0	8	8	*10*
15	3	0	8	8	*7*	76	7	5	12		18	10	8	0	15	15	*17*
16	5	0	4	4	*4*	78	4	7	15		25	8	8	0	20	20	*22*
17	7	1	0	-1	*-3*	79	8	4	16		28	8	6	0	21	21	*21*
18	4	6	0	-6	*-6*	85	10	8	19		29	6	2	0	25	25	*25*
19	8	7	0	-7	*-4*	92	10	10	22		31	2	5	0	23	23	*23*
20	10	9	0	-9	*-8*	101	10	10	28		25	5	0	0	15	15	*15*
21	10	9	0	-9	*-6*	110	6	10	30		20	0	2	0	10	10	*10*
22	10	5	0	-5	*-6*	115	10	6	26		10	2	5	0	0	0	*0*
23	2	5	0	-5	*-13*	120	20	10	26		2	5	10	4	0	-4	*-4*
24	5	12	0	-12	*-11*	132	10	20	36		5	10	18	9	0	-9	*-9*
25	10	18	0	-18	*-19*	150	12	10	44		10	18	10	19	0	-19	*-19*
26	18	23	0	-23	*-24*	173	8	12	51		18	10	12	11	0	-11	*-19*
27	10	23	0	-23	*-20*	196	4	8	49		10	12	18	13	0	-13	*-21*
28	12	11	0	-11	*-18*	207	8	4	35		12	18	20	9	0	-9	*-19*
29	13	19	0	-19	*-14*	226	6	8	33		18	20	15	0	5	5	*-3*
30	8	13	0	-13	*-12*	239	6	6	27		25	15	10	0	17	17	*9*
31	6	8	0	-8	*2*	247	2	6	20		32	10	8	0	26	26	*13*
32	6	6	0	-6	*11*	253	0	2	14		36	8	6	0	30	30	*15*
33	2	2	0	-2	*17*	255	0	0	8		38	6	6	0	36	36	*21*
34	0	0	4	4	*23*	257	0	0	2		42	6	2	0	42	42	*27*
35	0	0	6	6	*17*	260	6	0	0		48	2	1	0	48	48	*33*
36	0	0	0	0	*11*	260	6	6	6		50	1	0	0	50	50	*35*
37	6	8	0	-8	*1*	268	12	6	12		51	0	0	0	45	45	*29*
38	6	18	0	-18	*-7*	286	20	12	24		45	0	0	0	39	39	*26*
39	12	20	0	-20	*-17*	306	16	20	38		39	0	0	0	27	27	*17*
40	20	30	0	-30	*-17*	336	8	16	48		27	0	10	0	7	7	*-3*

BLACK LABEL GENERAL BEER GAME MODEL

MODEL WORKSHEET

STEP 5
Place and record your orders

	Distributor		IT								BLACK LABEL		Factory	IT		
	$ 386.50											Costs	$ 245.50			
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	6	8	
4	24	6	6	14		16	4	6	0	12	12	*12*	24	4	10	
5	30	8	6	16		16	6	4	0	10	10	*12*	29	6	10	
6	36.5	8	8	20		16	4	6	0	10	10	*10*	34	6	10	
7	44.5	4	8	22		14	6	6	0	6	6	*8*	37	10	12	
8	50.5	10	4	20		12	6	10	0	4	4	*6*	39	10	16	
9	54.5	10	10	22		10	10	10	0	6	6	*8*	42	6	20	
10	58	15	10	24		16	10	6	0	6	6	*8*	45	10	16	
11	61	15	15	35		16	6	10	0	6	6	*8*	48	10	16	
12	66	6	15	40		12	10	10	3	0	-3	*-1*	51	16	20	
13	67	4	6	36		10	10	16	8	0	-8	*-6*	59	16	26	
14	71	8	4	28		10	16	16	4	0	-4	*-2*	63	10	32	
15	78.5	6	8	26		16	16	10	0	8	8	*10*	67	4	26	
16	88.5	2	6	22		24	10	4	0	16	16	*18*	75	6	14	
17	99	5	2	16		26	4	6	0	20	20	*22*	85	4	10	
18	111.5	0	5	13		24	6	4	0	22	22	*20*	96	0	10	
19	123	2	0	7		28	4	0	0	23	23	*25*	107.5	0	4	
20	130.5	5	2	7		27	0	0	0	27	27	*29*	121	4	0	
21	135.5	10	5	7		27	0	4	0	25	25	*27*	133.5	4	4	
22	135.5	20	10	17		25	4	4	0	20	20	*22*	143.5	10	8	
23	139.5	10	20	35		24	4	10	0	14	14	*16*	150.5	20	14	
24	148.5	10	10	40		18	10	20	2	0	-2	*0*	152.5	10	30	
25	167.5	30	10	40		10	20	10	2	0	-2	*0*	154.5	20	30	
26	178.5	15	30	52		20	10	20	0	8	8	*10*	158.5	15	30	
27	191.5	10	15	57		18	20	15	12	0	-12	*-10*	170.5	15	35	
28	200.5	8	10	55		20	15	15	7	0	-7	*-5*	177.5	7	30	
29	203	8	8	45		15	15	7	2	0	-2	*5*	179.5	8	22	
30	211.5	6	8	33		15	7	8	0	5	5	*12*	182	0	15	
31	224.5	6	6	24		12	8	0	0	4	4	*11*	184	3	8	
32	239.5	2	6	20		12	0	3	0	6	6	*13*	187	0	3	
33	257.5	6	2	14		6	3	0	0	0	0	*7*	187	0	3	
34	278.5	6	6	14		3	0	0	0	1	1	*8*	187.5	0	0	
35	302.5	0	6	14		1	0	0	5	0	-5	*8*	192.5	0	0	
36	327.5	0	0	12		0	0	0	11	0	-11	*2*	203.5	0	0	
37	350	0	0	11		0	0	0	11	0	-11	*2*	214.5	10	0	
38	369.5	8	0	11		0	0	10	11	0	-11	*2*	225.5	8	10	
39	383	10	8	19		0	10	8	11	0	-11	*2*	236.5	20	18	
40	386.5	20	10	29		10	8	20	9	0	-9	*4*	245.5	20	28	

BLACK LABEL GENERAL BEER GAME MODEL MODEL DATA

BLACK LABEL 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	6	12	6	12
4	4	12	3	12	6	12	4	12
5	10	8	3	12	8	12	6	12
6	14	4	10	6	8	13	6	10
7	8	0	12	-4	4	16	10	8
8	8	2	9	-9	10	12	10	6
9	8	4	14	-14	10	8	6	8
10	6	-1	12	-12	15	7	10	8
11	6	-6	6	-6	15	-3	10	8
12	8	-4	3	-3	6	-5	16	-1
13	8	0	3	3	4	-1	16	-6
14	8	1	5	5	8	10	10	-2
15	8	1	7	7	6	17	4	10
16	10	1	4	4	2	22	6	18
17	8	1	8	-3	5	21	4	22
18	6	0	10	-6	0	25	0	20
19	8	-1	10	-4	2	23	0	25
20	6	-4	10	-8	5	15	4	29
21	10	-5	6	-6	10	10	4	27
22	17	-9	10	-6	20	0	10	22
23	8	-9	20	-13	10	-4	20	16
24	10	-7	10	-11	10	-9	10	0
25	10	-5	12	-19	30	-19	20	0
26	6	-3	8	-24	15	-19	15	10
27	18	-9	4	-20	10	-21	15	-10
28	6	-12	8	-18	8	-19	7	-5
29	8	-10	6	-14	8	-3	8	5
30	6	2	6	-12	6	9	0	12
31	2	4	2	2	6	13	3	11
32	0	6	0	11	2	15	0	13
33	0	16	0	17	6	21	0	7
34	6	10	0	23	6	27	0	8
35	8	2	6	17	0	33	0	8
36	10	-6	6	11	0	35	0	2
37	8	-8	12	1	0	29	10	2
38	16	-8	20	-7	8	26	8	2
39	6	-6	16	-17	10	17	20	2
40	10	-13	8	-17	20	-3	20	4