Toy Store Simulation Report

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This simulation determines the starting price, minimum amount of each toy before reordering, and maximum amount of each toy that maximize profits. The starting prices are relative to the manufacturers suggested retail price (MSRP). These are the prices that will be used on November 8 (Day 1) and are adjusted by market trends in the last ten days. Similarly, the maximum amount of each toy and the minimum amount of each toy before ordering are also adjusted by the market trends in the last ten days.

Many assumptions were made for this simulation. This simulation is built around the assumption that the identity of the "hot" toy is completely unknown, so all of the starting prices and probabilities for which toy a customer wants to purchase are equal on Day 1 of the simulation. Furthermore, this simulation assumes customers know a toy's MSRP and walk into the store with the intention of purchasing the toy. If they are prepared to purchase a toy at MSRP, they will always purchase the toy at a price lower than the MSRP but are less likely to purchase a toy at a price greater than the MSRP. This allows the store to sell more units when needed and prevents the prices from skyrocketing. Another assumption is that customers are willing to purchase toys at a higher price as Christmas Eve approaches. Thus, the probability of purchasing a toy increases with time. This means that the probability of purchasing a toy, in this simulation, increases with time and decreases with an increase price. The simulation also assumes that the customers (parents) do not know what the "hot" toy will be and will also learn as time goes on. Thus, the probability of which toy they will purchase is initially the same for all toys and is also adjusted by market trends. It

is also assumed that the amount of customers will increase until after Black Friday where a slight decrease occurs until the following weekend. The amount of customers continues to increase from this point until Christmas Eve. Lastly, the simulation assumes that deliveries to restock on toys occur before customers can purchase toys on a given day.

For simplicity, the MSRP was set to \$100. This means that \$90 is 10% below MSRP while \$125 is 25% above MSRP. The starting prices relative to MSRP that were examined range from 10% below MSRP to 25% above MSRP. The minimum amounts examined for each toy range from 200 to 800 while the maximum amounts range from 400 to 1200. In the event that the examined minimum is above the maximum, no order was placed until the amount in the inventory was less than the maximum. The amount of time until a delivery arrives was set to 10 days. Holding costs were set to \$1 per toy per day while the order costs were determined by the quantity ordered and the number of days since the simulation started ($costs = 20(quantity\ ordered) + days$). The expected amount of customers ranges from 10 to 25 per day. The expected total amount of toys a customer wants was set to 3 per customer.

Each combination of price, minimum, and maximum is simulated 100 times to produce 100 averages of profits per day. The mean of those 100 averages was then recorded as the estimate for the average profits per day. The combination with the maximum estimate of daily profits was then selected to determine which price, minimum, and maximum would maximize profits. As seen in **Table 1**, the starting price should be the MSRP, with an initial minimum amount of 200 per toy before reordering and a initial maximum amount of 1,200 per toy.

Appendix

Table 1: Estimated Daily Profits for Each Combination

Max Stock	%MSRP \ Min Stock	200	400	600	800
400	90	3003.2259	3002.334	2990.7467	2997.8643
	95	3108.0137	3137.764	3143.3249	3129.0233
	100	3238.3611	3215.0424	3230.1713	3235.3475
	105	3242.3093	3206.9926	3236.6096	3226.745
	110	3191.3516	3149.519	3153.0983	3153.7159
	125	2816.4215	2781.4087	2773.7248	2792.6323
600	90	3063.0198	2970.918	2949.2077	2982.5354
	95	3176.3705	3105.5622	3103.0045	3118.8634
	100	3323.6515	3205.7855	3196.1202	3199.6338
	105	3350.4764	3207.4631	3163.3531	3192.4884
	110	3396.732	3193.7732	3126.7888	3124.1265
	125	3104.5327	2825.4566	2766.0409	2768.2781
900	90	3488.0254	3163.722	2986.8989	2872.7853
	95	3626.031	3338.5917	3164.1756	3026.501
	100	3708.7874	3492.2832	3281.4128	3164.2801
	105	3650.8268	3559.2639	3237.4603	3191.4616
	110	3562.0492	3478.2411	3108.9574	3149.2412
	125	3124.1987	3080.5261	2790.1525	2753.7957
1200	90	3516.0412	3498.2346	3239.3245	2908.2194
	95	3630.9859	3618.9626	3485.0354	3085.7051
	100	3723.0113	3705.0857	3652.7842	3161.0973
	105	3634.5481	3637.3152	3583.0724	3139.4685
	110	3569.1469	3538.9614	3513.1077	3081.2325
	125	3087.3325	3100.3601	3092.6071	2864.2042