

Appendix A

Simulation Results (Uniform Distribution)

Table A.1 Simulation results 1 (Uniform Distribution)

| Data | Average demand | Average inventory | Average backorder | Average order frequency | Average fill rate (%) |
|---------------------------|----------------|-------------------|-------------------|-------------------------|-----------------------|
| L = 1 | | | | | |
| L1 | 4.961 | 5.847 | 0.149 | 0.497 | 97.00 |
| L2 | 4.969 | 5.624 | 0.168 | 0.497 | 96.62 |
| H1 | 49.769 | 52.06 | 2.43 | 0.497 | 95.12 |
| H2 | 50.395 | 51.595 | 1.893 | 0.504 | 96.24 |
| LL (without postponement) | 9.93 | 11.471 | 0.317 | 0.994 | 96.81 |
| LL (with postponement) | 9.93 | 10.428 | 0.184 | 0.496 | 98.15 |
| Change (%) | 0.00 | 9.09 | 41.96 | 60.10 | 1.34 |
| HH (without postponement) | 100.164 | 103.655 | 4.323 | 1.001 | 95.68 |
| HH (with postponement) | 100.164 | 102.271 | 2.139 | 0.501 | 97.86 |
| Change (%) | 0.00 | -1.34 | -50.52 | -49.95 | 2.18 |
| HL (without postponement) | 54.738 | 57.684 | 2.598 | 0.994 | 95.25 |
| HL (with postponement) | 54.738 | 56.57 | 1.904 | 0.497 | 96.52 |
| Change (%) | 0.00 | -1.93 | -26.71 | -50.00 | 1.27 |
| LH (without postponement) | 55.356 | 57.442 | 2.042 | 1.001 | 96.31 |
| LH (with postponement) | 55.356 | 57.328 | 1.728 | 0.503 | 96.88 |
| Change (%) | 0.00 | -0.20 | -15.38 | -49.75 | 0.57 |
| L = 2 | | | | | |
| L1 | 4.961 | 10.869 | 0.141 | 0.248 | 97.16 |
| L2 | 4.969 | 11.041 | 0.185 | 0.249 | 96.28 |
| H1 | 49.769 | 102.364 | 2.034 | 0.249 | 95.91 |
| H2 | 50.395 | 101.454 | 2.052 | 0.252 | 95.93 |
| LL (without postponement) | 9.93 | 21.91 | 0.326 | 0.497 | 96.72 |
| LL (with postponement) | 9.93 | 21.219 | 0.175 | 0.248 | 98.24 |
| Change (%) | 0.00 | -3.15 | -46.32 | -50.10 | 1.52 |
| HH (without postponement) | 100.164 | 203.818 | 4.086 | 0.501 | 95.92 |
| HH (with postponement) | 100.164 | 203.352 | 1.82 | 0.25 | 98.18 |
| Change (%) | 0.00 | -0.23 | -55.46 | -50.10 | 2.26 |
| HL (without postponement) | 54.738 | 113.405 | 2.219 | 0.498 | 95.95 |
| HL (with postponement) | 54.738 | 112.035 | 1.929 | 0.249 | 96.48 |
| Change (%) | 0.00 | -1.21 | -13.07 | -50.00 | 0.53 |
| LH (without postponement) | 55.356 | 112.323 | 2.193 | 0.5 | 96.04 |
| LH (with postponement) | 55.356 | 111.867 | 2.257 | 0.252 | 95.92 |
| Change (%) | 0.00 | -0.41 | 2.92 | -49.60 | -0.12 |
| L = 3 | | | | | |
| L1 | 4.961 | 15.691 | 0.203 | 0.166 | 95.91 |
| L2 | 4.969 | 15.76 | 0.154 | 0.166 | 96.90 |
| H1 | 49.769 | 152.396 | 1.666 | 0.166 | 96.65 |
| H2 | 50.395 | 150.142 | 2.44 | 0.168 | 95.16 |
| LL (without postponement) | 9.93 | 31.451 | 0.357 | 0.332 | 96.40 |
| LL (with postponement) | 9.93 | 30.344 | 0.18 | 0.165 | 98.19 |

Table A.1 (continued)

| Data | Average demand | Average inventory | Average backorder | Average order frequency | Average fill rate (%) |
|---------------------------|----------------|-------------------|-------------------|-------------------------|-----------------------|
| Change (%) | 0.00 | -3.52 | -49.58 | -50.30 | 1.78 |
| HH (without postponement) | 100.164 | 302.538 | 4.106 | 0.334 | 95.90 |
| HH (with postponement) | 100.164 | 297.774 | 2.042 | 0.167 | 97.96 |
| Change (%) | 0.00 | -1.57 | -50.27 | -50.00 | 2.06 |
| HL (without postponement) | 54.738 | 168.156 | 1.82 | 0.332 | 96.68 |
| HL (with postponement) | 54.738 | 169.162 | 1.416 | 0.166 | 97.41 |
| Change (%) | 0.00 | 0.60 | -22.20 | -50.00 | 0.74 |
| LH (without postponement) | 55.356 | 165.833 | 2.643 | 0.334 | 95.23 |
| LH (with postponement) | 55.356 | 165.404 | 2.334 | 0.168 | 95.78 |
| Change (%) | 0.00 | -0.26 | -11.69 | -49.70 | 0.56 |

Table A.2 Simulation results 2 (Uniform Distribution)

| Data | Average demand | Average inventory | Average backorder | Average order frequency | Average fill rate (%) |
|---------------------------|----------------|-------------------|-------------------|-------------------------|-----------------------|
| L = 5 | | | | | |
| L1 | 4.961 | 25.688 | 0.21 | 0.099 | 95.77 |
| L2 | 4.969 | 25.534 | 0.198 | 0.1 | 96.02 |
| H1 | 49.769 | 250.314 | 2.184 | 0.099 | 95.61 |
| H2 | 50.395 | 256.118 | 2.116 | 0.101 | 95.80 |
| LL (without postponement) | 9.93 | 51.222 | 0.408 | 0.199 | 95.89 |
| LL (with postponement) | 9.93 | 51.447 | 0.183 | 0.099 | 98.16 |
| Change (%) | 0.00 | 0.44 | -55.15 | -50.25 | 2.27 |
| HH (without postponement) | 100.164 | 506.432 | 4.3 | 0.2 | 95.71 |
| HH (with postponement) | 100.164 | 507.507 | 2.375 | 0.1 | 97.63 |
| Change (%) | 0.00 | 0.21 | -44.77 | -50.00 | 1.92 |
| HL (without postponement) | 54.738 | 275.848 | 2.382 | 0.199 | 95.65 |
| HL (with postponement) | 54.738 | 277.061 | 1.845 | 0.099 | 96.63 |
| Change (%) | 0.00 | 0.44 | -22.54 | -50.25 | 0.98 |
| LH (without postponement) | 55.356 | 281.806 | 2.326 | 0.2 | 95.80 |
| LH (with postponement) | 55.356 | 276.117 | 1.837 | 0.101 | 96.68 |
| Change (%) | 0.00 | -2.02 | -21.02 | -49.50 | 0.88 |
| L = 10 | | | | | |
| L1 | 4.961 | 51.444 | 0.116 | 0.05 | 97.66 |
| L2 | 4.969 | 50.847 | 0.211 | 0.049 | 95.75 |
| H1 | 49.769 | 508.342 | 1.212 | 0.05 | 97.56 |
| H2 | 50.395 | 491.972 | 2.97 | 0.05 | 94.11 |
| LL (without postponement) | 9.93 | 102.291 | 0.327 | 0.099 | 96.71 |
| LL (with postponement) | 9.93 | 102.126 | 0.162 | 0.049 | 98.37 |
| Change (%) | 0.00 | -0.16 | -50.46 | -50.51 | 1.66 |
| HH (without postponement) | 100.164 | 1,000.314 | 4.182 | 0.1 | 95.82 |
| HH (with postponement) | 100.164 | 995.633 | 2.501 | 0.05 | 97.50 |

Table A.2 (continued)

| Data | Average demand | Average inventory | Average backorder | Average order frequency | Average fill rate (%) |
|---------------------------|----------------|-------------------|-------------------|-------------------------|-----------------------|
| Change (%) | 0.00 | -0.47 | -40.20 | -50.00 | 1.68 |
| HL (without postponement) | 54.738 | 559.189 | 1.423 | 0.099 | 97.40 |
| HL (with postponement) | 54.738 | 556.338 | 1.172 | 0.05 | 97.86 |
| Change (%) | 0.00 | -0.51 | -17.64 | -49.49 | 0.46 |
| LH (without postponement) | 55.356 | 543.416 | 3.086 | 0.1 | 94.43 |
| LH (with postponement) | 55.356 | 546.036 | 2.806 | 0.05 | 94.93 |
| Change (%) | 0.00 | 0.48 | -9.07 | -50.00 | 0.51 |
| L = 20 | | | | | |
| L1 | 4.961 | 101.082 | 0.054 | 0.025 | 98.91 |
| L2 | 4.969 | 101.194 | 0.258 | 0.025 | 94.81 |
| H1 | 49.769 | 1,001.791 | 1.661 | 0.025 | 96.66 |
| H2 | 50.395 | 1,013.586 | 2.584 | 0.025 | 94.87 |
| LL (without postponement) | 9.93 | 202.276 | 0.312 | 0.05 | 96.86 |
| LL (with postponement) | 9.93 | 201.732 | 0.168 | 0.025 | 98.31 |
| Change (%) | 0.00 | -0.27 | -46.15 | -50.00 | 1.45 |
| HH (without postponement) | 100.164 | 2,015.377 | 4.245 | 0.05 | 95.76 |
| HH (with postponement) | 100.164 | 2,027.159 | 2.027 | 0.025 | 97.98 |
| Change (%) | 0.00 | 0.58 | -52.25 | -50.00 | 2.21 |
| HL (without postponement) | 54.738 | 1,102.985 | 1.919 | 0.05 | 96.49 |
| HL (with postponement) | 54.738 | 1,083.868 | 1.802 | 0.025 | 96.71 |
| Change (%) | 0.00 | -1.73 | -6.10 | -50.00 | 0.21 |
| LH (without postponement) | 55.356 | 1,114.668 | 2.638 | 0.05 | 95.23 |
| LH (with postponement) | 55.356 | 1,111.164 | 2.534 | 0.025 | 95.42 |
| Change (%) | 0.00 | -0.31 | -3.94 | -50.00 | 0.19 |

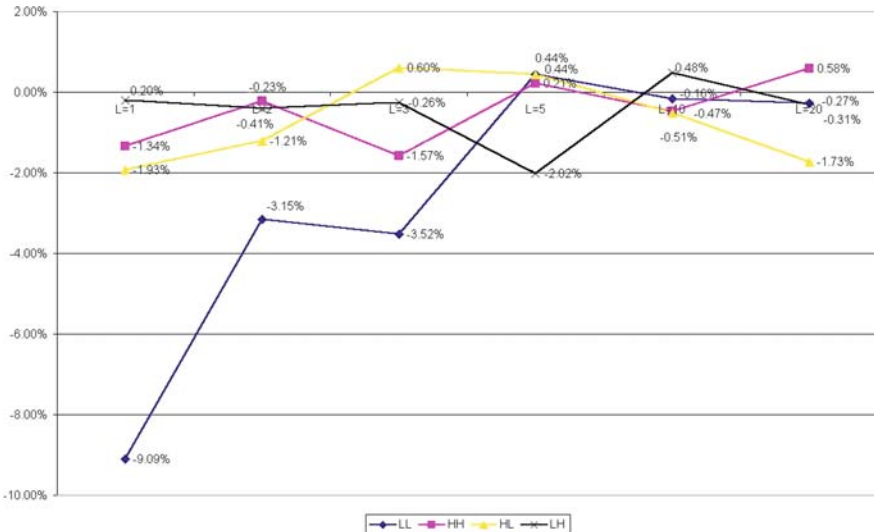


Fig. A.1 Difference in average inventory (Uniform Distribution)

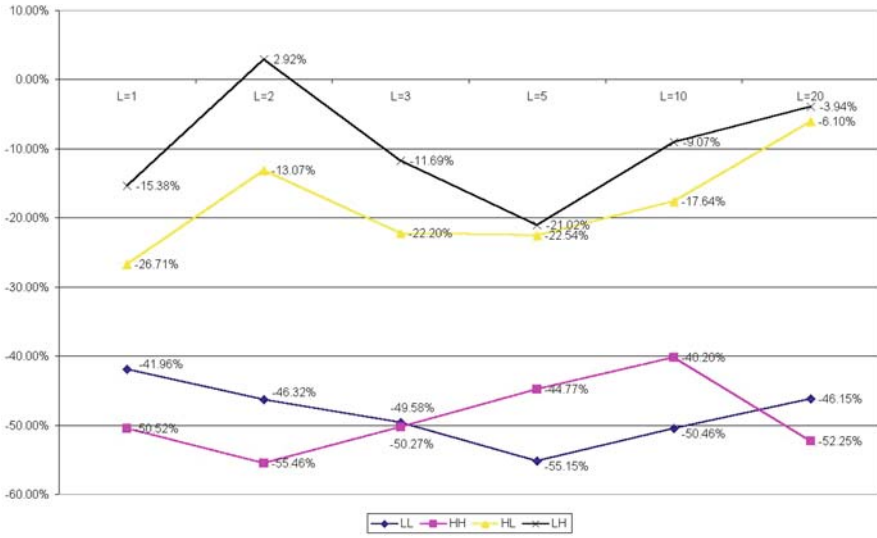


Fig. A.2 Difference in average backorder (Uniform Distribution)

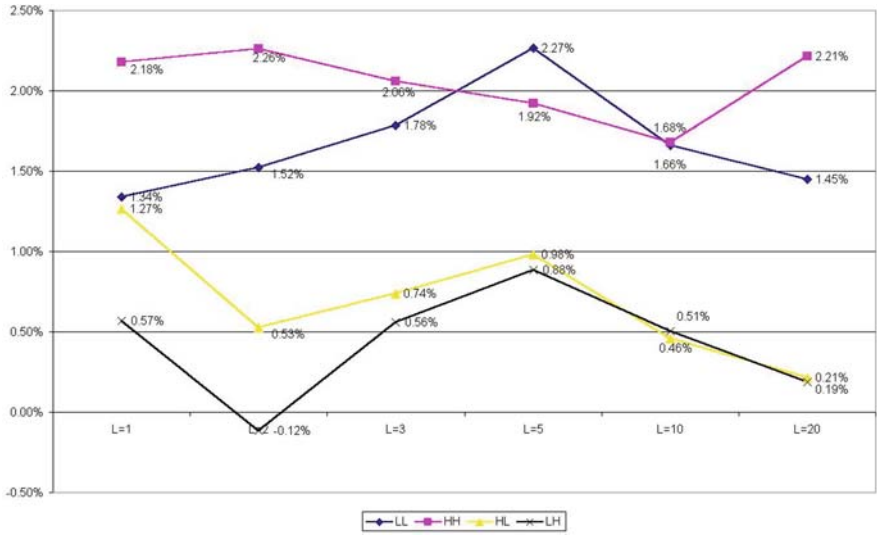


Fig. A.3 Improvement in average fill rate (Uniform Distribution)

Appendix B

Simulation Results (Poisson Distribution)

Table B.1 Simulation results 1 (Poisson Distribution)

| Data | Average demand | Average inventory | Average backorder | Average order frequency | Average fill rate (%) |
|-----------------------|----------------|-------------------|-------------------|-------------------------|-----------------------|
| L = 1 | | | | | |
| L1 | 9.954 | 10.777 | 0.094 | 0.498 | 99.06 |
| L2 | 10.01 | 10.692 | 0.142 | 0.5 | 98.58 |
| H1 | 100.305 | 104.872 | 0.122 | 0.502 | 99.88 |
| H2 | 100.522 | 97.846 | 0.159 | 0.502 | 99.84 |
| LL (non-postponement) | 19.964 | 21.469 | 0.236 | 0.998 | 98.82 |
| LL (postponement) | 19.964 | 20.711 | 0.098 | 0.499 | 99.51 |
| Change (%) | 0.00 | -3.53 | -58.47 | -50.00 | 0.69 |
| HH (non-postponement) | 200.827 | 202.718 | 0.281 | 1.004 | 99.86 |
| HH (postponement) | 200.827 | 196.006 | 0.169 | 0.503 | 99.92 |
| Change (%) | 0.00 | -3.31 | -39.86 | -49.90 | 0.06 |
| HL (non-postponement) | 110.315 | 115.564 | 0.264 | 1.002 | 99.76 |
| HL (postponement) | 110.315 | 108.985 | 0.125 | 0.502 | 99.89 |
| Change (%) | 0.00 | -5.69 | -52.65 | -49.90 | 0.13 |
| LH (non-postponement) | 110.476 | 108.623 | 0.253 | 1 | 99.77 |
| LH (postponement) | 110.476 | 109.978 | 0.148 | 0.502 | 99.87 |
| Change (%) | 0.00 | 1.25 | -41.50 | -49.80 | 0.10 |
| L = 2 | | | | | |
| L1 | 9.954 | 20.974 | 0.091 | 0.248 | 99.09 |
| L2 | 10.01 | 20.804 | 0.114 | 0.251 | 98.86 |
| H1 | 100.305 | 204.688 | 0.138 | 0.25 | 99.86 |
| H2 | 100.522 | 197.417 | 0.13 | 0.251 | 99.87 |
| LL (non-postponement) | 19.964 | 41.778 | 0.205 | 0.499 | 98.97 |
| LL (postponement) | 19.964 | 40.558 | 0.105 | 0.249 | 99.47 |
| Change (%) | 0.00 | -2.92 | -48.78 | -50.10 | 0.50 |
| HH (non-postponement) | 200.827 | 402.105 | 0.268 | 0.501 | 99.87 |
| HH (postponement) | 200.827 | 397.608 | 0.171 | 0.251 | 99.91 |
| Change (%) | 0.00 | -1.12 | -36.19 | -49.90 | 0.05 |
| HL (non-postponement) | 110.315 | 225.492 | 0.252 | 0.501 | 99.77 |
| HL (postponement) | 110.315 | 217.462 | 0.142 | 0.25 | 99.87 |
| Change (%) | 0.00 | -3.56 | -43.65 | -50.10 | 0.10 |
| LH (non-postponement) | 110.476 | 218.391 | 0.221 | 0.499 | 99.80 |
| LH (postponement) | 110.476 | 221.485 | 0.115 | 0.251 | 99.90 |
| Change (%) | 0.00 | 1.42 | -47.96 | -49.70 | 0.10 |
| L = 3 | | | | | |
| L1 | 9.954 | 31.032 | 0.129 | 0.166 | 98.70 |
| L2 | 10.01 | 30.993 | 0.123 | 0.167 | 98.77 |
| H1 | 100.305 | 304.466 | 0.116 | 0.167 | 99.88 |
| H2 | 100.522 | 297.068 | 0.181 | 0.167 | 99.82 |
| LL (non-postponement) | 19.964 | 62.025 | 0.252 | 0.333 | 98.74 |

Table B.1 (continued)

| Data | Average demand | Average inventory | Average backorder | Average order frequency | Average fill rate (%) |
|-----------------------|----------------|-------------------|-------------------|-------------------------|-----------------------|
| LL (postponement) | 19.964 | 60.905 | 0.092 | 0.166 | 99.54 |
| Change (%) | 0.00 | -1.81 | -63.49 | -50.15 | 0.80 |
| HH (non-postponement) | 200.827 | 601.534 | 0.297 | 0.334 | 99.85 |
| HH (postponement) | 200.827 | 595.96 | 0.123 | 0.167 | 99.94 |
| Change (%) | 0.00 | -0.93 | -58.59 | -50.00 | 0.09 |
| HL (non-postponement) | 110.315 | 335.459 | 0.239 | 0.334 | 99.78 |
| HL (postponement) | 110.315 | 327.695 | 0.155 | 0.167 | 99.86 |
| Change (%) | 0.00 | -2.31 | -35.15 | -50.00 | 0.08 |
| LH (non-postponement) | 110.476 | 328.1 | 0.31 | 0.333 | 99.72 |
| LH (postponement) | 110.476 | 330.643 | 0.153 | 0.167 | 99.86 |
| Change (%) | 0.00 | 0.78 | -50.65 | -49.85 | 0.14 |

Table B.2 Simulation results 2 (Poisson Distribution)

| Data | Average demand | Average inventory | Average backorder | Average order frequency | Average fill rate (%) |
|-----------------------|----------------|-------------------|-------------------|-------------------------|-----------------------|
| L = 5 | | | | | |
| L1 | 9.954 | 51.773 | 0.07 | 0.1 | 99.30 |
| L2 | 10.01 | 51.199 | 0.069 | 0.1 | 99.31 |
| H1 | 100.305 | 504.216 | 0.066 | 0.101 | 99.93 |
| H2 | 100.522 | 497.047 | 0.16 | 0.1 | 99.84 |
| LL (non-postponement) | 19.964 | 102.972 | 0.139 | 0.2 | 99.30 |
| LL (postponment) | 19.964 | 100.461 | 0.128 | 0.1 | 99.36 |
| Change (%) | 0.00 | -2.44 | -7.91 | -50.00 | 0.06 |
| HH (non-postponement) | 200.827 | 1,001.263 | 0.226 | 0.201 | 99.89 |
| HH (postponement) | 200.827 | 987.317 | 0.28 | 0.101 | 99.86 |
| Change (%) | 0.00 | -1.39 | 23.89 | -49.75 | -0.03 |
| HL (non-postponement) | 110.315 | 555.415 | 0.135 | 0.201 | 99.88 |
| HL (postponement) | 110.315 | 551.419 | 0.139 | 0.101 | 99.87 |
| Change (%) | 0.00 | -0.72 | 2.96 | -49.75 | 0.00 |
| LH (non-postponement) | 110.476 | 548.82 | 0.23 | 0.2 | 99.79 |
| LH (postponement) | 110.476 | 546.298 | 0.208 | 0.1 | 99.81 |
| Change (%) | 0.00 | -0.46 | -9.57 | -50.00 | 0.02 |
| L = 10 | | | | | |
| L1 | 9.954 | 101.312 | 0.109 | 0.05 | 98.90 |
| L2 | 10.01 | 99.877 | 0.147 | 0.05 | 98.53 |
| H1 | 100.305 | 1,000.279 | 0.129 | 0.05 | 99.87 |
| H2 | 100.522 | 983.228 | 0.341 | 0.05 | 99.66 |
| LL (non-postponement) | 19.964 | 201.189 | 0.256 | 0.1 | 98.72 |
| LL (postponment) | 19.964 | 199.152 | 0.219 | 0.05 | 98.90 |
| Change (%) | 0.00 | -1.01 | -14.45 | -50.00 | 0.19 |
| HH (non-postponement) | 200.827 | 1,983.507 | 0.47 | 0.1 | 99.77 |
| HH (postponement) | 200.827 | 1,983.327 | 0.29 | 0.05 | 99.86 |

Table B.2 (continued)

| Data | Average demand | Average inventory | Average backorder | Average order frequency | Average fill rate (%) |
|-----------------------|----------------|-------------------|-------------------|-------------------------|-----------------------|
| Change (%) | 0.00 | -0.01 | -38.30 | -50.00 | 0.09 |
| HL (non-postponement) | 110.315 | 1,100.156 | 0.276 | 0.1 | 99.75 |
| HL (postponement) | 110.315 | 1,097.006 | 0.126 | 0.05 | 99.89 |
| Change (%) | 0.00 | -0.29 | -54.35 | -50.00 | 0.14 |
| LH (non-postponement) | 110.476 | 1,084.54 | 0.45 | 0.1 | 99.59 |
| LH (postponement) | 110.476 | 1,094.102 | 0.212 | 0.05 | 99.81 |
| Change (%) | 0.00 | 0.88 | -52.89 | -50.00 | 0.22 |
| L = 20 | | | | | |
| L1 | 9.954 | 200.371 | 0.168 | 0.024 | 98.31 |
| L2 | 10.01 | 200.48 | 0.15 | 0.025 | 98.50 |
| H1 | 100.305 | 1,996.4 | 0.25 | 0.025 | 99.75 |
| H2 | 100.522 | 2,003.006 | 0.119 | 0.026 | 99.88 |
| LL (non-postponement) | 19.964 | 400.851 | 0.318 | 0.049 | 98.41 |
| LL (postponment) | 19.964 | 402.227 | 0.094 | 0.025 | 99.53 |
| Change (%) | 0.00 | 0.34 | -70.44 | -48.98 | 1.12 |
| HH (non-postponement) | 200.827 | 3,999.406 | 0.369 | 0.051 | 99.82 |
| HH (postponement) | 200.827 | 3,947.468 | 0.431 | 0.025 | 99.79 |
| Change (%) | 0.00 | -1.30 | 16.80 | -50.98 | -0.03 |
| HL (non-postponement) | 110.315 | 2,196.88 | 0.4 | 0.05 | 99.64 |
| HL (postponement) | 110.315 | 2,183.976 | 0.296 | 0.025 | 99.73 |
| Change (%) | 0.00 | -0.59 | -26.00 | -50.00 | 0.09 |
| LH (non-postponement) | 110.476 | 2,203.377 | 0.287 | 0.05 | 99.74 |
| LH (postponement) | 110.476 | 2,193.983 | 0.093 | 0.026 | 99.92 |
| Change (%) | 0.00 | -0.43 | -67.60 | -48.00 | 0.18 |

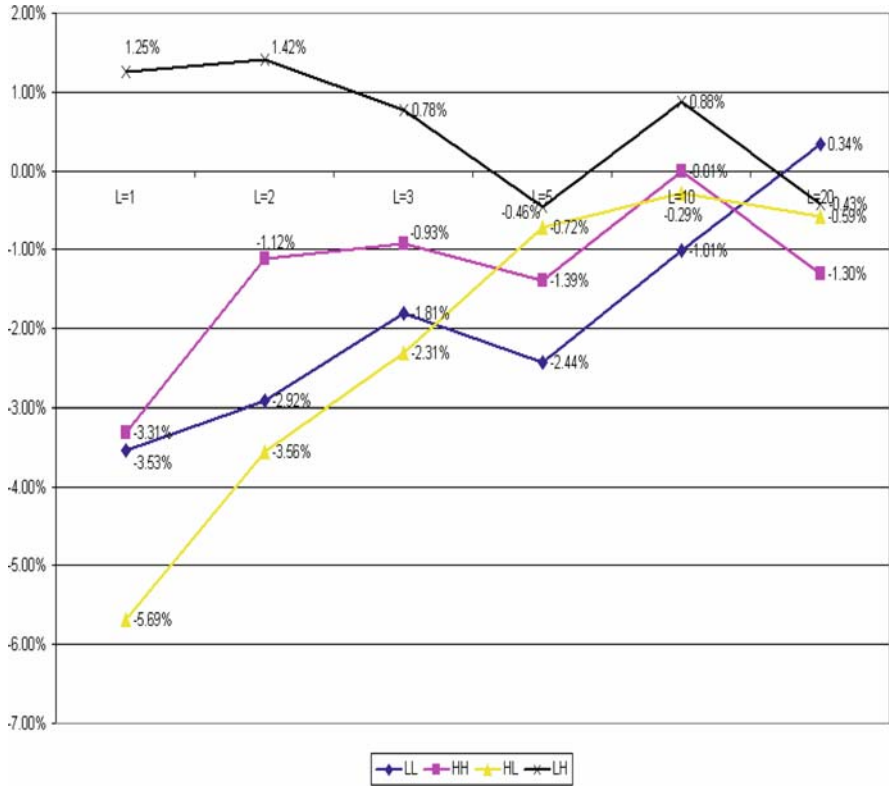


Fig. B.1 Difference in average inventory (Poisson Distribution)

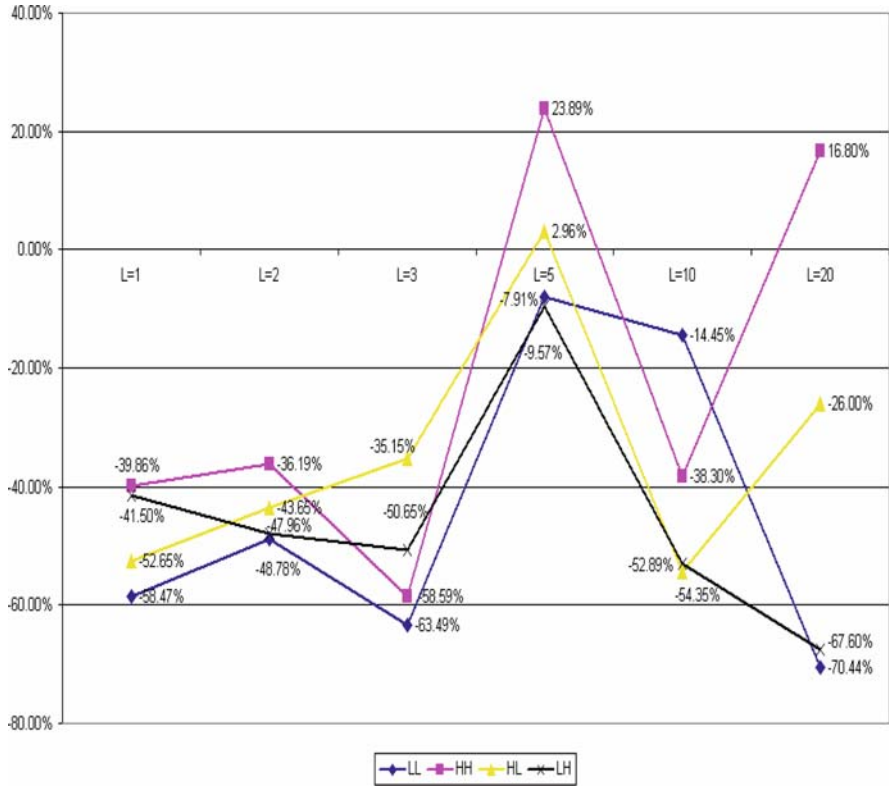


Fig. B.2 Difference in average backorder (Poisson Distribution)

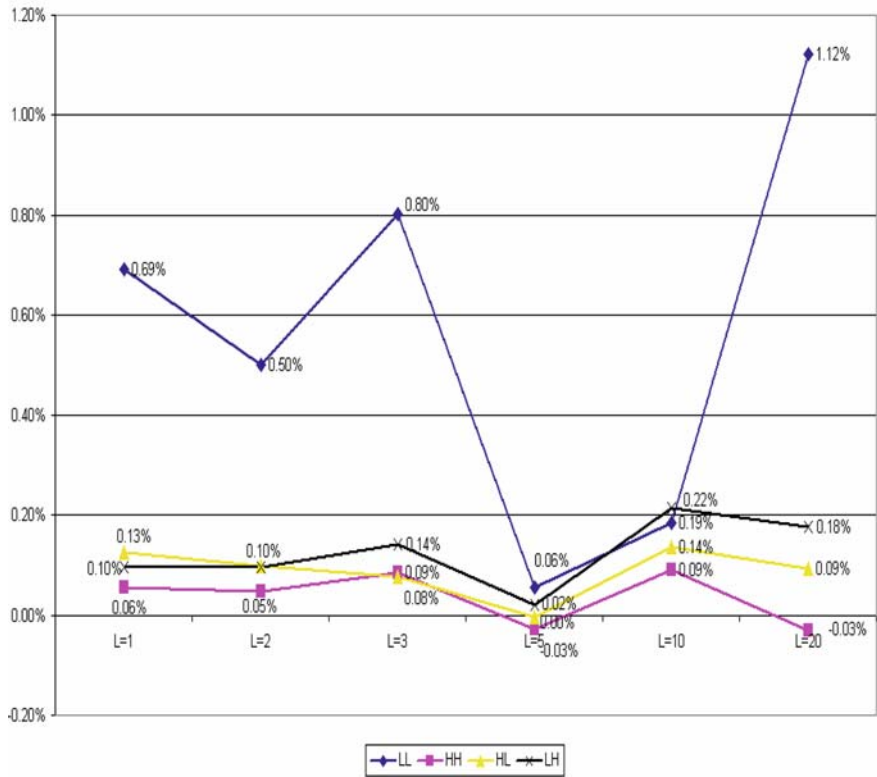


Fig. B.3 Improvement in average fill rate (Poisson Distribution)

Appendix C

Simulation Results (Normal Distribution I)

Table C.1 Simulation results 1 (Normal Distribution I)

| Data | Average demand | Average inventory | Average backorder | Average order frequency | Average fill rate (%) |
|-----------------------|----------------|-------------------|-------------------|-------------------------|-----------------------|
| L = 1 | | | | | |
| L1 | 10.033 | 10.663 | 0.303 | 0.501 | 96.98 |
| L2 | 9.981 | 10.878 | 0.269 | 0.499 | 97.30 |
| H1 | 100.045 | 103.47 | 3.488 | 0.501 | 96.51 |
| H2 | 101.25 | 100.865 | 3.504 | 0.506 | 96.54 |
| LL (non-postponement) | 20.014 | 21.541 | 0.572 | 1 | 97.14 |
| LL (postponement) | 20.014 | 20.646 | 0.297 | 0.501 | 98.52 |
| Change (%) | 0.00 | -4.15 | -48.08 | -49.90 | 1.37 |
| HH (non-postponement) | 201.295 | 204.335 | 6.992 | 1.007 | 96.53 |
| HH (postponement) | 201.295 | 206.539 | 3.196 | 0.503 | 98.41 |
| Change (%) | 0.00 | 1.08 | -54.29 | -50.05 | 1.89 |
| HL (non-postponement) | 110.026 | 114.348 | 3.757 | 1 | 96.59 |
| HL (postponement) | 110.026 | 113.906 | 2.655 | 0.5 | 97.59 |
| Change (%) | 0.00 | -0.39 | -29.33 | -50.00 | 1.00 |
| LH (non-postponement) | 111.283 | 111.528 | 3.807 | 1.007 | 96.58 |
| LH (postponement) | 111.283 | 108.775 | 2.974 | 0.505 | 97.33 |
| Change (%) | 0.00 | -2.47 | -21.88 | -49.85 | 0.75 |
| L = 2 | | | | | |
| L1 | 10.033 | 20.485 | 0.265 | 0.251 | 97.36 |
| L2 | 9.981 | 20.891 | 0.322 | 0.249 | 96.77 |
| H1 | 100.045 | 205.071 | 2.689 | 0.25 | 97.31 |
| H2 | 101.25 | 199.159 | 2.598 | 0.253 | 97.43 |
| LL (non-postponement) | 20.014 | 41.376 | 0.587 | 0.5 | 97.07 |
| LL (postponement) | 20.014 | 40.673 | 0.244 | 0.25 | 98.78 |
| Change (%) | 0.00 | -1.70 | -58.43 | -50.00 | 1.71 |
| HH (non-postponement) | 201.295 | 404.23 | 5.287 | 0.503 | 97.37 |
| HH (postponement) | 201.295 | 402.628 | 2.885 | 0.252 | 98.57 |
| Change (%) | 0.00 | -0.40 | -45.43 | -49.90 | 1.19 |
| HL (non-postponement) | 110.026 | 225.962 | 3.011 | 0.499 | 97.26 |
| HL (postponement) | 110.026 | 222.161 | 2.45 | 0.25 | 97.77 |
| Change (%) | 0.00 | -1.68 | -18.63 | -49.90 | 0.51 |
| LH (non-postponement) | 111.283 | 219.644 | 2.863 | 0.504 | 97.43 |
| LH (postponement) | 111.283 | 223.103 | 4.002 | 0.253 | 96.40 |
| Change (%) | 0.00 | 1.57 | 39.78 | -49.80 | -1.02 |
| L = 3 | | | | | |
| L1 | 10.033 | 30.239 | 0.339 | 0.167 | 96.62 |
| L2 | 9.981 | 30.682 | 0.353 | 0.166 | 96.46 |
| H1 | 100.045 | 295.628 | 3.846 | 0.167 | 96.16 |
| H2 | 101.25 | 298.052 | 3.091 | 0.169 | 96.95 |
| LL (non-postponement) | 20.014 | 60.921 | 0.692 | 0.333 | 96.54 |

Table C.1 (continued)

| Data | Average demand | Average inventory | Average backorder | Average order frequency | Average fill rate (%) |
|-----------------------|----------------|-------------------|-------------------|-------------------------|-----------------------|
| LL (postponement) | 20.014 | 60.988 | 0.279 | 0.167 | 98.61 |
| Change (%) | 0.00 | 0.11 | -59.68 | -49.85 | 2.06 |
| HH (non-postponement) | 201.295 | 593.68 | 6.937 | 0.336 | 96.55 |
| HH (postponement) | 201.295 | 595.024 | 4.081 | 0.168 | 97.97 |
| Change (%) | 0.00 | 0.23 | -41.17 | -50.00 | 1.42 |
| HL (non-postponement) | 110.026 | 326.31 | 4.199 | 0.333 | 96.18 |
| HL (postponement) | 110.026 | 336.909 | 2.798 | 0.166 | 97.46 |
| Change (%) | 0.00 | 3.25 | -33.37 | -50.15 | 1.27 |
| LH (non-postponement) | 111.283 | 328.291 | 3.43 | 0.336 | 96.92 |
| LH (postponement) | 111.283 | 324.889 | 3.268 | 0.168 | 97.06 |
| Change (%) | 0.00 | -1.04 | -4.72 | -50.00 | 0.15 |

Table C.2 Simulation results 2 (Normal Distribution I)

| Data | Average demand | Average inventory | Average backorder | Average order frequency | Average fill rate (%) |
|-----------------------|----------------|-------------------|-------------------|-------------------------|-----------------------|
| L = 5 | | | | | |
| L1 | 10.033 | 50.894 | 0.394 | 0.1 | 96.07 |
| L2 | 9.981 | 51.644 | 0.295 | 0.099 | 97.04 |
| H1 | 100.045 | 505.674 | 3.092 | 0.1 | 96.91 |
| H2 | 101.25 | 503.021 | 3.46 | 0.101 | 96.58 |
| LL (non-postponement) | 20.014 | 102.538 | 0.689 | 0.199 | 96.56 |
| LL (postponement) | 20.014 | 101.29 | 0.341 | 0.1 | 98.30 |
| Change (%) | 0.00 | -1.22 | -50.51 | -49.75 | 1.74 |
| HH (non-postponement) | 201.295 | 1,008.695 | 6.552 | 0.201 | 96.75 |
| HH (postponement) | 201.295 | 1,010.098 | 3.955 | 0.1 | 98.04 |
| Change (%) | 0.00 | 0.14 | -39.64 | -50.25 | 1.29 |
| HL (non-postponement) | 110.026 | 557.318 | 3.387 | 0.199 | 96.92 |
| HL (postponement) | 110.026 | 549.165 | 2.534 | 0.1 | 97.70 |
| Change (%) | 0.00 | -1.46 | -25.18 | -49.75 | 0.78 |
| LH (non-postponement) | 111.283 | 553.915 | 3.854 | 0.201 | 96.54 |
| LH (postponement) | 111.283 | 553.194 | 2.333 | 0.101 | 97.90 |
| Change (%) | 0.00 | -0.13 | -39.47 | -49.75 | 1.37 |
| L = 10 | | | | | |
| L1 | 10.033 | 101.547 | 0.247 | 0.05 | 97.54 |
| L2 | 9.981 | 100.852 | 0.403 | 0.05 | 95.96 |
| H1 | 100.045 | 1,009.158 | 3.576 | 0.05 | 96.43 |
| H2 | 101.25 | 996.001 | 5.44 | 0.051 | 94.63 |
| LL (non-postponement) | 20.014 | 202.399 | 0.65 | 0.1 | 96.75 |
| LL (postponement) | 20.014 | 200.651 | 0.302 | 0.05 | 98.49 |
| Change (%) | 0.00 | -0.86 | -53.54 | -50.00 | 1.74 |
| HH (non-postponement) | 201.295 | 2,005.159 | 9.016 | 0.101 | 95.52 |
| HH (postponement) | 201.295 | 1,989.497 | 3.354 | 0.051 | 98.33 |
| Change (%) | 0.00 | -0.78 | -62.80 | -49.50 | 2.81 |
| HL (non-postponement) | 110.026 | 1110.01 | 3.979 | 0.1 | 96.38 |

Table C.2 (continued)

| Data | Average demand | Average inventory | Average backorder | Average order frequency | Average fill rate (%) |
|-----------------------|----------------|-------------------|-------------------|-------------------------|-----------------------|
| HL (postponement) | 110.026 | 1, 108.647 | 3.216 | 0.05 | 97.08 |
| Change (%) | 0.00 | -0.12 | -19.18 | -50.00 | 0.69 |
| LH (non-postponement) | 111.283 | 1, 097.548 | 5.687 | 0.101 | 94.89 |
| LH (postponement) | 111.283 | 1, 096.416 | 4.355 | 0.051 | 96.09 |
| Change (%) | 0.00 | -0.10 | -23.42 | -49.50 | 1.20 |
| L = 20 | | | | | |
| L1 | 10.033 | 199.512 | 0.212 | 0.025 | 97.89 |
| L2 | 9.981 | 195.954 | 0.505 | 0.025 | 94.94 |
| H1 | 100.045 | 1, 988.154 | 2.572 | 0.025 | 97.43 |
| H2 | 101.25 | 1, 979.427 | 6.866 | 0.025 | 93.22 |
| LL (non-postponement) | 20.014 | 395.466 | 0.717 | 0.05 | 96.42 |
| LL (postponement) | 20.014 | 397.468 | 0.319 | 0.025 | 98.41 |
| Change (%) | 0.00 | 0.51 | -55.51 | -50.00 | 1.99 |
| HH (non-postponement) | 201.295 | 3, 967.581 | 9.438 | 0.05 | 95.31 |
| HH (postponement) | 201.295 | 3, 997.116 | 2.973 | 0.025 | 98.52 |
| Change (%) | 0.00 | 0.74 | -68.50 | -50.00 | 3.21 |
| HL (non-postponement) | 110.026 | 2, 184.108 | 3.077 | 0.05 | 97.20 |
| HL (postponement) | 110.026 | 2, 181.633 | 2.602 | 0.025 | 97.64 |
| Change (%) | 0.00 | -0.11 | -15.44 | -50.00 | 0.43 |
| LH (non-postponement) | 111.283 | 2, 178.939 | 7.078 | 0.05 | 93.64 |
| LH (postponement) | 111.283 | 2, 198.638 | 4.377 | 0.025 | 96.07 |
| Change (%) | 0.00 | 0.90 | -38.16 | -50.00 | 2.43 |

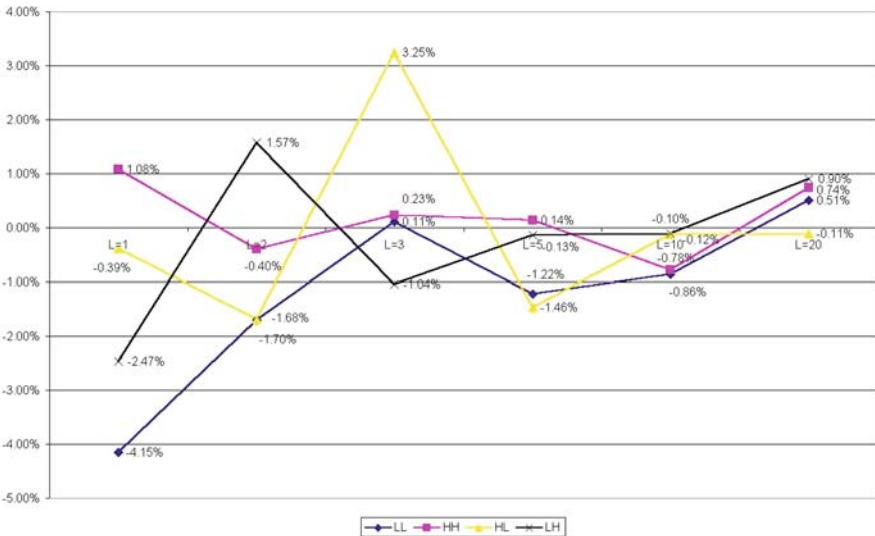


Fig. C.1 Difference in average inventory (Normal Distribution I)

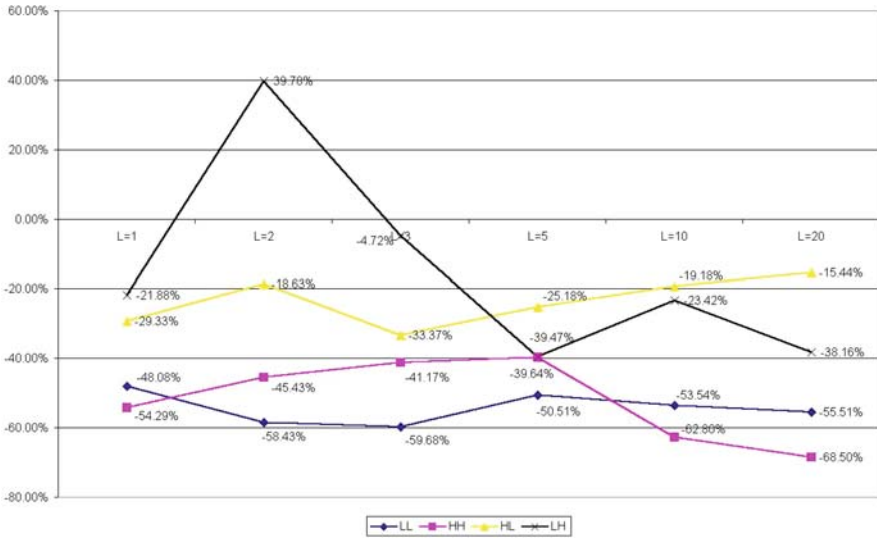


Fig. C.2 Difference in average backorder (Normal Distribution I)

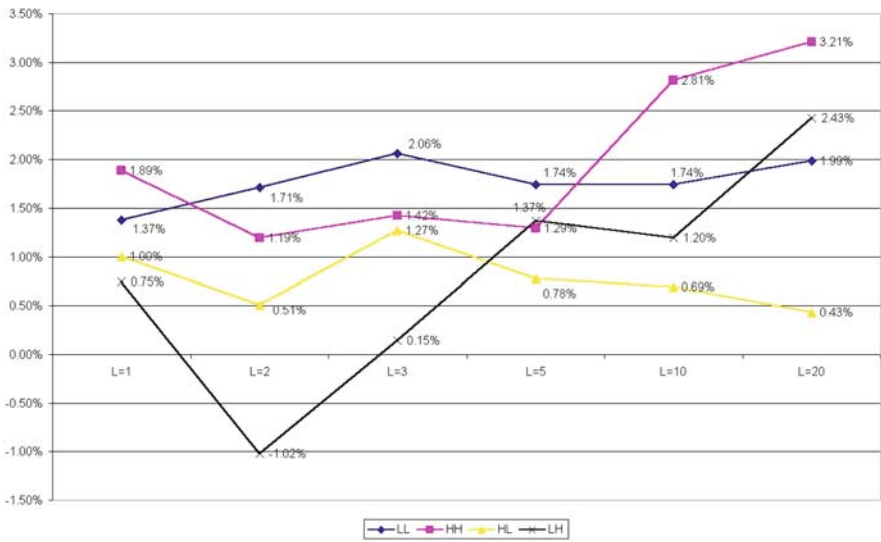


Fig. C.3 Improvement in average fill rate (Normal Distribution I)

Appendix D

Simulation Results (Normal Distribution II)

Table D.1 Simulation results 1 (Normal Distribution II)

| Data | Average demand | Average inventory | Average backorder | Average order frequency | Average fill rate (%) |
|-----------------------|----------------|-------------------|-------------------|-------------------------|-----------------------|
| L = 1 | | | | | |
| L1 | 10.041 | 10.481 | 0.027 | 0.502 | 99.73 |
| L2 | 9.979 | 10.571 | 0.013 | 0.499 | 99.87 |
| H1 | 99.435 | 101.695 | 0.57 | 0.497 | 99.43 |
| H2 | 100.134 | 101.964 | 0.445 | 0.501 | 99.56 |
| LL (non-postponement) | 20.02 | 21.052 | 0.04 | 1.001 | 99.80 |
| LL (postponement) | 20.02 | 20.607 | 0.035 | 0.501 | 99.83 |
| Change (%) | 0.00 | -2.11 | -12.50 | -49.95 | 0.02 |
| HH (non-postponement) | 199.569 | 203.659 | 1.015 | 0.998 | 99.49 |
| HH (postponement) | 199.569 | 202.283 | 0.439 | 0.499 | 99.78 |
| Change (%) | 0.00 | -0.68 | -56.75 | -50.00 | 0.29 |
| HL (non-postponement) | 109.414 | 112.266 | 0.583 | 0.996 | 99.47 |
| HL (postponement) | 109.414 | 112.655 | 0.392 | 0.497 | 99.64 |
| Change (%) | 0.00 | 0.35 | -32.76 | -50.10 | 0.17 |
| LH (non-postponement) | 110.175 | 112.445 | 0.472 | 1.003 | 99.57 |
| LH (postponement) | 110.175 | 113.113 | 0.44 | 0.501 | 99.60 |
| Change (%) | 0.00 | 0.59 | -6.78 | -50.05 | 0.03 |
| L = 2 | | | | | |
| L1 | 10.041 | 20.392 | 0.018 | 0.251 | 99.82 |
| L2 | 9.979 | 20.395 | 0.037 | 0.249 | 99.63 |
| H1 | 99.435 | 203.56 | 0.435 | 0.248 | 99.56 |
| H2 | 100.134 | 199.819 | 0.7 | 0.251 | 99.30 |
| LL (non-postponement) | 20.02 | 40.787 | 0.055 | 0.5 | 99.73 |
| LL (postponement) | 20.02 | 40.44 | 0.028 | 0.25 | 99.86 |
| Change (%) | 0.00 | -0.85 | -49.09 | -50.00 | 0.13 |
| HH (non-postponement) | 199.569 | 403.379 | 1.135 | 0.499 | 99.43 |
| HH (postponement) | 199.569 | 402.705 | 0.461 | 0.25 | 99.77 |
| Change (%) | 0.00 | -0.17 | -59.38 | -49.90 | 0.34 |
| HL (non-postponement) | 109.414 | 223.955 | 0.472 | 0.497 | 99.57 |
| HL (postponement) | 109.414 | 220.392 | 0.549 | 0.248 | 99.50 |
| Change (%) | 0.00 | -1.59 | 16.31 | -50.10 | -0.07 |
| LH (non-postponement) | 110.175 | 220.211 | 0.718 | 0.502 | 99.35 |
| LH (postponement) | 110.175 | 218.602 | 0.549 | 0.251 | 99.50 |
| Change (%) | 0.00 | -0.73 | -23.54 | -50.00 | 0.15 |
| L = 3 | | | | | |
| L1 | 10.041 | 30.529 | 0.035 | 0.167 | 99.65 |
| L2 | 9.979 | 30.857 | 0.019 | 0.167 | 99.81 |
| H1 | 99.435 | 306.63 | 0.305 | 0.166 | 99.69 |
| H2 | 100.134 | 299.315 | 0.596 | 0.167 | 99.40 |
| LL (non-postponement) | 20.02 | 61.386 | 0.054 | 0.334 | 99.73 |

Table D.1 (continued)

| Data | Average demand | Average inventory | Average backorder | Average order frequency | Average fill rate (%) |
|-----------------------|----------------|-------------------|-------------------|-------------------------|-----------------------|
| LL (postponement) | 20.02 | 60.889 | 0.037 | 0.167 | 99.82 |
| Change (%) | 0.00 | -0.81 | -31.48 | -50.00 | 0.08 |
| HH (non-postponement) | 199.569 | 605.945 | 0.901 | 0.333 | 99.55 |
| HH (postponement) | 199.569 | 603.071 | 0.427 | 0.166 | 99.79 |
| Change (%) | 0.00 | -0.47 | -52.61 | -50.15 | 0.24 |
| HL (non-postponement) | 109.414 | 337.487 | 0.324 | 0.333 | 99.70 |
| HL (postponement) | 109.414 | 336.636 | 0.193 | 0.166 | 99.82 |
| Change (%) | 0.00 | -0.25 | -40.43 | -50.15 | 0.12 |
| LH (non-postponement) | 110.175 | 329.844 | 0.631 | 0.334 | 99.43 |
| LH (postponement) | 110.175 | 332.321 | 0.528 | 0.167 | 99.52 |
| Change (%) | 0.00 | 0.75 | -16.32 | -50.00 | 0.09 |

Table D.2 Simulation results 2 (Normal Distribution II)

| Data | Average demand | Average inventory | Average backorder | Average order frequency | Average fill rate (%) |
|-----------------------|----------------|-------------------|-------------------|-------------------------|-----------------------|
| L = 5 | | | | | |
| L1 | 10.041 | 50.03 | 0.056 | 0.1 | 99.44 |
| L2 | 9.979 | 50.925 | 0.027 | 0.1 | 99.73 |
| H1 | 99.435 | 503.589 | 0.664 | 0.099 | 99.33 |
| H2 | 100.134 | 503.154 | 0.435 | 0.1 | 99.57 |
| LL (non-postponement) | 20.02 | 100.955 | 0.083 | 0.2 | 99.59 |
| LL (postponement) | 20.02 | 101.198 | 0.026 | 0.101 | 99.87 |
| Change (%) | 0.00 | 0.24 | -68.67 | -49.50 | 0.28 |
| HH (non-postponement) | 199.569 | 1006.743 | 1.099 | 0.199 | 99.45 |
| HH (postponement) | 199.569 | 1007.193 | 0.549 | 0.099 | 99.72 |
| Change (%) | 0.00 | 0.04 | -50.05 | -50.25 | 0.28 |
| HL (non-postponement) | 109.414 | 554.514 | 0.691 | 0.199 | 99.37 |
| HL (postponement) | 109.414 | 551.08 | 0.357 | 0.099 | 99.67 |
| Change (%) | 0.00 | -0.62 | -48.34 | -50.25 | 0.31 |
| LH (non-postponement) | 110.175 | 553.184 | 0.491 | 0.2 | 99.55 |
| LH (postponement) | 110.175 | 552.369 | 0.576 | 0.1 | 99.48 |
| Change (%) | 0.00 | -0.15 | 17.31 | -50.00 | -0.08 |
| L = 10 | | | | | |
| L1 | 10.041 | 100.403 | 0.029 | 0.05 | 99.71 |
| L2 | 9.979 | 100.82 | 0.022 | 0.049 | 99.78 |
| H1 | 99.435 | 1,014.223 | 0.298 | 0.049 | 99.70 |
| H2 | 100.134 | 993.792 | 1.073 | 0.05 | 98.93 |
| LL (non-postponement) | 20.02 | 201.223 | 0.051 | 0.099 | 99.75 |
| LL (postponement) | 20.02 | 200.991 | 0.019 | 0.05 | 99.91 |
| Change (%) | 0.00 | -0.12 | -62.75 | -49.49 | 0.16 |
| HH (non-postponement) | 199.569 | 2,008.015 | 1.371 | 0.099 | 99.31 |
| HH (postponement) | 199.569 | 2,024.898 | 0.254 | 0.05 | 99.87 |

Table D.2 (continued)

| Data | Average demand | Average inventory | Average backorder | Average order frequency | Average fill rate (%) |
|-----------------------|----------------|-------------------|-------------------|-------------------------|-----------------------|
| Change (%) | 0.00 | 0.84 | -81.47 | -49.49 | 0.56 |
| HL (non-postponement) | 109.414 | 1,115.043 | 0.32 | 0.098 | 99.71 |
| HL (postponement) | 109.414 | 1,103.296 | 0.373 | 0.049 | 99.66 |
| Change (%) | 0.00 | -1.05 | 16.56 | -50.00 | -0.05 |
| LH (non-postponement) | 110.175 | 1,094.195 | 1.102 | 0.1 | 99.00 |
| LH (postponement) | 110.175 | 1,096.984 | 0.691 | 0.05 | 99.37 |
| Change (%) | 0.00 | 0.25 | -37.30 | -50.00 | 0.37 |
| L = 20 | | | | | |
| L1 | 10.041 | 199.633 | 0.059 | 0.026 | 99.41 |
| L2 | 9.979 | 200.243 | 0.045 | 0.025 | 99.55 |
| H1 | 99.435 | 2010.22 | 0.295 | 0.025 | 99.70 |
| H2 | 100.134 | 1,991.487 | 0.768 | 0.025 | 99.23 |
| LL (non-postponement) | 20.02 | 399.876 | 0.104 | 0.051 | 99.48 |
| LL (postponement) | 20.02 | 398.22 | 0.048 | 0.025 | 99.76 |
| Change (%) | 0.00 | -0.41 | -53.85 | -50.98 | 0.28 |
| HH (non-postponement) | 199.569 | 4,001.707 | 1.063 | 0.05 | 99.47 |
| HH (postponement) | 199.569 | 4,012.991 | 0.347 | 0.025 | 99.83 |
| Change (%) | 0.00 | 0.28 | -67.36 | -50.00 | 0.36 |
| HL (non-postponement) | 109.414 | 2,210.463 | 0.34 | 0.05 | 99.69 |
| HL (postponement) | 109.414 | 2,220.788 | 0.265 | 0.025 | 99.76 |
| Change (%) | 0.00 | 0.47 | -22.06 | -50.00 | 0.07 |
| LH (non-postponement) | 110.175 | 2,191.12 | 0.827 | 0.051 | 99.25 |
| LH (postponement) | 110.175 | 2,192.591 | 0.698 | 0.025 | 99.37 |
| Change (%) | 0.00 | 0.07 | -15.60 | -50.98 | 0.12 |

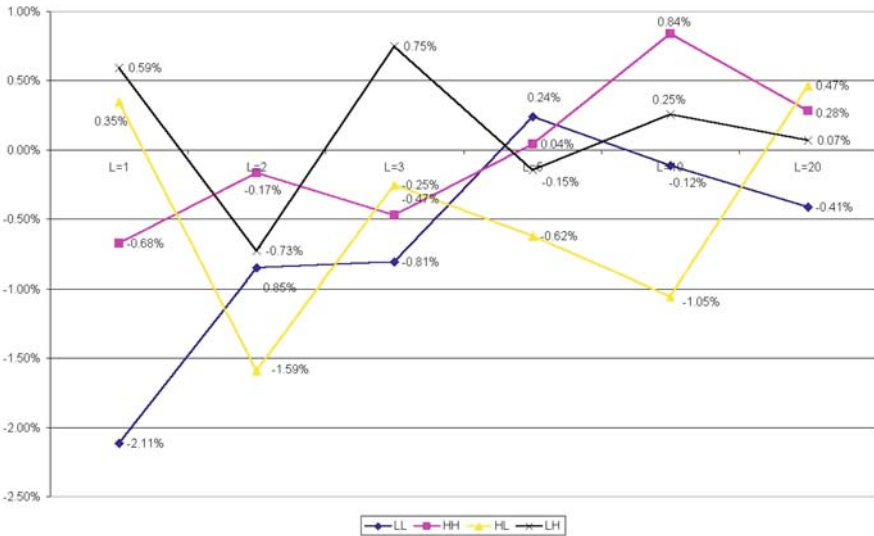


Fig. D.1 Difference in average inventory (Normal Distribution II)

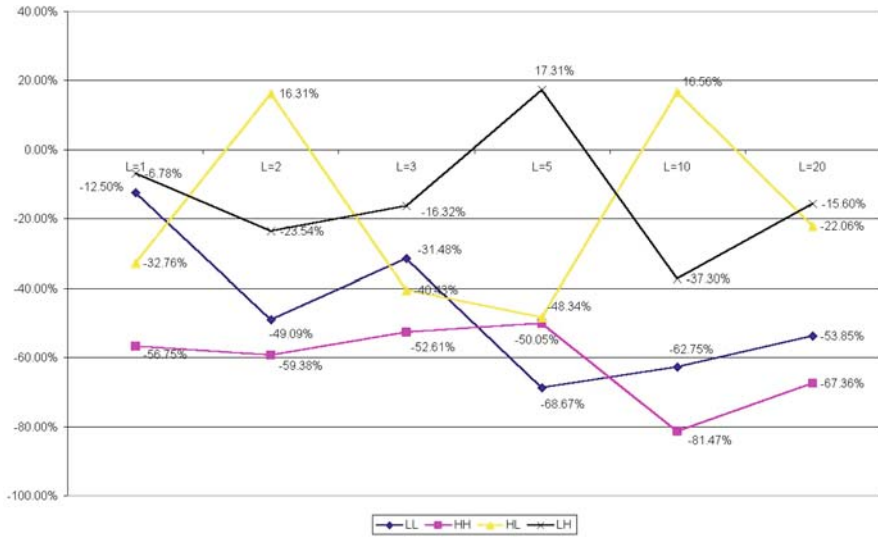


Fig. D.2 Difference in average backorder (Normal Distribution II)

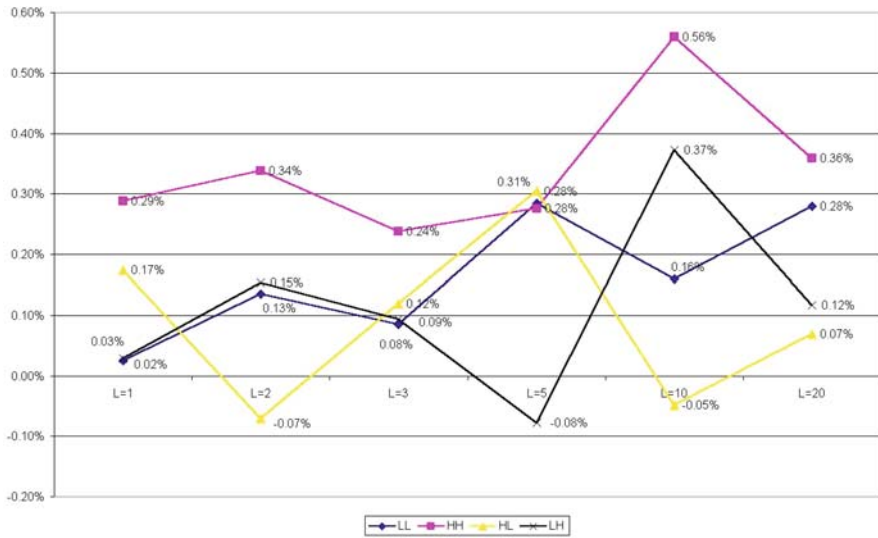


Fig. D.3 Improvement in average fill rate (Normal Distribution II)

Appendix E

Simulation Results for Cost Analysis

Table E.1 Simulation results for cost analysis

| Data set | Lead-time | Uniform distribution | | | Poisson distribution | | | Normal distribution I | | | Normal distribution II | | |
|----------|-----------|----------------------|--------------------|------------------|----------------------|--------------------|------------------|-----------------------|--------------------|------------------|------------------------|--------------------|------------------|
| | | $\alpha = 0$ (%) | $\alpha = 0.5$ (%) | $\alpha = 1$ (%) | $\alpha = 0$ (%) | $\alpha = 0.5$ (%) | $\alpha = 1$ (%) | $\alpha = 0$ (%) | $\alpha = 0.5$ (%) | $\alpha = 1$ (%) | $\alpha = 0$ (%) | $\alpha = 0.5$ (%) | $\alpha = 1$ (%) |
| LL | 1 | -7.7 | -5.6 | -3.4 | -3.5 | -1.2 | 1.2 | -4.1 | -1.8 | 0.5 | -2.4 | -0.1 | 2.3 |
| LL | 2 | -3.5 | -2.0 | -0.5 | -2.6 | -1.0 | 0.6 | -2.2 | -0.6 | 1.0 | -1.1 | 0.5 | 2.2 |
| LL | 3 | -3.6 | -2.4 | -1.2 | -1.8 | -0.6 | 0.6 | -0.7 | 0.5 | 1.7 | -0.9 | 0.4 | 1.6 |
| LL | 5 | -0.2 | 0.6 | 1.4 | -2.1 | -1.3 | -0.5 | -1.4 | -0.6 | 0.2 | 0.1 | 0.9 | 1.7 |
| LL | 10 | -0.4 | 0.1 | 0.5 | -1.0 | -0.5 | -0.1 | -1.0 | -0.5 | -0.1 | -0.1 | 0.3 | 0.8 |
| LL | 20 | -0.3 | -0.1 | 0.1 | 0.3 | 0.5 | 0.7 | 0.4 | 0.6 | 0.8 | -0.4 | -0.2 | 0.1 |
| HH | 1 | -2.1 | 0.2 | 2.6 | -1.8 | 0.6 | 3.1 | -0.7 | 1.8 | 4.2 | -0.6 | 1.8 | 4.3 |
| HH | 2 | -1.1 | 0.5 | 2.1 | -0.8 | 0.9 | 2.5 | -0.8 | 0.9 | 2.5 | -0.3 | 1.4 | 3.0 |
| HH | 3 | -1.8 | -0.6 | 0.7 | -0.8 | 0.5 | 1.8 | -0.3 | 1.0 | 2.2 | -0.4 | 0.8 | 2.0 |
| HH | 5 | -0.2 | 0.6 | 1.4 | -1.2 | -0.3 | 0.5 | -0.1 | 0.7 | 1.5 | 0.0 | 0.8 | 1.6 |
| HH | 10 | -0.6 | -0.2 | 0.3 | 0.0 | 0.4 | 0.9 | -1.0 | -0.6 | -0.1 | 0.7 | 1.2 | 1.6 |
| HH | 20 | 0.4 | 0.7 | 0.9 | -1.2 | -1.0 | -0.8 | 0.5 | 0.8 | 1.0 | 0.2 | 0.5 | 0.7 |
| HL | 1 | -2.1 | 0.2 | 2.6 | -3.2 | -0.8 | 1.6 | -1.0 | 1.4 | 3.8 | -0.2 | 2.3 | 4.7 |
| HL | 2 | -1.2 | 0.4 | 2.0 | -2.5 | -0.9 | 0.8 | -1.4 | 0.2 | 1.8 | -1.1 | 0.5 | 2.1 |
| HL | 3 | 0.2 | 1.4 | 2.6 | -1.8 | -0.6 | 0.7 | 2.0 | 3.2 | 4.5 | -0.3 | 1.0 | 2.2 |
| HL | 5 | 0.1 | 1.0 | 1.8 | -0.6 | 0.2 | 1.0 | -1.4 | -0.6 | 0.3 | -0.6 | 0.2 | 1.1 |
| HL | 10 | -0.5 | -0.1 | 0.4 | -0.3 | 0.2 | 0.6 | -0.2 | 0.3 | 0.7 | -1.0 | -0.5 | -0.1 |
| HL | 20 | -1.7 | -1.4 | -1.2 | -0.6 | -0.3 | -0.1 | -0.1 | 0.1 | 0.3 | 0.4 | 0.7 | 0.9 |
| LH | 1 | -0.9 | 1.5 | 3.8 | 0.3 | 2.8 | 5.3 | -1.9 | 0.6 | 3.0 | 0.0 | 2.5 | 4.9 |
| LH | 2 | -0.4 | 1.2 | 2.8 | 0.8 | 2.5 | 4.2 | 1.3 | 3.0 | 4.7 | -0.6 | 1.0 | 2.7 |
| LH | 3 | -0.4 | 0.8 | 2.0 | 0.5 | 1.8 | 3.0 | -0.9 | 0.4 | 1.7 | 0.5 | 1.7 | 3.0 |
| LH | 5 | -1.9 | -1.1 | -0.2 | -0.4 | 0.4 | 1.3 | -0.4 | 0.4 | 1.3 | -0.1 | 0.7 | 1.5 |
| LH | 10 | 0.4 | 0.8 | 1.3 | 0.8 | 1.2 | 1.7 | -0.2 | 0.2 | 0.7 | 0.2 | 0.6 | 1.1 |
| LH | 20 | -0.3 | -0.1 | 0.2 | -0.4 | -0.2 | 0.1 | 0.7 | 1.0 | 1.2 | 0.1 | 0.3 | 0.5 |

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Index

B

Backorders, 11, 15, 20–21, 62, 64, 67
Branding postponement, 7
Bullwhip effect, 4

C

Case study, 11, 13, 17, 125, 129, 132, 134
Customer order decoupling point, 4–5

D

Demand-driven, 4, 82
Demand-pull, 4, 7
Demand-push, 4
Demand rate, 21, 34, 38–39, 45, 47, 51, 56, 63–64
Descriptive models, 11, 13
Deterioration rate, 19, 32–33, 39–41
Deterministic models, 11, 41, 133

E

Economies of scale, 1, 3, 10, 41
Economies of scope, 1, 3, 19, 41
EOQ model, 14–15, 20–21, 32, 41
EPQ model, 15, 41, 44–45, 62, 67
Exponential distribution, 34

F

Fill rate, 13–14, 111–112, 114, 118–121, 123, 140, 146, 150, 154
Flexible supply chain, 3
Forecast-driven, 4, 82
Form postponement, 7, 17, 33, 63, 125–126, 129, 130

H

Heuristic models, 11–12
Hybrid postponement strategy, 9

I

Independent system, 20, 24, 26, 30, 33, 38–39, 44, 47, 50–52, 55–56, 59, 78, 113
Inventory management, 2, 9, 11, 41

J

JIT principle, 9

L

Labeling postponement, 7, 13, 129–132
Late customization, 3
Lead-time, 4–5, 9, 12, 16–17, 21, 81–82, 84, 115, 126, 134
Logistics postponement, 4, 6–7, 9–10, 13, 17, 41, 129, 134, 136
Lot size-reorder point model, 16

M

Make-to-order, 4–5, 9, 81, 102–103, 107, 126, 128
Make-to-stock, 4, 6, 126–128
Markov chain, 16–17, 81, 83–86, 89
Mass customization, 1–2, 7, 10
Mass production, 10–11
Modular design, 2, 132

N

Non-postponement system, 15, 26, 62–66, 70–72, 75–76, 78–79, 81–84, 100, 105–107, 109–110, 113–114, 117–118
Normal distribution, 11, 109, 114, 119–123

O

Optimization technique, 19, 43, 81, 107

P

Packaging postponement, 7, 13, 129–132
Partial postponement strategy, 9, 11

Perishable product, 32–33, 41, 133
Physical supply chain, 4–5
Place postponement, 7
Point of product differentiation, 3, 5, 11–12, 20, 44, 82, 108
Poisson distribution, 16, 114, 118, 122–123
(r, q) policy, 16, 81, 84, 134
Postponement, 1, 3–4, 15, 17, 19, 42, 80, 125
Postponement system, 20, 22–24, 26, 30, 38, 44, 46, 48, 50–51, 53, 81–82, 84, 102–104, 109–110, 112, 114, 116, 118, 120, 122
Price postponement, 8–9, 17, 134, 136
Product postponement, 7
Product variety, 1–3, 12, 108, 127
Pull postponement, 4–8, 17–20, 25, 29, 41, 81, 126, 133
Push–pull boundary, 4–5, 17

R

Risk-pooling, 3, 19, 112

S

Service level, 9, 12–14, 16, 33
Simulation technique, 81, 107, 109, 134
Standardization, 1–3
Stochastic models, 11, 17, 41, 81
Stockout, 33, 43, 62, 78, 133–134
Supply chain, 1–6, 8–10, 17, 19, 43, 81, 110, 132, 136

T

Time postponement, 7, 13

U

Uniform distribution, 117, 123, 133

V

Virtual supply chain, 4–5

W

WIP, 6, 9, 11, 13, 15, 110–112, 122–123, 126