**Null hypothesis (H0):** The mean departure delays are the same for 2 airport *ORD (IL)* and *AUS (TX)*

**Alternative hypothesis:** The mean departure delays are different for 2 airport *ORD (IL)* and *AUS (TX)* (Mean departure delay for *ORD (IL)* is much higher than *AUS (TX)*)

**Set α**

Significance level at 5% here.

# 

# Exploring the sample data

Query Used:

*select f.origin, f.dest as destination, count(\*) as count,*

*sum(arrdelay) as total\_arrival\_delay\_minutes,*

*d.number\_of\_delays,*

*(d.number\_of\_delays \* 100)/count(\*) as delayPercentage*

*from ontime f,*

*(select origin,*

*dest,*

*count(arrdelay) as number\_of\_delays*

*from ontime*

*where arrdelay > 15*

*and year=2008*

*group by origin, dest) d*

*where f.origin = d.origin and f.dest = d.dest and year=2008*

*and f.origin in ('ORD','AUS')*

*group by f.origin, f.dest, d.number\_of\_delays;*

Data after getting from query -

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| origin | destination | count | total\_arrival\_delay\_minutes | number\_of\_delays | delaypercentage | Mean | SD |
| AUS | ABQ | 435 | 1493 | 61 | 14 | 18.16 | 13.14342 |
| AUS | ATL | 2252 | 31474 | 596 | 26 |
| AUS | BNA | 792 | 1506 | 104 | 13 |
| AUS | BOS | 368 | 1504 | 65 | 17 |
| AUS | BWI | 730 | -120 | 86 | 11 |
| AUS | CLE | 380 | 1922 | 63 | 16 |
| AUS | CLT | 659 | 3298 | 109 | 16 |
| AUS | CVG | 653 | 4082 | 114 | 17 |
| AUS | DAL | 5573 | 33131 | 825 | 14 |
| AUS | DEN | 2673 | 14495 | 435 | 16 |
| AUS | DFW | 5506 | 35884 | 962 | 17 |
| AUS | DSM | 1 | 100 | 1 | 100 |
| AUS | ELP | 1349 | 7085 | 216 | 16 |
| AUS | EWR | 949 | 12840 | 281 | 29 |
| AUS | FLL | 481 | -2402 | 38 | 7 |
| AUS | HOU | 2319 | 16992 | 383 | 16 |
| AUS | HRL | 367 | 1743 | 55 | 14 |
| AUS | IAD | 670 | 7182 | 144 | 21 |
| AUS | IAH | 3691 | 25879 | 619 | 16 |
| AUS | IND | 218 | -1857 | 18 | 8 |
| AUS | JAX | 226 | 2253 | 51 | 22 |
| AUS | JFK | 1358 | 13116 | 385 | 28 |
| AUS | LAS | 1231 | 3410 | 189 | 15 |
| AUS | LAX | 1733 | 7184 | 288 | 16 |
| AUS | LBB | 692 | 4426 | 108 | 15 |
| AUS | LGB | 245 | 2968 | 60 | 24 |
| AUS | MAF | 470 | 2714 | 79 | 16 |
| AUS | MCI | 459 | 2311 | 64 | 13 |
| AUS | MCO | 632 | 2111 | 92 | 14 |
| AUS | MDW | 712 | 1448 | 105 | 14 |
| AUS | MEM | 834 | 2332 | 103 | 12 |
| AUS | MSP | 55 | 874 | 13 | 23 |
| AUS | MSY | 444 | 3247 | 76 | 17 |
| AUS | OAK | 236 | 2502 | 63 | 26 |
| AUS | OKC | 88 | 785 | 28 | 31 |
| AUS | ONT | 305 | 2355 | 55 | 18 |
| AUS | ORD | 2514 | 27068 | 569 | 22 |
| AUS | PHL | 290 | -3362 | 24 | 8 |
| AUS | PHX | 2783 | 9841 | 408 | 14 |
| AUS | RDU | 231 | 294 | 31 | 13 |
| AUS | SAN | 719 | 1907 | 119 | 16 |
| AUS | SEA | 149 | 1345 | 40 | 26 |
| AUS | SFO | 610 | 4765 | 115 | 18 |
| AUS | SJC | 968 | 3163 | 151 | 15 |
| AUS | SLC | 548 | -3342 | 34 | 6 |
| AUS | SNA | 245 | 142 | 21 | 8 |
| AUS | STL | 95 | 544 | 15 | 15 |
| AUS | TPA | 367 | 2459 | 74 | 20 |
| AUS | TUL | 88 | -316 | 7 | 7 |
| AUS | TUS | 228 | -205 | 29 | 12 |
| ORD | ABE | 1426 | 27472 | 446 | 31 | 29.14189 | 0.707107 |
| ORD | ABQ | 754 | 16646 | 261 | 34 |
| ORD | ALB | 1632 | 19998 | 416 | 25 |
| ORD | ANC | 561 | 9733 | 213 | 37 |
| ORD | ASE | 310 | 5405 | 110 | 35 |
| ORD | ATL | 7449 | 116186 | 2134 | 28 |
| ORD | ATW | 2288 | 35306 | 603 | 26 |
| ORD | AUS | 2515 | 42896 | 793 | 31 |
| ORD | AVP | 718 | 16301 | 244 | 33 |
| ORD | AZO | 2350 | 19656 | 492 | 20 |
| ORD | BDL | 3335 | 48017 | 949 | 28 |
| ORD | BHM | 1511 | 24035 | 457 | 30 |
| ORD | BIL | 105 | 993 | 25 | 23 |
| ORD | BMI | 2005 | 32398 | 570 | 28 |
| ORD | BNA | 3905 | 67430 | 1219 | 31 |
| ORD | BOI | 786 | 16005 | 287 | 36 |
| ORD | BOS | 7133 | 118416 | 2087 | 29 |
| ORD | BTR | 215 | 2326 | 67 | 31 |
| ORD | BTV | 738 | 13182 | 214 | 28 |
| ORD | BUF | 3437 | 45436 | 892 | 25 |
| ORD | BWI | 3552 | 45063 | 909 | 25 |
| ORD | BZN | 336 | 5226 | 105 | 31 |
| ORD | CAE | 1373 | 37762 | 495 | 36 |
| ORD | CAK | 1047 | 19257 | 301 | 28 |
| ORD | CHA | 767 | 10585 | 216 | 28 |
| ORD | CHS | 1337 | 25539 | 408 | 30 |
| ORD | CID | 4154 | 50211 | 1043 | 25 |
| ORD | CLE | 4567 | 69519 | 1303 | 28 |
| ORD | CLT | 6013 | 79059 | 1609 | 26 |
| ORD | CMH | 4664 | 83875 | 1424 | 30 |
| ORD | CMI | 2404 | 40134 | 709 | 29 |
| ORD | COS | 1525 | 33413 | 541 | 35 |
| ORD | CPR | 134 | 2406 | 43 | 32 |
| ORD | CRW | 708 | 14680 | 209 | 29 |
| ORD | CVG | 5993 | 66989 | 1446 | 24 |
| ORD | CWA | 1715 | 29435 | 478 | 27 |
| ORD | DAL | 1007 | 9048 | 237 | 23 |
| ORD | DAY | 1786 | 23808 | 459 | 25 |
| ORD | DBQ | 1347 | 14304 | 325 | 24 |
| ORD | DCA | 7430 | 101072 | 1985 | 26 |
| ORD | DEN | 5773 | 91384 | 1812 | 31 |
| ORD | DFW | 8093 | 118148 | 2438 | 30 |
| ORD | DSM | 4823 | 65882 | 1363 | 28 |
| ORD | DTW | 7602 | 101057 | 1960 | 25 |
| ORD | EGE | 197 | 6012 | 84 | 42 |
| ORD | ELP | 670 | 11296 | 213 | 31 |
| ORD | EVV | 1944 | 19246 | 447 | 22 |
| ORD | EWR | 7174 | 180997 | 2737 | 38 |
| ORD | FAR | 1344 | 17258 | 341 | 25 |
| ORD | FCA | 104 | 1984 | 32 | 30 |
| ORD | FLL | 1583 | 20801 | 451 | 28 |
| ORD | FNT | 1265 | 15436 | 332 | 26 |
| ORD | FSD | 1724 | 27844 | 490 | 28 |
| ORD | FWA | 2956 | 35999 | 746 | 25 |
| ORD | GEG | 327 | 9302 | 137 | 41 |
| ORD | GPT | 214 | 1451 | 53 | 24 |
| ORD | GRB | 3631 | 48150 | 945 | 26 |
| ORD | GRR | 3699 | 45100 | 910 | 24 |
| ORD | GSO | 870 | 17838 | 276 | 31 |
| ORD | GSP | 1302 | 21400 | 370 | 28 |
| ORD | GTF | 23 | -106 | 2 | 8 |
| ORD | GUC | 2 | 16 | 1 | 50 |
| ORD | HDN | 200 | 4445 | 84 | 42 |
| ORD | HNL | 641 | 5146 | 177 | 27 |
| ORD | HPN | 3624 | 29177 | 834 | 23 |
| ORD | HSV | 547 | 5795 | 147 | 26 |
| ORD | IAD | 2891 | 37379 | 713 | 24 |
| ORD | IAH | 5463 | 83029 | 1550 | 28 |
| ORD | ICT | 3001 | 38404 | 836 | 27 |
| ORD | IND | 4103 | 58286 | 1182 | 28 |
| ORD | JAC | 463 | 11196 | 161 | 34 |
| ORD | JAN | 211 | 3008 | 66 | 31 |
| ORD | JAX | 1697 | 24793 | 477 | 28 |
| ORD | JFK | 3684 | 66228 | 1151 | 31 |
| ORD | LAN | 1409 | 20510 | 353 | 25 |
| ORD | LAS | 5257 | 77220 | 1633 | 31 |
| ORD | LAX | 6974 | 116586 | 2379 | 34 |
| ORD | LEX | 1965 | 23471 | 491 | 24 |
| ORD | LGA | 10770 | 209318 | 3734 | 34 |
| ORD | LGB | 604 | 10940 | 198 | 32 |
| ORD | LIT | 1806 | 28157 | 549 | 30 |
| ORD | LNK | 1407 | 22442 | 380 | 27 |
| ORD | LSE | 1572 | 17089 | 388 | 24 |
| ORD | MBS | 1339 | 26172 | 390 | 29 |
| ORD | MCI | 3900 | 59178 | 1105 | 28 |
| ORD | MCO | 3798 | 60167 | 1187 | 31 |
| ORD | MDT | 1552 | 28038 | 480 | 30 |
| ORD | MEM | 3782 | 48987 | 1038 | 27 |
| ORD | MHT | 1144 | 21339 | 337 | 29 |
| ORD | MIA | 3343 | 68478 | 1208 | 36 |
| ORD | MKE | 3400 | 39747 | 803 | 23 |
| ORD | MLI | 2579 | 33178 | 645 | 25 |
| ORD | MOB | 210 | 1892 | 57 | 27 |
| ORD | MQT | 313 | 8612 | 117 | 37 |
| ORD | MSN | 4878 | 55528 | 1171 | 24 |
| ORD | MSO | 105 | 466 | 18 | 17 |
| ORD | MSP | 9688 | 109971 | 2333 | 24 |
| ORD | MSY | 1502 | 26274 | 462 | 30 |
| ORD | MTJ | 30 | 1570 | 18 | 60 |
| ORD | OAK | 59 | 1826 | 29 | 49 |
| ORD | OGG | 221 | 1209 | 46 | 20 |
| ORD | OKC | 1937 | 31375 | 603 | 31 |
| ORD | OMA | 4097 | 56335 | 1156 | 28 |
| ORD | ORF | 1188 | 32785 | 418 | 35 |
| ORD | PBI | 656 | 18446 | 278 | 42 |
| ORD | PDX | 2394 | 40921 | 826 | 34 |
| ORD | PHL | 6733 | 113592 | 2096 | 31 |
| ORD | PHX | 5124 | 70225 | 1537 | 29 |
| ORD | PIA | 3256 | 28995 | 707 | 21 |
| ORD | PIT | 3611 | 53958 | 987 | 27 |
| ORD | PNS | 292 | 3228 | 74 | 25 |
| ORD | PSP | 451 | 8828 | 168 | 37 |
| ORD | PVD | 1789 | 25930 | 493 | 27 |
| ORD | PWM | 343 | 5832 | 104 | 30 |
| ORD | RAP | 218 | 2019 | 47 | 21 |
| ORD | RDU | 3140 | 61527 | 999 | 31 |
| ORD | RIC | 1884 | 29352 | 534 | 28 |
| ORD | RNO | 365 | 7315 | 135 | 36 |
| ORD | ROA | 555 | 2864 | 95 | 17 |
| ORD | ROC | 2550 | 34878 | 716 | 28 |
| ORD | RST | 2366 | 24200 | 577 | 24 |
| ORD | RSW | 764 | 8581 | 177 | 23 |
| ORD | SAN | 3308 | 49134 | 1069 | 32 |
| ORD | SAT | 1713 | 31513 | 568 | 33 |
| ORD | SAV | 1132 | 24807 | 369 | 32 |
| ORD | SBN | 2266 | 26485 | 528 | 23 |
| ORD | SDF | 3496 | 45623 | 928 | 26 |
| ORD | SEA | 4802 | 77541 | 1545 | 32 |
| ORD | SFO | 5524 | 98617 | 1981 | 35 |
| ORD | SGF | 2306 | 37373 | 669 | 29 |
| ORD | SHV | 211 | 2242 | 55 | 26 |
| ORD | SJC | 1333 | 26027 | 484 | 36 |
| ORD | SJU | 1036 | 8394 | 253 | 24 |
| ORD | SLC | 2860 | 54104 | 945 | 33 |
| ORD | SMF | 1077 | 21655 | 405 | 37 |
| ORD | SNA | 2580 | 37264 | 856 | 33 |
| ORD | SPI | 1085 | 17504 | 289 | 26 |
| ORD | STL | 4558 | 58868 | 1138 | 24 |
| ORD | STT | 80 | 695 | 24 | 30 |
| ORD | SYR | 2314 | 33118 | 628 | 27 |
| ORD | TOL | 1337 | 14426 | 336 | 25 |
| ORD | TPA | 2443 | 47548 | 794 | 32 |
| ORD | TUL | 2040 | 33265 | 593 | 29 |
| ORD | TUS | 865 | 15837 | 289 | 33 |
| ORD | TVC | 2435 | 34142 | 649 | 26 |
| ORD | TYS | 2017 | 23302 | 502 | 24 |
| ORD | VPS | 236 | 2310 | 57 | 24 |
| ORD | XNA | 3116 | 50878 | 942 | 30 |

# Compute p-value

ANOVA

P= 2.4974769606e-07

. . .

Kruskall-Wallis H-test

P= 2.49809315473e-13

# Conclusion

We, therefore, have sufficient evidence to reject the null hypothesis. Our initial guess that a statistically significant difference existed in the means was backed by this statistical analysis. We have evidence to suggest that departure delay is related to Airport.

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