# Hitachi BladeSymphony BS2000 using Hitachi Advanced Data Binder 01-02

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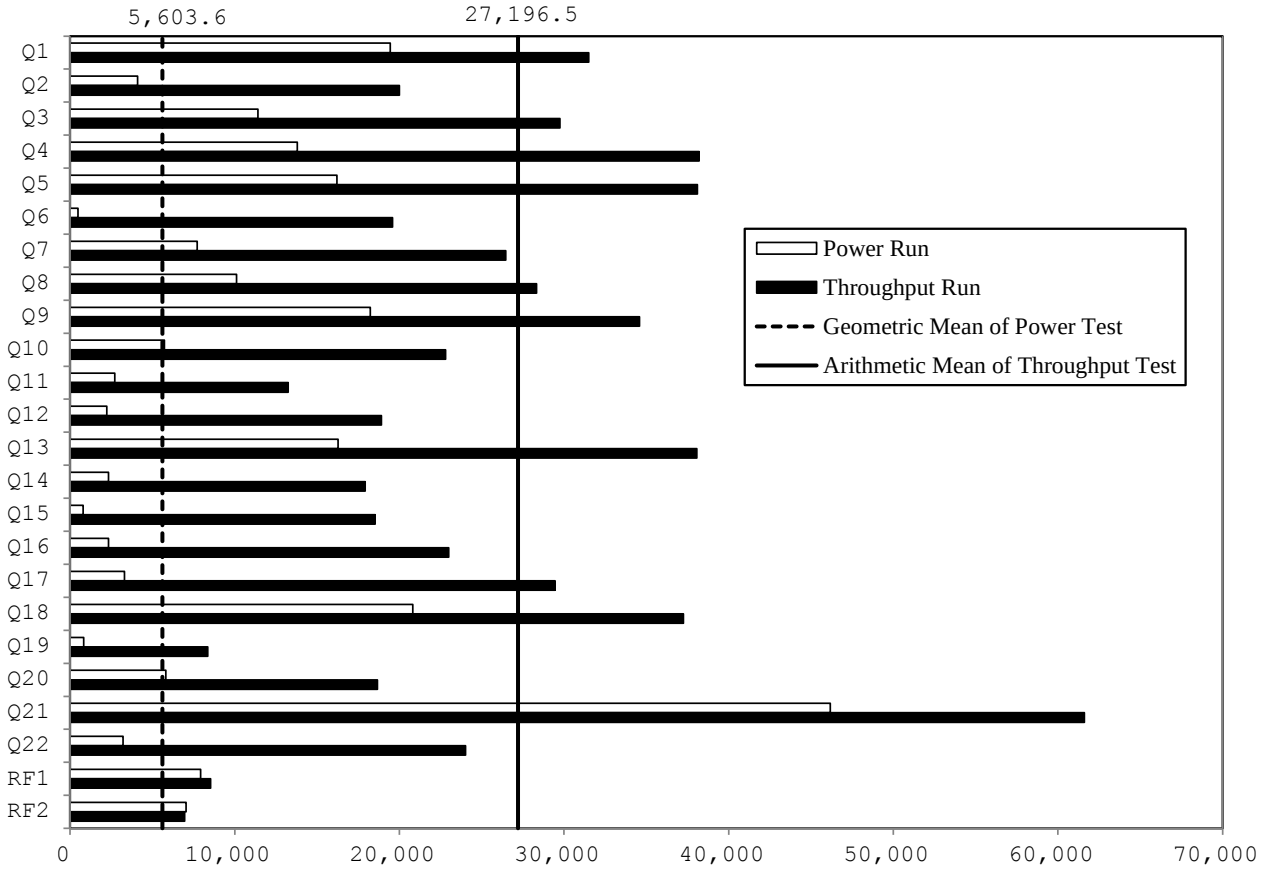
**TPC-H Rev. 2.16.0**
**TPC-Pricing Rev. 1.7.0**

**Report Date:**
**Oct 19, 2013**

| Total System Cost | Composite Query per Hour Metric | Price/Performance |
|---|---|---|
| **¥1,563,605,024 JPY** | **82,678.0**<br>**QphH@100000GB** | **¥ 18,911.98 JPY**<br>**¥ / QphH@100000GB** |

| Database Size (*) | Database Manager | Operating System | Other Software | Availability Date |
|---|---|---|---|---|
| **100,000GB** | **Hitachi Advanced Data Binder 01-02** | **Red Hat® Enterprise Linux® 6.2** | **None** | **Oct 19, 2013** |




Database Load Time =139:53:08
Load Includes Backup: N
Total Data Storage / Database Size (*) = 14.76
Memory / Database Size = 8.0%

Storage Redundancy Levels:

| | |
|---|---|
| Base Tables: | Level One |
| Auxiliary Data Structures: | Level One |
| DBMS Temporary Space: | Level One |
| OS and DBMS Software: | Level One |

**System Configuration**

| | |
|---|---|
| **Number of Nodes:** | 4 |
| **Processors/Cores/Threads/Type:** | 32/320/640 Intel® Xeon® Processor E7-8870 (24M Cache, 2.40 GHz, 6.40 GT/s Intel® QPI) |
| **Memory:** | 8TB |
| **Storage Controllers:** | 128 x 8Gbps PCI Express FC Dual-port HBA, 4 x 8Gbps PCI Express Mezzanine FC Dual-port HBA |
| **Storage Subsystem Disk Drives:** | 16 x Hitachi Unified Storage 150 (Dual 8-port controller) each with 100 x 900GB 10Krpm SAS Disks<br>4 x Hitachi BR1600E each with 15 x 600GB 10Krpm SAS Disks |
| **Total Disk Storage:** | 1,476,000GB |

* Database Size includes only raw data (e.g., no temp, index, redundant storage space, etc.)

| Description | Key | Product Code | Unit Price | Qty | Exit. Price | 3 Yr. Maint. |
|---|---|---|---|---|---|---|
| ***Server Hardware*** | | | | | | |
| BS2000 Server chassis | 1 | GV-SRE2A172NN1 | 1,800,000 | 2 | 3,600,000 | |
| BS2000 ACElectric power input module | 1 | GV-BE2ACM1N1BX | 50,000 | 4 | 200,000 | |
| BS2000 Brocade 8Gb Fiber channel switch module | 1 | GV-BE2FSW2N1BX | 1,800,000 | 4 | 7,200,000 | |
| BS2000 SFP+module for Brocade 8Gb | 1 | GV-BE2SFP1N1BX | 35,000 | 8 | 280,000 | |
| BS2000 Power supply module for chassis | 1 | GV-BP2PWM1N1BX | 180,000 | 6 | 1,080,000 | |
| BS2000 Highly efficient server blade | 1 | GVAE57A2-5NNN14X | 2,450,000 | 16 | 39,200,000 | |
| BS2000 I/O slot extension equipment Connection board | 1 | GV-CB2NPT1N1BX | 75,000 | 32 | 2,400,000 | |
| BS2000 Hitachi 8Gb 2-ports Fiber channel extension card | 1 | GV-CC2M8G1N1EX | 120,000 | 4 | 480,000 | |
| BS2000 Extension processor Xeon E7-8870 | 1 | GV-EC22401N4EX | 1,350,000 | 16 | 21,600,000 | |
| BS2000 4-braids SMP connection board | 1 | GV-EZ2SMP2N1BX | 600,000 | 4 | 2,400,000 | |
| BS2000 16GB memory | 1 | GV-MJ216H1N1EX | 104,000 | 512 | 53,248,000 | |
| BS2000 I/O slot extension equipment | 1 | GV0EDW11-224N11N | 1,500,000 | 16 | 24,000,000 | |
| BS2000 Hitachi 8Gb 2-ports Fiber channel board | 1 | GV-CC2D8G2N1EX | 400,000 | 128 | 51,200,000 | |
| BS2000 Connection metal cable | 1 | GV-SLT2DPE2N1 | 90,000 | 32 | 2,880,000 | |
| HA8000/RS210AL Base model | 1 | GQU210AL-A6NNKN2 | 794000 | 1 | 794,000 | |
| HA8000/RS210 Xeon X5675 3.06GHz（6-core）/L3 Cache | 1 | GQ-ECDPH3P0BEX | 264000 | 1 | 264,000 | |
| HA8000/RS210 200V Accable | 1 | GQ-LG2252 | 2,000 | 1 | 2,000 | |
| HA8000/RS210 Memory board 4GB | 1 | GQ-MJ704G2WEEX | 36,000 | 6 | 216,000 | |
| HA8000/RS210 Internal hard disk SAS 600GB 2.5type | 1 | GQ-UH7600NVLEX | 108,000 | 5 | 540,000 | |
| HA8000/RS210 Reserve disk SAS 600GB 2.5type | 1 | GQ-UH7600NVLRX | 108,000 | 1 | 108,000 | |
| HA8000/RS210 Display/Keyboard unit | 1 | GQ-SRLK72406A | 385,000 | 1 | 385,000 | |
| HA8000/RS210 USB keyboard/Mouse/Display cable | 1 | GQ-LUB7113A | 6,000 | 2 | 12,000 | |
| Support Fee (Standard support of Server Hardware) | 1 | | 50,979,024 | 1 | | 50,979,024 |
| | | | ***Server Hardware Subtotal*** | | 212,089,000 | 50,979,024 |
| ***Storage*** | | | | | | |
| BR1600E Basic case | 1 | GV0BR162-D48NNNN | 3,821,600 | 4 | 15,286,400 | |
| BR1600E BladeSymphony License for connection | 1 | GV-AR9BBDSN1 | 1,000 | 4 | 4,000 | |
| BR1600E SAS HDD 600GB | 1 | GV-UH9F6001EEX | 380,000 | 60 | 22,800,000 | |
| BR1600E Performance Monitor | 1 | GVS-ESU9PPM1A | 80,000 | 4 | 320,000 | |
| HUS150 24-ports 8Gbps Fiber switch | 1 | HT-4990-SW360H | 3,040,000 | 4 | 12,160,000 | |
| HUS150 Basic case | 1 | HT-4066-RMHY | 5,160,000 | 16 | 82,560,000 | |
| HUS150 Cache memory | 1 | HT-F4066-32GBY | 6,834,000 | 16 | 109,344,000 | |
| HUS150 2.5type SAS 900GB HDD | 1 | HT-F4066-9HGSSY | 307,000 | 1,600 | 491,200,000 | |
| HUS150 8GbpsFC 4ports module | 1 | HT-F4066-HF8GY | 654,000 | 64 | 41,856,000 | |
| HUS150 BladeSymphony Server connection license | 1 | HT-F4066-LBS | 0 | 16 | 0 | |
| HUS150 2.5type Drive loading extension case | 1 | HT-F4066-DBSY | 700,000 | 80 | 56,000,000 | |
| Support Fee (Standard support of Storage Hardware) | 1 | | 49,309,800 | 1 | | 49,309,800 |
| | | | ***Storage Subtotal*** | | 831,530,400 | 49,309,800 |

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**TPC-H Rev. 2.16.0**
**TPC-Pricing Rev. 1.7.0**

**Report Date:**
**Oct 19, 2013**

| Description | Key | Product Code | Unit Price | Qty | Exit. Price | 3 Yr. Maint. |
|---|---|---|---|---|---|---|
| ***Other Hardware*** | | | | | | |
| PDU for BS2000 | 1 | GV-AG9PDU200V4 | 40,000 | 8 | 320,000 | |
| 200V PDB for rack | 1 | A-F6516-PDU6 | 150,000 | 16 | 2,400,000 | |
| Electric socket box metal fittings | 1 | GV-AU9PDUBKT1 | 16,000 | 8 | 128,000 | |
| Electric socket box unit | 1 | GV-AG1207 | 40,000 | 6 | 240,000 | |
| Electric socket box unit | 1 | GH-AG7107 | 17,000 | 1 | 17,000 | |
| Power cable | 1 | GV-LG1045N | 18,000 | 6 | 108,000 | |
| Power cable for PDU | 1 | A-F6516-P620 | 16,000 | 16 | 256,000 | |
| FC cable | 1 | A-6515-HM20L | 75,000 | 288 | 21,600,000 | |
| HA8500 common use Rack cabinet | 1 | GH-RK7386 | 157,000 | 5 | 785,000 | |
| HA8500 common use Punching metal specification front door | 1 | GH-RD7386 | 53,000 | 5 | 265,000 | |
| Blank panel | 1 | GH-RP7012 | 800 | 86 | 68,800 | |
| HA8500 common use Rack side panel | 1 | GH-RS7386 | 17,000 | 5 | 85,000 | |
| 40U 19-inch rack | 1 | A-6516-RK40 | 1,100,000 | 16 | 17,600,000 | |
| HUS100/HUS VM Rack decoration panel | 1 | A-F6516-FP1U | 6,000 | 224 | 1,344,000 | |
| | | | ***Other Hardware Subtotal*** | | 45,216,800 | |
| ***Software*** | | | | | | |
| Hitachi Advanced Data Binder 01-02 +4-license | 1 | P-9W62-C111&V3 | 5,760,000 | 40 | 230,400,000 | |
| Hitachi Advanced Data Binder 01-02 Master +1-license | 1 | P-9W62-C111&VW | 3,600,000 | 4 | 14,400,000 | |
| Hitachi Device Manager MASTER | 1 | P-2Z13-3574 | 0 | 1 | 0 | |
| Hitachi Device Manager for BR1600 | 1 | P-9Z13-3571&D3CF | 80,000 | 1 | 80,000 | |
| Support Fee (Standard support of Software) | 1 | | 43,200,000 | 3 | | 129,600,000 |
| | | | ***Software Subtotal*** | | 244,880,000 | 129,600,000 |
| | | | | **Total** | ¥1,333,716,200 | ¥229,888,824 |
| | | | **Three-Year Cost of Ownership:** | | | **¥1,563,605,024 JPY** |
| | | | **QphH@100000GB:** | | | **82,678** |
| | | | **¥/QphH@100000GB:** | | | **¥18,911.98 JPY** |

Key: 1 – Hitachi, Ltd.

Audited by Francois Raab of InfoSizing (sizing.com)

Prices used in TPC benchmarks reflect the actual prices a customer would pay for a one-time purchase of the stated components. Individually negotiated discounts are not permitted. Special prices based on assumptions about past or future purchases are not permitted. All discounts reflect standard pricing policies for the listed components. For complete details, see the pricing section of the TPC benchmark specifications. If you find that the stated prices are not available according to these terms, please inform the TPC at pricing@tpc.org. Thank you.

## Numerical Quantities

**Measurement Results:**

| | |
|---|---|
| Database Scale Factor | 100,000 |
| Total Data Storage / Database Size | 14.76 |
| Start of Database Load | 2013-08-29 19:07:31 |
| Shutdown | 2013-09-04 06:43:11 |
| Restart | 2013-09-04 08:05:31 |
| End of Database Load | 2013-09-04 16:22:59 |
| Database Load Time | 139:53:08 |
| Query Streams for Throughput Test | 11 |
| TPC-H Power | 64,244.1 |
| TPC-H Throughput | 106,401.3 |
| TPC-H Composite Query-per-Hour (QphH@100000GB) | 82,678.0 |
| Total System Price over 3 Years | ¥1,563,605,024 JPY |
| TPC-H Price / Performance Metric (¥ JPY / QphH@100000GB) | ¥18,911.98 JPY |

**Measurement Interval:**

| | |
|---|---|
| Measurement Interval in Throughput Test (Ts) | 818,787 |

### Duration of Stream Execution

| | Seed | Query Start Time | Duration (sec) | RF1 Start Time | RF2 Start Time |
|---|---|---|---|---|---|
| | | Query End Time | | RF1 End Time | RF2 End Time |
| Power Run | 904162259 | 09/28/2013 18:21:13 | 214,037 | 09/28/2013 16:08:59 | 10/01/2013 05:48:30 |
| | | 10/01/2013 05:48:30 | | 09/28/2013 18:21:12 | 10/01/2013 07:45:58 |

| Throughput Stream | Seed | Query Start Time | Duration (sec) | RF1 Start Time | RF2 Start Time |
|---|---|---|---|---|---|
| | | Query End Time | | RF1 End Time | RF2 End Time |
| 1 | 904162260 | 10/01/2013 07:45:58 | 567,020 | 10/08/2013 19:53:41 | 10/08/2013 22:11:49 |
| | | 10/07/2013 21:16:19 | | 10/08/2013 22:11:49 | 10/09/2013 00:08:15 |
| 2 | 904162261 | 10/01/2013 07:45:59 | 639,299 | 10/09/2013 00:08:15 | 10/09/2013 02:34:23 |
| | | 10/08/2013 17:20:58 | | 10/09/2013 02:34:23 | 10/09/2013 04:31:12 |
| 3 | 904162262 | 10/01/2013 07:45:59 | 608,302 | 10/09/2013 04:31:12 | 10/09/2013 06:55:04 |
| | | 10/08/2013 08:44:21 | | 10/09/2013 06:55:04 | 10/09/2013 08:51:12 |
| 4 | 904162263 | 10/01/2013 08:03:58 | 596,191 | 10/09/2013 08:51:12 | 10/09/2013 11:16:10 |
| | | 10/08/2013 05:40:29 | | 10/09/2013 11:16:10 | 10/09/2013 13:12:33 |
| 5 | 904162264 | 10/01/2013 07:45:58 | 574,892 | 10/09/2013 13:12:33 | 10/09/2013 15:38:43 |
| | | 10/07/2013 23:27:30 | | 10/09/2013 15:38:43 | 10/09/2013 17:34:25 |

| Throughput Stream | Seed | Query Start Time / Query End Time | Duration (sec) | RF1 Start Time / RF1 End Time | RF2 Start Time / RF2 End Time |
|---|---|---|---|---|---|
| 6 | 904162265 | 10/01/2013 07:45:59 / 10/08/2013 17:30:45 | 639,886 | 10/09/2013 17:34:25 / 10/09/2013 19:58:50 | 10/09/2013 19:58:50 / 10/09/2013 21:54:30 |
| 7 | 904162266 | 10/01/2013 08:04:01 / 10/07/2013 20:28:53 | 563,092 | 10/09/2013 21:54:30 / 10/10/2013 00:16:48 | 10/10/2013 00:16:48 / 10/10/2013 02:11:43 |
| 8 | 904162267 | 10/01/2013 07:45:59 / 10/07/2013 08:31:20 | 521,121 | 10/10/2013 02:11:43 / 10/10/2013 04:36:54 | 10/10/2013 04:36:54 / 10/10/2013 06:32:38 |
| 9 | 904162268 | 10/01/2013 08:03:58 / 10/08/2013 12:31:09 | 620,831 | 10/10/2013 06:32:38 / 10/10/2013 08:50:11 | 10/10/2013 08:50:11 / 10/10/2013 10:46:10 |
| 10 | 904162269 | 10/01/2013 07:45:59 / 10/08/2013 07:06:55 | 602,456 | 10/10/2013 10:46:10 / 10/10/2013 13:03:21 | 10/10/2013 13:03:21 / 10/10/2013 14:59:00 |
| 11 | 904162270 | 10/01/2013 07:45:59 / 10/08/2013 19:53:41 | 648,462 | 10/10/2013 14:59:01 / 10/10/2013 17:15:52 | 10/10/2013 17:15:52 / 10/10/2013 19:12:25 |

**TPC-H Timing Intervals (in seconds)**

| Stream ID | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q11 | Q12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 19,448.8 | 4,089.4 | 11,412.4 | 13,793.6 | 16,201.3 | 477.8 | 7,712.7 | 10,114.9 | 18,239.3 | 5,723.7 | 2,717.9 | 2,228.5 |
| 1 | 24,717.4 | 4,447.7 | 34,545.3 | 26,180.1 | 30,166.6 | 15,117.2 | 22,568.1 | 16,174.8 | 56,080.6 | 10,114.7 | 6,871.4 | 10,038.6 |
| 2 | 34,996.9 | 45,407.7 | 24,131.4 | 34,408.6 | 57,891.2 | 2,030.3 | 33,730.0 | 11,834.6 | 72,834.2 | 54,809.5 | 6,477.8 | 10,365.4 |
| 3 | 23,911.6 | 33,291.6 | 17,607.2 | 45,313.1 | 64,002.6 | 40,515.3 | 26,223.4 | 14,715.6 | 19,058.1 | 33,246.6 | 20,050.5 | 2,378.7 |
| 4 | 46,651.9 | 30,559.5 | 11,576.3 | 38,522.9 | 68,312.0 | 4,463.8 | 8,531.9 | 34,358.9 | 22,349.1 | 23,050.4 | 9,916.5 | 16,457.3 |
| 5 | 22,785.5 | 20,183.7 | 18,066.2 | 84,488.3 | 34,962.8 | 7,975.0 | 55,083.6 | 37,193.3 | 31,892.7 | 8,613.6 | 5,028.8 | 9,107.1 |
| 6 | 33,932.0 | 26,349.5 | 52,321.5 | 18,507.8 | 33,810.2 | 31,297.3 | 16,275.0 | 20,827.9 | 25,660.4 | 6,333.2 | 7,150.9 | 29,276.6 |
| 7 | 20,192.3 | 10,068.8 | 27,225.2 | 14,821.7 | 21,243.3 | 30,501.6 | 15,928.4 | 51,340.2 | 21,659.3 | 13,392.1 | 24,942.8 | 8,589.0 |
| 8 | 44,605.6 | 15,980.1 | 48,135.6 | 16,393.6 | 36,751.3 | 8,919.0 | 34,459.3 | 57,893.3 | 34,182.3 | 17,478.6 | 7,460.8 | 12,089.2 |
| 9 | 38,605.2 | 15,283.8 | 27,007.0 | 82,415.2 | 16,374.8 | 27,071.8 | 50,381.1 | 24,036.9 | 32,718.7 | 16,692.4 | 26,191.4 | 61,787.2 |
| 10 | 33,363.6 | 6,293.9 | 49,250.0 | 19,728.1 | 28,112.5 | 919.4 | 20,023.5 | 17,466.8 | 22,489.1 | 22,248.6 | 7,042.3 | 26,632.0 |
| 11 | 22,808.2 | 12,171.4 | 17,375.9 | 39,411.2 | 27,512.8 | 46,674.1 | 7,853.6 | 25,757.0 | 41,452.1 | 44,780.4 | 24,587.9 | 21,232.0 |
| Minimum | 19,448.8 | 4,089.4 | 11,412.4 | 13,793.6 | 16,201.3 | 477.8 | 7,712.7 | 10,114.9 | 18,239.3 | 5,723.7 | 2,717.9 | 2,228.5 |
| Average | 30,501.6 | 18,677.3 | 28,221.2 | 36,165.4 | 36,278.5 | 17,996.9 | 24,897.6 | 26,809.5 | 33,218.0 | 21,373.7 | 12,369.9 | 17,515.1 |
| Maximum | 46,651.9 | 45,407.7 | 52,321.5 | 84,488.3 | 68,312.0 | 46,674.1 | 55,083.6 | 57,893.3 | 72,834.2 | 54,809.5 | 26,191.4 | 61,787.2 |

| Stream ID | Q13 | Q14 | Q15 | Q16 | Q17 | Q18 | Q19 | Q20 | Q21 | Q22 | RF1 | RF2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 16,274.7 | 2,322.6 | 787.1 | 2,334.4 | 3,308.2 | 20,820.2 | 832.6 | 5,806.5 | 46,171.2 | 3,219.6 | 7,933.0 | 7,047.5 |
| 1 | 43,200.6 | 28,789.0 | 19,987.5 | 19,685.0 | 27,383.1 | 40,647.2 | 4,803.9 | 12,500.0 | 56,346.6 | 56,654.7 | 8,287.5 | 6,986.0 |
| 2 | 23,847.0 | 17,023.9 | 3,427.3 | 8,281.2 | 60,368.6 | 38,797.5 | 21,548.4 | 7,060.8 | 46,860.0 | 23,166.9 | 8,768.0 | 7,009.0 |
| 3 | 33,915.9 | 21,495.9 | 21,214.8 | 15,463.0 | 16,243.1 | 23,755.1 | 26,063.6 | 26,154.5 | 64,807.5 | 18,874.0 | 8,632.4 | 6,967.6 |
| 4 | 47,399.5 | 24,950.7 | 22,547.8 | 21,013.9 | 20,559.6 | 30,846.3 | 3,636.7 | 7,566.2 | 71,428.0 | 31,492.0 | 8,698.2 | 6,983.4 |
| 5 | 24,283.1 | 21,755.5 | 18,379.9 | 43,372.6 | 5,105.8 | 42,884.6 | 3,632.5 | 19,224.2 | 51,820.8 | 9,051.9 | 8,769.9 | 6,941.5 |
| 6 | 28,916.4 | 12,679.9 | 5,646.0 | 11,345.3 | 59,584.8 | 41,603.3 | 21,626.4 | 43,961.8 | 88,939.1 | 23,840.8 | 8,665.3 | 6,940.0 |
| 7 | 69,297.4 | 6,755.7 | 34,677.1 | 49,164.8 | 8,480.8 | 27,067.2 | 1,854.8 | 14,265.9 | 64,628.4 | 26,994.6 | 8,538.5 | 6,894.9 |
| 8 | 34,743.2 | 8,177.7 | 11,615.5 | 5,491.9 | 10,922.2 | 32,329.8 | 3,235.0 | 16,778.2 | 56,255.7 | 7,222.8 | 8,711.0 | 6,943.9 |
| 9 | 23,092.4 | 17,156.1 | 12,168.6 | 2,335.2 | 22,676.7 | 48,945.3 | 1,628.1 | 21,936.9 | 47,615.3 | 4,710.8 | 8,252.7 | 6,958.7 |
| 10 | 47,433.9 | 14,896.9 | 51,719.4 | 47,376.1 | 54,582.1 | 39,417.7 | 3,107.5 | 8,559.0 | 56,827.1 | 24,966.7 | 8,231.5 | 6,939.5 |
| 11 | 42,575.5 | 23,448.2 | 2,396.6 | 29,481.4 | 38,076.4 | 43,517.5 | 831.9 | 27,252.5 | 72,083.1 | 37,182.9 | 8,211.3 | 6,993.1 |
| Minimum | 16,274.7 | 2,322.6 | 787.1 | 2,334.4 | 3,308.2 | 20,820.2 | 831.9 | 5,806.5 | 46,171.2 | 3,219.6 | 7,933.0 | 6,894.9 |
| Average | 36,248.3 | 16,621.0 | 17,047.3 | 21,278.7 | 27,274.3 | 35,886.0 | 7,733.5 | 17,588.9 | 60,315.2 | 22,281.5 | 8,474.9 | 6,967.1 |
| Maximum | 69,297.4 | 28,789.0 | 51,719.4 | 49,164.8 | 60,368.6 | 48,945.3 | 26,063.6 | 43,961.8 | 88,939.1 | 56,654.7 | 8,769.9 | 7,047.5 |