**Appendix A1** Actual Data of Facebook and Tencent

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Year | Facebook Data | | | Tencent Data | | | |
| MAUs  (Billion) | Revenues  (Billion USD) | Cost  (Billion USD) | MAUs  (Billion) | Revenues  (Billion USD) | Filtered Revenues  (Billion USD) | Cost  (Billion USD) |
| 2003 | N/A | N/A | N/A | 0.082 | 0.089 | 0.0881 | 0.045 |
| 2004 | 0.001 | 0.000382 | N/A | 0.135 | 0.138 | 0.1371 | 0.085 |
| 2005 | 0.006 | 0.009 | N/A | 0.202 | 0.177 | 0.1753 | 0.117 |
| 2006 | 0.012 | 0.048 | N/A | 0.233 | 0.359 | 0.3571 | 0.223 |
| 2007 | 0.058 | 0.153 | 0.015 | 0.300 | 0.523 | 0.5140 | 0.310 |
| 2008 | 0.145 | 0.272 | 0.216 | 0.377 | 1.047 | 1.0372 | 0.636 |
| 2009 | 0.360 | 0.777 | 0.548 | 0.522 | 1.822 | 1.8161 | 1.057 |
| 2010 | 0.608 | 1.974 | 1.368 | 0.648 | 2.967 | 2.9646 | 1.737 |
| 2011 | 0.845 | 3.711 | 2.711 | 0.771 | 4.523 | 4.4905 | 2.900 |
| 2012 | 1.056 | 5.089 | 5.036 | 0.959 | 6.983 | 6.2763 | 4.931 |
| 2013 | 1.228 | 7.872 | 6.372 | 1.163 | 9.913 | 8.2040 | 7.360 |
| 2014 | 1.390 | 12.470 | 9.530 | 1.315 | 12.899 | 11.7042 | 8.995 |
| 2015 | 1.591 | 17.928 | 14.238 | 1.550 | 15.841 | 15.1129 | 11.358 |
| 2016 | 1.860 | 27.638 | 17.421 | 1.758 | 21.877 | 19.4068 | 15.909 |
| 2017 | 2.129 | 40.653 | 24.719 | 1.772 | 36.541 | 29.8807 | 25.403 |
| 2018 | 2.320 | 55.838 | 33.726 | 1.905 | 45.460 | 34.1244 | 33.832 |
| 2019 | 2.498 | 70.697 | 52.212 | 1.892 | 54.082 | 38.5409 | 40.311 |
| 2020 | 2.797 | 85.970 | 56.820 | N/A | N/A | N/A | N/A |

**Appendix A2** Facebook’s Coefficients, RMSEs, and NRMSEs of the Network Value Functions (Rolling years)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Start**  **year** | **End**  **year** | **Sarnoff’s function** | | | **Odlyzko’s function** | | | **Metcalfe’s function** | | | **Cube function** | | | **Quad function** | | |
|  | RMSEs | NRMSEs |  | RMSEs | NRMSEs | ×10-9 | RMSEs | NRMSEs | ×10-18 | RMSEs | NRMSEs | ×10-27 | RMSEs | NRMSEs |
| 2004 | 2010 | 2.92 | 0.14 | 7.12% | 0.15 | 0.13 | 6.49% | 5.44 | **0.086** | 4.36% | 9.12 | 0.17 | 8.86% | 14.9 | 0.23 | 11.77% |
| 2005 | 2011 | 3.77 | 0.34 | 9.10% | 0.19 | 0.31 | 8.42% | 5.25 | **0.091** | 2.47% | 6.53 | 0.30 | 8.04% | 7.80 | 0.45 | 12.13% |
| 2006 | 2012 | 4.27 | 0.45 | 9.00% | 0.21 | 0.41 | 8.23% | 4.80 | **0.19** | 3.85% | 4.83 | 0.56 | 11.07% | 4.66 | 0.82 | 16.18% |
| 2007 | 2013 | 5.10 | 0.90 | 11.66% | 0.25 | 0.85 | 10.97% | 5.03 | **0.25** | 3.26% | 4.45 | 0.61 | 7.86% | 3.77 | 0.97 | 12.57% |
| 2008 | 2014 | 6.40 | 1.89 | 15.46% | 0.31 | 1.81 | 14.86% | 5.70 | 0.79 | 6.52% | 4.56 | **0.62** | 5.06% | 3.49 | 1.03 | 8.45% |
| 2009 | 2015 | 7.89 | 3.07 | 17.89% | 0.38 | 2.96 | 17.28% | 6.32 | 1.26 | 7.36% | 4.50 | **0.62** | 3.61% | 3.03 | 1.41 | 8.22% |
| 2010 | 2016 | 10.03 | 5.02 | 19.56% | 0.48 | 4.86 | 18.95% | 7.08 | 2.05 | 7.97% | 4.38 | **0.66** | 2.58% | 2.53 | 2.26 | 8.82% |
| 2011 | 2017 | 12.79 | 7.67 | 20.76% | 0.61 | 7.44 | 20.14% | 7.92 | 3.15 | 8.53% | 4.28 | **0.67** | 1.81% | 2.16 | 3.26 | 8.83% |
| 2012 | 2018 | 16.05 | 10.88 | 21.44% | 0.76 | 10.58 | 20.84% | 8.88 | 4.94 | 9.73% | 4.37 | **0.83** | 1.64% | 2.02 | 3.51 | 6.92% |
| 2013 | 2019 | 19.53 | 13.70 | 21.80% | 0.91 | 13.33 | 21.22% | 9.77 | 6.42 | 10.23% | 4.44 | **1.07** | 1.70% | 1.91 | 4.03 | 6.41% |
| 2014 | 2020 | 22.89 | 15.46 | 21.03% | 1.07 | 15.00 | 20.41% | 10.3 | 6.42 | 8.74% | 4.20 | **3.36** | 4.57% | 1.63 | 8.78 | 11.95% |

**Appendix A3** Tencent’s Coefficients, RMSEs, and NRMSEs of the Network Value Functions (Rolling years)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Start**  **year** | **End**  **year** | **Sarnoff’s function** | | | **Odlyzko’s function** | | | **Metcalfe’s function** | | | **Cube function** | | | **Quad function** | | |
|  | RMSEs | NRMSEs |  | RMSEs | NRMSEs | ×10-9 | RMSEs | NRMSEs | ×10-18 | RMSEs | NRMSEs | ×10-27 | RMSEs | NRMSEs |
| 2003 | 2009 | 2.64 | 0.27 | 15.81% | 0.13 | 0.26 | 14.95% | 6.70 | **0.063** | 3.61% | 13.9 | 0.17 | 9.67% | 26.8 | 0.27 | 15.49% |
| 2004 | 2010 | 3.43 | 0.45 | 16.02% | 0.17 | 0.43 | 15.14% | 6.93 | **0.071** | 2.50% | 11.7 | 0.22 | 7.91% | 18.5 | 0.38 | 13.37% |
| 2005 | 2011 | 4.36 | 0.70 | 16.21% | 0.22 | 0.67 | 15.37% | 7.31 | **0.12** | 2.85% | 10.4 | 0.28 | 6.46% | 14.1 | 0.52 | 12.02% |
| 2006 | 2012 | 5.49 | 1.04 | 15.76% | 0.27 | 0.99 | 14.93% | 7.47 | **0.13** | 1.98% | 8.63 | 0.53 | 7.95% | 9.33 | 0.96 | 14.43% |
| 2007 | 2013 | 6.63 | 1.43 | 15.23% | 0.32 | 1.35 | 14.38% | 7.39 | **0.14** | 1.48% | 7.01 | 0.92 | 9.83% | 6.23 | 1.56 | 16.57% |
| 2008 | 2014 | 7.72 | 1.82 | 15.34% | 0.37 | 1.72 | 14.48% | 7.43 | **0.13** | 1.11% | 6.22 | 1.17 | 9.89% | 4.93 | 1.97 | 16.65% |
| 2009 | 2015 | 8.59 | 2.03 | 14.47% | 0.41 | 1.90 | 13.56% | 7.03 | **0.56** | 4.01% | 5.01 | 2.06 | 14.69% | 3.36 | 3.19 | 22.78% |
| 2010 | 2016 | 9.86 | 2.69 | 14.23% | 0.47 | 2.53 | 13.40% | 7.05 | **0.56** | 2.98% | 4.45 | 2.41 | 12.74% | 2.65 | 3.85 | 20.38% |
| 2011 | 2017 | 12.58 | 6.60 | 20.60% | 0.60 | 6.46 | 20.17% | 8.50 | 4.54 | 14.17% | 5.23 | **4.23** | 13.21% | 3.09 | 4.80 | 15.00% |
| 2012 | 2018 | 15.34 | 9.38 | 24.38% | 0.73 | 9.21 | 23.94% | 9.71 | 6.47 | 16.81% | 5.72 | 5.02 | 13.05% | 3.24 | **4.83** | 12.56% |
| 2013 | 2019 | 18.24 | 12.10 | 27.39% | 0.86 | 11.93 | 27.01% | 10.98 | 9.04 | 20.47% | 6.30 | 7.06 | 15.98% | 3.52 | **6.10** | 13.81% |

**Appendix A4** Tencent’s Coefficients, RMSEs, and NRMSEs of the Network Value Functions (Rolling years, filtered revenues)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Start**  **year** | **End**  **year** | **Sarnoff’s function** | | | **Odlyzko’s function** | | | **Metcalfe’s function** | | | **Cube function** | | | **Quad function** | | |
|  | RMSEs | NRMSEs |  | RMSEs | NRMSEs | ×10-9 | RMSEs | NRMSEs | ×10-18 | RMSEs | NRMSEs | ×10-27 | RMSEs | NRMSEs |
| 2003 | 2009 | 2.62 | 0.27 | 15.88% | 0.13 | 0.26 | 15.02% | 6.66 | **0.063** | 3.62% | 13.8 | 0.16 | 9.51% | 26.7 | 0.26 | 15.31% |
| 2004 | 2010 | 3.42 | 0.46 | 16.10% | 0.17 | 0.43 | 15.22% | 6.91 | **0.072** | 2.56% | 11.6 | 0.22 | 7.75% | 18.5 | 0.37 | 13.20% |
| 2005 | 2011 | 4.33 | 0.70 | 16.23% | 0.22 | 0.66 | 15.39% | 7.27 | **0.12** | 2.78% | 10.4 | 0.28 | 6.49% | 14.0 | 0.52 | 12.09% |
| 2006 | 2012 | 5.21 | 0.89 | 15.03% | 0.26 | 0.84 | 14.14% | 7.02 | **0.15** | 2.56% | 8.04 | 0.64 | 10.86% | 8.64 | 1.04 | 17.65% |
| 2007 | 2013 | 5.92 | 1.04 | 13.47% | 0.29 | 0.96 | 12.55% | 6.49 | **0.36** | 4.67% | 6.08 | 1.12 | 14.61% | 5.35 | 1.67 | 21.72% |
| 2008 | 2014 | 6.94 | 1.50 | 14.02% | 0.34 | 1.41 | 13.19% | 6.62 | **0.38** | 3.57% | 5.52 | 1.23 | 11.50% | 4.37 | 1.90 | 17.78% |
| 2009 | 2015 | 7.89 | 1.90 | 14.26% | 0.38 | 1.78 | 13.40% | 6.46 | **0.44** | 3.29% | 4.62 | 1.75 | 13.16% | 3.11 | 2.76 | 20.76% |
| 2010 | 2016 | 8.93 | 2.36 | 14.36% | 0.43 | 2.22 | 13.50% | 6.38 | **0.46** | 2.83% | 4.02 | 2.20 | 13.40% | 2.40 | 3.52 | 21.40% |
| 2011 | 2017 | 10.95 | 4.99 | 19.67% | 0.52 | 4.87 | 19.16% | 7.37 | 3.12 | 12.27% | 4.52 | **3.07** | 12.11% | 2.66 | 3.84 | 15.13% |
| 2012 | 2018 | 12.69 | 6.39 | 22.93% | 0.60 | 6.24 | 22.40% | 7.98 | 3.90 | 13.99% | 4.67 | **3.07** | 11.02% | 2.63 | 3.61 | 12.95% |
| 2013 | 2019 | 14.45 | 7.59 | 25.03% | 0.68 | 7.45 | 24.57% | 8.63 | 5.08 | 16.76% | 4.92 | 3.74 | 12.33% | 2.73 | **3.63** | 11.98% |

**Appendix A5** Facebook’s Coefficients, RMSEs, and NRMSEs of the Network Value Functions with Quality (rolling years)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Start**  **year** | **End**  **year** | **Sarnoff’s function with quality** | | | | **Odlyzko’s function with quality** | | | | **Metcalfe’s function with quality** | | | | **Cube function with quality** | | | | **Quad function with quality** | | | |
|  | q | RMSEs | NRM-SEs |  | q | RMSEs | NRM-  SEs | ×10-9 | q | RMSEs | NRM-SEs | ×10-18 | q | RMSEs | NRM-SEs | ×10-27 | q | RMSEs | NRM-SEs |
| 2007 | 2013 | 4.82 | 0.07 | 0.90 | 11.65% | 0.28 | -0.14 | 0.84 | 10.95% | 4.93 | 0.03 | **0.25** | 3.24% | 2.97 | 0.44 | 0.33 | 4.32% | 2.03 | 0.62 | 0.41 | 5.33% |
| 2008 | 2014 | -2.84 | 2.07 | 1.57 | 12.89% | -0.07 | 1.75 | 1.60 | 13.09% | 6.50 | -0.21 | 0.77 | 6.35% | 3.66 | 0.31 | 0.47 | 3.85% | 2.24 | 0.58 | **0.43** | 3.52% |
| 2009 | 2015 | -11.56 | 4.06 | 1.04 | 6.04% | -0.58 | 4.19 | 1.11 | 6.49% | 9.15 | -0.77 | 1.16 | 6.74% | 3.75 | 0.30 | 0.47 | 2.76% | 1.84 | 0.72 | **0.43** | 2.50% |
| 2010 | 2016 | -13.86 | 4.90 | 3.57 | 13.90% | -0.63 | 4.79 | 3.70 | 14.41% | 12.34 | -1.64 | 1.13 | 4.39% | 3.96 | 0.22 | 0.48 | 1.86% | 1.70 | 0.79 | **0.42** | 1.65% |
| 2011 | 2017 | -24.99 | 7.46 | 5.15 | 13.95% | -1.16 | 7.40 | 5.42 | 14.68% | 14.59 | -2.28 | 1.25 | 3.38% | 3.98 | 0.21 | **0.42** | 1.14% | 1.49 | 0.93 | 0.72 | 1.94% |
| 2012 | 2018 | -32.45 | 8.94 | 5.21 | 10.27% | -1.58 | 9.15 | 5.56 | 10.95% | 17.39 | -3.01 | 3.24 | 6.38% | 4.33 | 0.03 | 0.83 | 1.63% | 1.46 | 0.95 | **0.74** | 1.45% |
| 2013 | 2019 | -9.56 | 4.70 | 6.48 | 10.32% | -0.44 | 4.68 | 6.60 | 10.50% | 8.19 | 0.53 | 6.38 | 10.15% | 4.36 | 0.06 | **1.06** | 1.69% | 1.29 | 1.10 | 1.66 | 2.64% |
| 2014 | 2020 | -10.86 | 5.16 | 8.17 | 11.12% | -0.49 | 5.11 | 8.31 | 11.31% | 10.80 | -0.19 | 6.42 | 8.73% | 3.28 | 0.81 | **2.18** | 2.97% | 0.85 | 1.79 | 2.96 | 4.03% |

**Appendix A6** Tencent’s Coefficients, RMSEs, and NRMSEs of the Network Value Functions with Quality (rolling years, filtered revenues)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Start**  **year** | **End**  **year** | **Sarnoff’s function with quality** | | | | **Odlyzko’s function with quality** | | | | **Metcalfe’s function with quality** | | | | **Cube function with quality** | | | | **Quad function with quality** | | | |
|  | q | RMSEs | NRM  -SEs |  | q | RMSEs | NRM-SEs | ×10-9 | q | RMSEs | NRM-SEs | ×10-18 | q | RMSEs | NRM-SEs | ×10-27 | q | RMSEs | NRM-SEs | |
| 2003 | 2009 | 1.81 | 0.21 | 0.27 | 15.75% | 0.13 | 0.02 | 0.26 | 15.02% | 6.43 | 0.03 | **0.06** | 3.57% | 9.34 | 0.26 | **0.06** | 3.30% | 15.33 | 0.35 | 0.08 | 4.81% | |
| 2004 | 2010 | -2.05 | 1.36 | 0.41 | 14.64% | 0.03 | 0.72 | 0.42 | 14.84% | 7.27 | -0.05 | 0.07 | 2.45% | 7.99 | 0.31 | **0.06** | 2.08% | 10.57 | 0.44 | 0.10 | 3.55% | |
| 2005 | 2011 | -5.95 | 2.38 | 0.39 | 9.09% | -0.28 | 2.32 | 0.43 | 9.92% | 8.20 | -0.14 | 0.11 | 2.43% | 6.94 | 0.37 | **0.08** | 1.78% | 7.34 | 0.54 | 0.15 | 3.57% | |
| 2006 | 2012 | -5.27 | 2.22 | 0.39 | 6.67% | -0.27 | 2.24 | 0.43 | 7.21% | 6.82 | 0.03 | **0.15** | 2.54% | 3.80 | 0.62 | 0.27 | 4.49% | 2.88 | 0.80 | 0.34 | 5.75% | |
| 2007 | 2013 | -5.36 | 2.26 | 0.35 | 4.50% | -0.28 | 2.35 | 0.37 | 4.87% | 4.36 | 0.40 | **0.25** | 3.26% | 1.95 | 0.85 | 0.32 | 4.21% | 1.24 | 0.97 | 0.37 | 4.86% | |
| 2008 | 2014 | -6.36 | 2.62 | 1.07 | 10.01% | -0.27 | 2.46 | 1.12 | 10.46% | 6.08 | 0.12 | **0.37** | 3.44% | 2.79 | 0.73 | 0.41 | 3.86% | 1.76 | 0.90 | 0.41 | 3.86% | |
| 2009 | 2015 | 4.46 | 0.69 | 1.87 | 14.08% | 0.40 | -0.09 | 1.78 | 13.39% | 5.77 | 0.18 | **0.37** | 2.79% | 2.53 | 0.79 | 0.39 | 2.96% | 1.39 | 1.00 | 0.41 | 3.05% | |
| 2010 | 2016 | 7.41 | 0.30 | 2.36 | 14.35% | 0.68 | -1.04 | 2.19 | 13.30% | 5.72 | 0.19 | **0.37** | 2.24% | 2.20 | 0.87 | 0.49 | 2.98% | 1.05 | 1.11 | 0.65 | 3.93% | |
| 2011 | 2017 | -3.30 | 2.45 | 2.45 | 9.64% | -0.14 | 2.40 | 2.49 | 9.81% | 2.89 | 1.18 | 2.27 | 8.94% | 2.07 | 1.08 | 1.53 | 6.02% | 1.09 | 1.20 | **1.19** | 4.70% | |
| 2012 | 2018 | -1.27 | 2.11 | 2.37 | 8.52% | -0.05 | 2.09 | 2.38 | 8.56% | 1.89 | 1.49 | 2.22 | 7.98% | 1.97 | 1.14 | 1.52 | 5.46% | 1.02 | 1.21 | **1.26** | 4.52% | |
| 2013 | 2019 | 0.80 | 1.80 | 2.15 | 7.08% | 0.04 | 1.79 | 2.14 | 7.06% | 1.70 | 1.54 | 1.87 | 6.18% | 1.63 | 1.29 | 1.41 | 4.64% | 0.96 | 1.25 | **1.22** | 4.02% | |

**Appendix A7** Actual Data of Weibo and LinkedIn

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year** | **Weibo Data** | | **LinkedIn** | |
| MAUs  (Billion) | Revenues  (Billion USD) | MAUs  (Billion) | Revenues  (Billion USD) |
| 2010 | N/A | N/A | 0.078 | 0.24 |
| 2011 | N/A | N/A | 0.116 | 0.52 |
| 2012 | 0.097 | 0.066 | 0.174 | 0.97 |
| 2013 | 0.129 | 0.188 | 0.238 | 1.52 |
| 2014 | 0.176 | 0.334 | 0.313 | 2.21 |
| 2015 | 0.236 | 0.4780 | 0.380 | 2.98 |
| 2016 | 0.313 | 0.656 | 0.450 | 2.97 |
| 2017 | 0.392 | 1.150 | 0.491 | 4.50 |
| 2018 | 0.462 | 1.719 | 0.556 | 6.02 |
| 2019 | 0.516 | 1.767 | 0.604 | 7.13 |
| 2020 | 0.521 | 1.690 | 0.690 | 8.37 |
| 2021 | 0.573 | 2.257 | 0.756 | 11.56 |

**Appendix A8** Weibo’s Coefficients, RMSEs, and NRMSEs of the Network Value Functions (Rolling years)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Start**  **year** | **End**  **year** | **Sarnoff’s function** | | | **Odlyzko’s function** | | | **Metcalfe’s function** | | | **Cube function** | | | **Quad function** | | |
|  | RMSEs | NRMSEs |  | RMSEs | NRMSEs | ×10-9 | RMSEs | NRMSEs | ×10-18 | RMSEs | NRMSEs | ×10-27 | RMSEs | NRMSEs |
| 2012 | 2016 | 1.93 | 0.065 | 11.14% | 0.10 | **0.059** | 10.12% | 7.48 | 0.069 | 11.81% | 24.98 | 0.14 | 23.21% | 79.37 | 0.18 | 30.57% |
| 2013 | 2017 | 2.40 | 0.13 | 13.41% | 0.12 | 0.12 | 12.49% | 7.49 | **0.069** | 7.24% | 20.50 | 0.16 | 16.22% | 53.47 | 0.22 | 22.80% |
| 2014 | 2018 | 2.94 | 0.24 | 17.09% | 0.15 | 0.22 | 16.21% | 7.78 | **0.074** | 5.35% | 18.42 | 0.16 | 11.64% | 41.50 | 0.26 | 18.65% |
| 2015 | 2019 | 3.14 | 0.23 | 18.23% | 0.16 | 0.22 | 17.23% | 7.23 | **0.11** | 8.89% | 15.23 | 0.25 | 19.62% | 30.73 | 0.38 | 29.59% |
| 2016 | 2020 | 3.23 | 0.20 | 19.38% | 0.16 | 0.19 | 18.51% | 6.88 | **0.15** | 14.16% | 13.93 | 0.27 | 26.23% | 27.43 | 0.39 | 37.89% |
| 2017 | 2021 | 3.51 | 0.17 | 15.23% | 0.18 | 0.16 | 14.61% | 6.88 | **0.15** | 13.21% | 13.07 | 0.28 | 25.00% | 24.22 | 0.41 | 37.23% |

**Appendix A9** LinkedIn’s Coefficients, RMSEs, and NRMSEs of the Network Value Functions (Rolling years)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Start**  **year** | **End**  **year** | **Sarnoff’s function** | | | **Odlyzko’s function** | | | **Metcalfe’s function** | | | **Cube function** | | | **Quad function** | | |
|  | RMSEs | NRMSEs |  | RMSEs | NRMSEs | ×10-9 | RMSEs | NRMSEs | ×10-18 | RMSEs | NRMSEs | ×10-27 | RMSEs | NRMSEs |
| 2010 | 2014 | 6.37 | 0.19 | 9.63% | 0.33 | **0.166** | 8.45% | 24.42 | 0.173 | 8.80% | 81.82 | 0.39 | 19.63% | 262.18 | 0.52 | 26.51% |
| 2011 | 2015 | 7.05 | 0.23 | 9.45% | 0.36 | **0.20** | 8.27% | 22.13 | 0.23 | 9.24% | 61.90 | 0.52 | 21.00% | 165.79 | 0.71 | 28.72% |
| 2012 | 2016 | 6.94 | 0.21 | 10.40% | 0.35 | **0.20** | 9.94% | 18.04 | 0.50 | 24.81% | 42.32 | 0.84 | 41.89% | 95.02 | 1.08 | 53.84% |
| 2013 | 2017 | 7.72 | 0.42 | 14.26% | 0.39 | **0.41** | 13.68% | 18.22 | 0.46 | 15.52% | 39.89 | 0.78 | 26.23% | 84.26 | 1.04 | 34.92% |
| 2014 | 2018 | 8.76 | 0.74 | 19.32% | 0.44 | 0.71 | 18.62% | 18.63 | **0.43** | 11.41% | 37.08 | 0.69 | 17.99% | 70.79 | 1.03 | 27.06% |
| 2015 | 2019 | 9.77 | 0.95 | 22.90% | 0.49 | 0.92 | 22.11% | 18.87 | **0.42** | 10.15% | 34.54 | 0.57 | 13.70% | 60.91 | 1.01 | 24.24% |
| 2016 | 2020 | 10.65 | 1.04 | 19.23% | 0.53 | 1.00 | 18.47% | 18.28 | **0.45** | 8.30% | 29.56 | 0.91 | 16.85% | 45.68 | 1.57 | 29.15% |
| 2017 | 2021 | 12.42 | 1.28 | 18.17% | 0.61 | 1.23 | 17.42% | 19.21 | **0.44** | 6.26% | 28.14 | 0.98 | 13.81% | 39.61 | 1.76 | 24.98% |