APPENDIX

**Forecast for export using the 6 period moving average**

Table 4.1 Forecasting export demand using the 6 period Moving Average

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Period** | **Demand** | **Forecast** | **Error** | **Absolute Error** | **Squared Error** | **Absolute % Error** |
| Jan-10 | 6737 |  |  |  |  |  |
| Feb-10 | 5800 |  |  |  |  |  |
| Mar-10 | 6579 |  |  |  |  |  |
| Apr-10 | 6352 |  |  |  |  |  |
| May-10 | 7153 |  |  |  |  |  |
| Jun-10 | 6964 |  |  |  |  |  |
| Jul-10 | 4551 | 6597.5 | -2046.5 | 2046.5 | 4188162.25 | 44.97% |
| Aug-10 | 6521 | 6233.16667 | 287.833333 | 287.8333333 | 82848.02778 | 04.41% |
| Sep-10 | 5525 | 6353.33333 | -828.333333 | 828.3333333 | 686136.1111 | 14.99% |
| Oct-10 | 5294 | 6177.66667 | -883.666667 | 883.6666667 | 780866.7778 | 16.69% |
| Nov-10 | 6418 | 6001.33333 | 416.666667 | 416.6666667 | 173611.1111 | 06.49% |
| Dec-10 | 4605 | 5878.83333 | -1273.83333 | 1273.833333 | 1622651.361 | 27.66% |
| Jan-11 | 1708 | 5485.66667 | -3777.66667 | 3777.666667 | 14270765.44 | 221.17% |
| Feb-11 | 2126 | 5011.83333 | -2885.83333 | 2885.833333 | 8328034.028 | 135.74% |
| Mar-11 | 2368 | 4279.33333 | -1911.33333 | 1911.333333 | 3653195.111 | 80.72% |
| Apr-11 | 3509 | 3753.16667 | -244.166667 | 244.1666667 | 59617.36111 | 06.96% |
| May-11 | 6145 | 3455.66667 | 2689.33333 | 2689.333333 | 7232513.778 | 43.76% |
| Jun-11 | 3041 | 3410.16667 | -369.166667 | 369.1666667 | 136284.0278 | 12.14% |
| Jul-11 | 4549 | 3149.5 | 1399.5 | 1399.5 | 1958600.25 | 30.77% |
| Aug-11 | 3427 | 3623 | -196 | 196 | 38416 | 05.72% |
| Sep-11 | 1615 | 3839.83333 | -2224.83333 | 2224.833333 | 4949883.361 | 137.76% |
| Oct-11 | 1410 | 3714.33333 | -2304.33333 | 2304.333333 | 5309952.111 | 163.43% |
|  |  | Total | -14152.3333 | 23739 | 53471537.11 | 953.39% |
|  |  | **Average** | **-884.520833** | **1483.6875** | **3341971.069** | **59.59%** |
|  |  |  | **Bias** | **MAD** | **MSE** | **MAPE** |
|  |  |  |  | **SE** | **1954.32738** |  |
| **Next period** | **3364.5** |  |  |  |  |  |

Table 4.2 Forecast of Import Demand using the 6-period moving Average

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Period | Demand | **Forecast** | **Error** | **Absolute Error** | **Squared Error** | **Absolute % Error** |
| Jan-10 | 23464 |  |  |  |  |  |
| Feb-10 | 10573 |  |  |  |  |  |
| Mar-10 | 26622 |  |  |  |  |  |
| Apr-10 | 21174 |  |  |  |  |  |
| May-10 | 22186 |  |  |  |  |  |
| Jun-10 | 23266 |  |  |  |  |  |
| Jul-10 | 23302 | 21214.17 | 2087.833 | 2087.833333 | 4359048.028 | 08.96% |
| Aug-10 | 30439 | 21187.17 | 9251.833 | 9251.833333 | 85596420.03 | 30.39% |
| Sep-10 | 24231 | 24498.17 | -267.167 | 267.1666667 | 71378.02778 | 01.10% |
| Oct-10 | 23235 | 24099.67 | -864.667 | 864.6666667 | 747648.4444 | 03.72% |
| Nov-10 | 12903 | 24443.17 | -11540.2 | 11540.16667 | 133175446.7 | 89.44% |
| Dec-10 | 26250 | 22896 | 3354 | 3354 | 11249316 | 12.78% |
| Jan-11 | 10090 | 23393.33 | -13303.3 | 13303.33333 | 176978677.8 | 131.85% |
| Feb-11 | 7271 | 21191.33 | -13920.3 | 13920.33333 | 193775680.1 | 191.45% |
| Mar-11 | 7571 | 17330 | -9759 | 9759 | 95238081 | 128.90% |
| Apr-11 | 7089 | 14553.33 | -7464.33 | 7464.333333 | 55716272.11 | 105.29% |
| May-11 | 6423 | 11862.33 | -5439.33 | 5439.333333 | 29586347.11 | 84.69% |
| Jun-11 | 7625 | 10782.33 | -3157.33 | 3157.333333 | 9968753.778 | 41.41% |
| Jul-11 | 10960 | 7678.167 | 3281.833 | 3281.833333 | 10770430.03 | 29.94% |
| Aug-11 | 10599 | 7823.167 | 2775.833 | 2775.833333 | 7705250.694 | 26.19% |
| Sep-11 | 13134 | 8377.833 | 4756.167 | 4756.166667 | 22621121.36 | 36.21% |
| Oct-11 | 8986 | 9305 | -319 | 319 | 101761 | 03.55% |
|  |  | Total | -40527.2 | 91542.16667 | 837661632.2 | 925.87% |
|  |  | **Average** | **-2532.95** | **5721.385417** | **52353852.01** | **57.87%** |
|  |  |  | **Bias** | **MAD** | **MSE** | **MAPE** |
|  |  |  |  | **SE** | **7735.177679** |  |
| **Next period** | **9621.16667** |  |  |  |  |  |

**Table 4.3 Three-period moving average forecast for export data**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Period | Demand | **Forecast** | **Error** | **Absolute** | **Squared** | **Absolute % Error** |
| Period 1 | 6737 |  |  |  |  |  |
| Period 2 | 5800 |  |  |  |  |  |
| Period 3 | 6579 |  |  |  |  |  |
| Period 4 | 6352 | 6372 | -20 | 20 | 400 | 00.31% |
| Period 5 | 7153 | 6243.667 | 909.3333 | 909.3333333 | 826887.1111 | 12.71% |
| Period 6 | 6964 | 6694.667 | 269.3333 | 269.3333333 | 72540.44444 | 03.87% |
| Period 7 | 4551 | 6823 | -2272 | 2272 | 5161984 | 49.92% |
| Period 8 | 6521 | 6222.667 | 298.3333 | 298.3333333 | 89002.77778 | 04.57% |
| Period 9 | 5525 | 6012 | -487 | 487 | 237169 | 08.81% |
| Period 10 | 5294 | 5532.333 | -238.333 | 238.3333333 | 56802.77778 | 04.50% |
| Period 11 | 6418 | 5780 | 638 | 638 | 407044 | 09.94% |
| Period 12 | 4605 | 5745.667 | -1140.67 | 1140.666667 | 1301120.444 | 24.77% |
| Period 13 | 1708 | 5439 | -3731 | 3731 | 13920361 | 218.44% |
| Period 14 | 2126 | 4243.667 | -2117.67 | 2117.666667 | 4484512.111 | 99.61% |
| Period 15 | 2368 | 2813 | -445 | 445 | 198025 | 18.79% |
| Period 16 | 3509 | 2067.333 | 1441.667 | 1441.666667 | 2078402.778 | 41.08% |
| Period 17 | 6145 | 2667.667 | 3477.333 | 3477.333333 | 12091847.11 | 56.59% |
| Period 18 | 3041 | 4007.333 | -966.333 | 966.3333333 | 933800.1111 | 31.78% |
| Period 19 | 4549 | 4231.667 | 317.3333 | 317.3333333 | 100700.4444 | 06.98% |
| Period 20 | 3427 | 4578.333 | -1151.33 | 1151.333333 | 1325568.444 | 33.60% |
| Period 21 | 1615 | 3672.333 | -2057.33 | 2057.333333 | 4232620.444 | 127.39% |
| Period 22 | 1410 | 3197 | -1787 | 1787 | 3193369 | 126.74% |
|  |  | Total | -9062.33 | 23765 | 50712157 | 880.41% |
|  |  | **Average** | **-476.965** | **1250.789474** | **2669060.895** | **46.34%** |
|  |  |  | **Bias** | **MAD** | **MSE** | **MAPE** |
|  |  |  |  | **SE** | **1727.156061** |  |
| **Next period** | **2150.66667** |  |  |  |  |  |

**4.4 (4.3.8) Three-period moving average forecast for import data**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Period | Demand | **Forecast** | **Error** | **Absolute** | **Squared** | **Abs Pct Err** |
| Period 1 | 23464 |  |  |  |  |  |
| Period 2 | 10573 |  |  |  |  |  |
| Period 3 | 26622 |  |  |  |  |  |
| Period 4 | 21174 | 20219.67 | 954.3333 | 954.3333333 | 910752.1111 | 04.51% |
| Period 5 | 22186 | 19456.33 | 2729.667 | 2729.666667 | 7451080.111 | 12.30% |
| Period 6 | 23266 | 23327.33 | -61.3333 | 61.33333333 | 3761.777778 | 00.26% |
| Period 7 | 23302 | 22208.67 | 1093.333 | 1093.333333 | 1195377.778 | 04.69% |
| Period 8 | 30439 | 22918 | 7521 | 7521 | 56565441 | 24.71% |
| Period 9 | 24231 | 25669 | -1438 | 1438 | 2067844 | 05.93% |
| Period 10 | 23235 | 25990.67 | -2755.67 | 2755.666667 | 7593698.778 | 11.86% |
| Period 11 | 12903 | 25968.33 | -13065.3 | 13065.33333 | 170702935.1 | 101.26% |
| Period 12 | 26250 | 20123 | 6127 | 6127 | 37540129 | 23.34% |
| Period 13 | 10090 | 20796 | -10706 | 10706 | 114618436 | 106.11% |
| Period 14 | 7271 | 16414.33 | -9143.33 | 9143.333333 | 83600544.44 | 125.75% |
| Period 15 | 7571 | 14537 | -6966 | 6966 | 48525156 | 92.01% |
| Period 16 | 7089 | 8310.667 | -1221.67 | 1221.666667 | 1492469.444 | 17.23% |
| Period 17 | 6423 | 7310.333 | -887.333 | 887.3333333 | 787360.4444 | 13.81% |
| Period 18 | 7625 | 7027.667 | 597.3333 | 597.3333333 | 356807.1111 | 07.83% |
| Period 19 | 10960 | 7045.667 | 3914.333 | 3914.333333 | 15322005.44 | 35.71% |
| Period 20 | 10599 | 8336 | 2263 | 2263 | 5121169 | 21.35% |
| Period 21 | 13134 | 9728 | 3406 | 3406 | 11600836 | 25.93% |
| Period 22 | 8986 | 11564.33 | -2578.33 | 2578.333333 | 6647802.778 | 28.69% |
|  |  | Total | -20217 | 77429 | 572103606.3 | 663.31% |
|  |  | **Average** | **-1064.05** | **4075.210526** | **30110716.12** | **34.91%** |
|  |  |  | **Bias** | **MAD** | **MSE** | **MAPE** |
| **Next period** | **10906.3333** |  |  |  |  |  |

**4.3.8 Three-period moving average forecast for import data**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Period | Demand | **Forecast** | **Error** | **Absolute** | **Squared** | **Abs Pct Err** |
| Period 1 | 23464 |  |  |  |  |  |
| Period 2 | 10573 |  |  |  |  |  |
| Period 3 | 26622 |  |  |  |  |  |
| Period 4 | 21174 | 20219.67 | 954.3333 | 954.3333333 | 910752.1111 | 04.51% |
| Period 5 | 22186 | 19456.33 | 2729.667 | 2729.666667 | 7451080.111 | 12.30% |
| Period 6 | 23266 | 23327.33 | -61.3333 | 61.33333333 | 3761.777778 | 00.26% |
| Period 7 | 23302 | 22208.67 | 1093.333 | 1093.333333 | 1195377.778 | 04.69% |
| Period 8 | 30439 | 22918 | 7521 | 7521 | 56565441 | 24.71% |
| Period 9 | 24231 | 25669 | -1438 | 1438 | 2067844 | 05.93% |
| Period 10 | 23235 | 25990.67 | -2755.67 | 2755.666667 | 7593698.778 | 11.86% |
| Period 11 | 12903 | 25968.33 | -13065.3 | 13065.33333 | 170702935.1 | 101.26% |
| Period 12 | 26250 | 20123 | 6127 | 6127 | 37540129 | 23.34% |
| Period 13 | 10090 | 20796 | -10706 | 10706 | 114618436 | 106.11% |
| Period 14 | 7271 | 16414.33 | -9143.33 | 9143.333333 | 83600544.44 | 125.75% |
| Period 15 | 7571 | 14537 | -6966 | 6966 | 48525156 | 92.01% |
| Period 16 | 7089 | 8310.667 | -1221.67 | 1221.666667 | 1492469.444 | 17.23% |
| Period 17 | 6423 | 7310.333 | -887.333 | 887.3333333 | 787360.4444 | 13.81% |
| Period 18 | 7625 | 7027.667 | 597.3333 | 597.3333333 | 356807.1111 | 07.83% |
| Period 19 | 10960 | 7045.667 | 3914.333 | 3914.333333 | 15322005.44 | 35.71% |
| Period 20 | 10599 | 8336 | 2263 | 2263 | 5121169 | 21.35% |
| Period 21 | 13134 | 9728 | 3406 | 3406 | 11600836 | 25.93% |
| Period 22 | 8986 | 11564.33 | -2578.33 | 2578.333333 | 6647802.778 | 28.69% |
|  |  | Total | -20217 | 77429 | 572103606.3 | 663.31% |
|  |  | **Average** | **-1064.05** | **4075.210526** | **30110716.12** | **34.91%** |
|  |  |  | **Bias** | **MAD** | **MSE** | **MAPE** |
| **Next period** | **10906.3333** |  |  |  |  |  |

Table 4.5 period weighted moving average forecast for export data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Period | Demand | Weights | **Forecast** | **Error** | **Absolute** | **Squared** | **Abs Pct Err** |
| Period 1 | 6737 | 1 |  |  |  |  |  |
| Period 2 | 5800 | 2 |  |  |  |  |  |
| Period 3 | 6579 | 10 |  |  |  |  |  |
| Period 4 | 6352 |  | 6471.308 | -119.308 | 119.3076923 | 14234.3254 | 01.88% |
| Period 5 | 7153 |  | 6344.462 | 808.5385 | 808.5384615 | 653734.444 | 11.30% |
| Period 6 | 6964 |  | 6985.615 | -21.6154 | 21.61538462 | 467.224852 | 00.31% |
| Period 7 | 4551 |  | 6946 | -2395 | 2395 | 5736025 | 52.63% |
| Period 8 | 6521 |  | 5122.385 | 1398.615 | 1398.615385 | 1956124.99 | 21.45% |
| Period 9 | 5525 |  | 6252 | -727 | 727 | 528529 | 13.16% |
| Period 10 | 5294 |  | 5603.308 | -309.308 | 309.3076923 | 95671.2485 | 05.84% |
| Period 11 | 6418 |  | 5423.923 | 994.0769 | 994.0769231 | 988188.929 | 15.49% |
| Period 12 | 4605 |  | 6176.385 | -1571.38 | 1571.384615 | 2469249.61 | 34.12% |
| Period 13 | 1708 |  | 4936.923 | -3228.92 | 3228.923077 | 10425944.2 | 189.05% |
| Period 14 | 2126 |  | 2516 | -390 | 390 | 152100 | 18.34% |
| Period 15 | 2368 |  | 2252.385 | 115.6154 | 115.6153846 | 13366.9172 | 04.88% |
| Period 16 | 3509 |  | 2280 | 1229 | 1229 | 1510441 | 35.02% |
| Period 17 | 6145 |  | 3227.077 | 2917.923 | 2917.923077 | 8514275.08 | 47.48% |
| Period 18 | 3041 |  | 5448.923 | -2407.92 | 2407.923077 | 5798093.54 | 79.18% |
| Period 19 | 4549 |  | 3554.538 | 994.4615 | 994.4615385 | 988953.751 | 21.86% |
| Period 20 | 3427 |  | 4439.769 | -1012.77 | 1012.769231 | 1025701.51 | 29.55% |
| Period 21 | 1615 |  | 3569.923 | -1954.92 | 1954.923077 | 3821724.24 | 121.05% |
| Period 22 | 1410 |  | 2119.462 | -709.462 | 709.4615385 | 503335.675 | 50.32% |
|  |  |  | Total | -6389.38 | 23305.84615 | 45196160.7 | 752.92% |
|  |  |  | **Average** | **-336.283** | **1226.623482** | **2378745.3** | **39.63%** |
|  |  |  |  | **Bias** | **MAD** | **MSE** | **MAPE** |
|  |  |  |  |  | **SE** | **1630.52068** |  |
| **Next period** | **1596.69231** |  |  |  |  |  |  |

Table 4.6 Forecast values for Import data using three period weighted average

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Period | Demand | Weights |  | **Forecast** | **Error** | **Absolute** | **Squared** | **Abs Pct Err** |
| Period 1 | 23464 | 1 |  |  |  |  |  |  |
| Period 2 | 10573 | 2 |  |  |  |  |  |  |
| Period 3 | 26622 | 10 |  |  |  |  |  |  |
| Period 4 | 21174 |  |  | 23910 | -2736 | 2736 | 7485696 | 12.92% |
| Period 5 | 22186 |  |  | 21196.69 | 989.3077 | 989.3076923 | 978729.71 | 04.46% |
| Period 6 | 23266 |  |  | 22371.54 | 894.4615 | 894.4615385 | 800061.444 | 03.84% |
| Period 7 | 23302 |  |  | 22938.92 | 363.0769 | 363.0769231 | 131824.852 | 01.56% |
| Period 8 | 30439 |  |  | 23210.62 | 7228.385 | 7228.384615 | 52249544.1 | 23.75% |
| Period 9 | 24231 |  |  | 28789.23 | -4558.23 | 4558.230769 | 20777467.7 | 18.81% |
| Period 10 | 23235 |  |  | 25114.62 | -1879.62 | 1879.615385 | 3532953.99 | 08.09% |
| Period 11 | 12903 |  |  | 23942.38 | -11039.4 | 11039.38462 | 121868013 | 85.56% |
| Period 12 | 26250 |  |  | 15363.92 | 10886.08 | 10886.07692 | 118506671 | 41.47% |
| Period 13 | 10090 |  |  | 23964.69 | -13874.7 | 13874.69231 | 192507087 | 137.51% |
| Period 14 | 7271 |  |  | 12792.54 | -5521.54 | 5521.538462 | 30487387 | 75.94% |
| Period 15 | 7571 |  |  | 9164.615 | -1593.62 | 1593.615385 | 2539609.99 | 21.05% |
| Period 16 | 7089 |  |  | 7718.615 | -629.615 | 629.6153846 | 396415.533 | 08.88% |
| Period 17 | 6423 |  |  | 7177.154 | -754.154 | 754.1538462 | 568748.024 | 11.74% |
| Period 18 | 7625 |  |  | 6613.769 | 1011.231 | 1011.230769 | 1022587.67 | 13.26% |
| Period 19 | 10960 |  |  | 7398.846 | 3561.154 | 3561.153846 | 12681816.7 | 32.49% |
| Period 20 | 10599 |  |  | 10097.92 | 501.0769 | 501.0769231 | 251078.083 | 04.73% |
| Period 21 | 13134 |  |  | 10425.77 | 2708.231 | 2708.230769 | 7334513.9 | 20.62% |
| Period 22 | 8986 |  |  | 12576.77 | -3590.77 | 3590.769231 | 12893623.7 | 39.96% |
|  |  |  |  | Total | -18034.6 | 74320.61538 | 587013829 | 566.64% |
|  |  |  |  | **Average** | **-949.19** | **3911.611336** | **30895464.7** | **29.82%** |
|  |  |  |  |  | **Bias** | **MAD** | **MSE** | **MAPE** |
| **Next period** | **9748.23077** |  |  |  |  |  |  |  |

Table 4.7 Forecasting of export data values using exponential smoothing with a smoothing constant of 0.80.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Alpha | 0.8 |  |  |  |  |  |
|  |  |  | | |  |  |
| Period | Demand | **Forecast** | **Error** | **Absolute** | **Squared** | **Abs Pct Err** |
| Period 1 | 6737 | 6737 | 0 | 0 | 0 | 00.00% |
| Period 2 | 5800 | 6737 | -937 | 937 | 877969 | 16.16% |
| Period 3 | 6579 | 5987.4 | 591.6 | 591.6 | 349990.6 | 08.99% |
| Period 4 | 6352 | 6460.68 | -108.68 | 108.68 | 11811.34 | 01.71% |
| Period 5 | 7153 | 6373.736 | 779.264 | 779.264 | 607252.4 | 10.89% |
| Period 6 | 6964 | 6997.147 | -33.1472 | 33.1472 | 1098.737 | 00.48% |
| Period 7 | 4551 | 6970.629 | -2419.63 | 2419.629 | 5854607 | 53.17% |
| Period 8 | 6521 | 5034.926 | 1486.074 | 1486.074 | 2208416 | 22.79% |
| Period 9 | 5525 | 6223.785 | -698.785 | 698.7852 | 488300.7 | 12.65% |
| Period 10 | 5294 | 5664.757 | -370.757 | 370.757 | 137460.8 | 07.00% |
| Period 11 | 6418 | 5368.151 | 1049.849 | 1049.849 | 1102182 | 16.36% |
| Period 12 | 4605 | 6208.03 | -1603.03 | 1603.03 | 2569706 | 34.81% |
| Period 13 | 1708 | 4925.606 | -3217.61 | 3217.606 | 10352989 | 188.38% |
| Period 14 | 2126 | 2351.521 | -225.521 | 225.5212 | 50859.82 | 10.61% |
| Period 15 | 2368 | 2171.104 | 196.8958 | 196.8958 | 38767.94 | 08.31% |
| Period 16 | 3509 | 2328.621 | 1180.379 | 1180.379 | 1393295 | 33.64% |
| Period 17 | 6145 | 3272.924 | 2872.076 | 2872.076 | 8248820 | 46.74% |
| Period 18 | 3041 | 5570.585 | -2529.58 | 2529.585 | 6398799 | 83.18% |
| Period 19 | 4549 | 3546.917 | 1002.083 | 1002.083 | 1004170 | 22.03% |
| Period 20 | 3427 | 4348.583 | -921.583 | 921.5834 | 849316 | 26.89% |
| Period 21 | 1615 | 3611.317 | -1996.32 | 1996.317 | 3985280 | 123.61% |
| Period 22 | 1410 | 2014.263 | -604.263 | 604.2633 | 365134.2 | 0.428556 |
|  |  | Total | -6507.68 | 24824.13 | 46896226 | 771.26% |
|  |  | **Average** | **-295.804** | **1128.369** | **2131647** | **35.06%** |
|  |  |  | **Bias** | **MAD** | **MSE** | **MAPE** |
|  |  |  |  | **SE** | **1531.278** |  |
| **Next period** | **1530.85267** |  |  |  |  |  |