

***Georgi Dobrovolski  
Solar Observatory***

***OBSERVED, CORRECTED  
& SMOOTHED  
PETTISINDICES  
1989 - 2013***

**COMPILED BY HOWARD BARNES,  
NEW ZEALAND.**

**E-MAIL: [gdso@earthling.net](mailto:gdso@earthling.net)**

**Second Edition,  
Published, October MMXIV.**



### SMOOTHING FORMULÆ.

The following are the three formulæ used in the smoothing of GDSO sunspot data. All are based on monthly means .

Data suffixed ( $S^{\text{HBm}}$ ) are computed as:

$$((\bar{x}_{+3} + \bar{x}_{-3}) + 2(\bar{x}_{+2} + \bar{x}_{-2}) + 3(\bar{x}_{+1} + \bar{x}_{-1}) + 4\bar{x}_0) / 16$$

Data suffixed ( $S^{\text{W}}$ ) are computed as:

$$\left( \sum_{-5}^{+5} \bar{x} + [\bar{x}_{+6} + \bar{x}_{-6}] / 2 \right) / 12$$

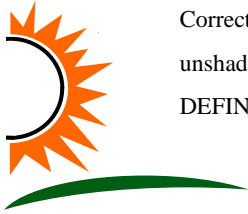
Data suffixed ( $S^{\text{B13}}$ ) are computed as:

$$(0.75(x_{+6} + x_{-6}) + 2(x_{+5} + x_{-5}) + 3(x_{+4} + x_{-4}) + 4(x_{+3} + x_{-3}) + 5(x_{+2} + x_{-2}) + 6(x_{+1} + x_{-1}) + 6.5x_0) / 48$$

-oOo-

### PLEASE NOTE:

PX<sub>GD</sub> data from January 2007 are corrected by a constant of 1.15, and are to be considered *provisional*.



Observed GDSO Pettisindices (SN) are corrected for seeing conditions and seasonal effects to create the Corrected GDSO Pettisindices (PX<sub>GD</sub>).

These two series are smoothed (the observed by three methods, the corrected by two) to create the data in the unshaded columns.

DEFINITIONS:

$$PX_{GD} = k(10p + s),$$

where s = number of outlying sunspots,

p = number of penumbr

& k = up- or downgrading figure to bring observatories to a world standard.

SN = observed Pettisindices, same as above, but k = 1.

| MONTH    | SN     | SN <sup>r</sup> (S <sup>HBm</sup> ) | SN <sup>r</sup> (S <sup>W</sup> ) | SN <sup>r</sup> (S <sup>B13</sup> ) | PX <sub>GD</sub> | PX <sub>GD</sub> <sup>r</sup> (S <sup>W</sup> ) | PX <sub>GD</sub> <sup>r</sup> (S <sup>B13</sup> ) |
|----------|--------|-------------------------------------|-----------------------------------|-------------------------------------|------------------|---|---|
| 1988 Jan | —      | —                                   | —                                 | —                                   | —                | —   | —   |
| Feb      | —      | —                                   | —                                 | —                                   | —                | —   | —   |
| Mar      | —      | —                                   | —                                 | —                                   | —                | —   | —   |
| Apr      | —      | —                                   | —                                 | —                                   | —                | —   | —   |
| May      | —      | —                                   | —                                 | —                                   | —                | —   | —   |
| Jun      | —      | —                                   | —                                 | —                                   | —                | —   | —   |
| Jul      | —      | —                                   | —                                 | —                                   | —                | —   | —   |
| Aug      | —      | —                                   | —                                 | —                                   | —                | —   | —   |
| Sep      | —      | —                                   | —                                 | —                                   | —                | —   | —   |
| Oct      | —      | —                                   | —                                 | —                                   | —                | —   | —   |
| Nov      | 126.86 | —                                   | —                                 | —                                   | 144.48           | —   | —   |
| Dec      | 204.70 | —                                   | —                                 | —                                   | 227.80           | —   | —   |
| 1989 Jan | 185.00 | —                                   | —                                 | —                                   | 219.46           | —   | —   |
| Feb      | 173.33 | 157.14                              | —                                 | —                                   | 210.20           | —   | —   |
| Mar      | 106.00 | 152.44                              | —                                 | —                                   | 133.88           | —   | —   |
| Apr      | 124.00 | 151.09                              | —                                 | —                                   | 138.27           | —   | —   |
| May      | 163.71 | 154.75                              | 164.83                            | 160.73                              | 185.35           | 197.94  | 192.88  |
| Jun      | 221.00 | 162.84                              | 166.25                            | 162.82                              | 270.71           | 201.66  | 197.28  |
| Jul      | 138.63 | 164.01                              | 163.17                            | 163.34                              | 158.29           | 199.15  | 199.59  |
| Aug      | 123.62 | 167.38                              | 160.28                            | 164.47                              | 179.70           | 195.56  | 202.02  |
| Sep      | 213.10 | 173.01                              | 161.12                            | 166.68                              | 263.96           | 196.16  | 205.03  |
| Oct      | 158.08 | 172.02                              | 165.92                            | 168.52                              | 183.18           | 200.63  | 206.79  |
| Nov      | 206.60 | 173.34                              | 167.91                            | 168.23                              | 264.49           | 201.58  | 205.23  |
| Dec      | 159.17 | 167.97                              | 163.86                            | 165.57                              | 197.00           | 196.09  | 200.15  |
| 1990 Jan | 156.67 | 161.53                              | 159.45                            | 162.42                              | 190.08           | 190.62  | 194.08  |
| Feb      | 132.19 | 158.70                              | 162.23                            | 161.04                              | 153.45           | 193.69  | 190.22  |
| Mar      | 167.38 | 157.31                              | 161.31                            | 159.07                              | 205.02           | 191.69  | 186.06  |
| Apr      | 177.67 | 155.68                              | 157.20                            | 156.34                              | 174.38           | 186.08  | 181.64  |
| May      | 157.93 | 154.60                              | 154.51                            | 153.69                              | 172.09           | 181.70  | 178.04  |
| Jun      | 129.50 | 150.43                              | 151.63                            | 151.41                              | 152.16           | 176.55  | 175.53  |
| Jul      | 124.27 | 148.50                              | 151.90                            | 151.06                              | 145.50           | 175.50  | 175.64  |
| Aug      | 204.85 | 150.08                              | 155.22                            | 152.15                              | 266.28           | 178.69  | 177.30  |
| Sep      | 109.80 | 147.12                              | 158.08                            | 153.32                              | 129.24           | 182.43  | 178.86  |
| Oct      | 162.69 | 150.49                              | 157.68                            | 154.58                              | 183.43           | 184.02  | 180.86  |
| Nov      | 137.33 | 154.47                              | 156.47                            | 156.56                              | 158.93           | 184.53  | 183.60  |
| Dec      | 159.44 | 159.21                              | 158.06                            | 159.56                              | 178.96           | 185.82  | 186.65  |

| MONTH    | SN     | SN <sup>r</sup> (S <sup>HBm</sup> ) | SN <sup>r</sup> (S <sup>W</sup> ) | SN <sup>r</sup> (S <sup>B13</sup> ) | PX <sub>GD</sub> | PX <sub>GD</sub> <sup>r</sup> (S <sup>W</sup> ) | PX <sub>GD</sub> <sup>r</sup> (S <sup>B13</sup> ) |
|----------|--------|-------------------------------------|-----------------------------------|-------------------------------------|------------------|---|---|
| 1991 Jan | 162.79 | 167.64                              | 164.31                            | 163.90                              | 183.07           | 191.39  | 190.82  |
| Feb      | 205.84 | 170.92                              | 167.31                            | 167.45                              | 237.04           | 192.61  | 193.99  |
| Mar      | 162.35 | 170.65                              | 168.73                            | 170.20                              | 211.25           | 192.19  | 196.21  |
| Apr      | 173.17 | 171.89                              | 170.93                            | 172.37                              | 206.13           | 193.97  | 197.52  |
| May      | 133.38 | 173.29                              | 170.58                            | 173.42                              | 152.72           | 192.62  | 196.83  |
| Jun      | 192.13 | 178.16                              | 172.90                            | 175.01                              | 202.37           | 193.38  | 196.25  |
| Jul      | 211.57 | 182.23                              | 177.61                            | 176.93                              | 229.09           | 196.80  | 195.95  |
| Aug      | 189.54 | 177.87                              | 179.37                            | 177.74                              | 211.96           | 197.84  | 194.67  |
| Sep      | 159.36 | 174.81                              | 178.30                            | 177.78                              | 173.36           | 194.96  | 192.62  |
| Oct      | 165.71 | 173.20                              | 175.58                            | 177.25                              | 182.20           | 189.42  | 190.15  |
| Nov      | 125.92 | 175.52                              | 170.60                            | 175.46                              | 127.56           | 183.08  | 187.16  |
| Dec      | 226.60 | 184.10                              | 162.46                            | 171.11                              | 228.73           | 174.69  | 182.30  |
| 1992 Jan | 208.67 | 184.33                              | 152.77                            | 163.54                              | 215.20           | 164.80  | 174.65  |
| Feb      | 202.17 | 171.99                              | 142.59                            | 152.92                              | 229.91           | 154.40  | 164.16  |
| Mar      | 140.33 | 149.31                              | 133.40                            | 140.10                              | 149.32           | 145.14  | 151.52  |
| Apr      | 130.00 | 123.08                              | 127.44                            | 126.84                              | 135.15           | 138.64  | 138.40  |
| May      | 57.00  | 98.44                               | 125.10                            | 115.09                              | 71.51            | 135.98  | 126.91  |
| Jun      | 73.13  | 84.07                               | 119.62                            | 104.99                              | 82.24            | 130.99  | 117.07  |
| Jul      | 98.09  | 80.22                               | 108.66                            | 96.54                               | 111.71           | 120.24  | 108.53  |
| Aug      | 58.69  | 80.56                               | 99.35                             | 91.36                               | 79.86            | 110.14  | 102.79  |
| Sep      | 69.56  | 87.82                               | 93.72                             | 90.11                               | 83.27            | 103.89  | 100.87  |
| Oct      | 112.60 | 94.59                               | 90.24                             | 91.41                               | 116.35           | 101.62  | 102.01  |
| Nov      | 122.80 | 98.93                               | 88.38                             | 92.86                               | 129.57           | 101.88  | 104.01  |
| Dec      | 98.15  | 99.94                               | 87.53                             | 92.78                               | 106.96           | 102.25  | 104.84  |
| 1993 Jan | 74.23  | 98.13                               | 84.89                             | 90.85                               | 78.75            | 99.90   | 103.96  |
| Feb      | 113.08 | 94.49                               | 82.20                             | 87.91                               | 123.98           | 96.78   | 102.18  |
| Mar      | 94.35  | 87.52                               | 79.62                             | 83.20                               | 105.33           | 94.08   | 98.98   |
| Apr      | 92.47  | 79.41                               | 75.23                             | 76.30                               | 124.57           | 93.06   | 94.72   |
| May      | 49.73  | 68.64                               | 69.61                             | 68.75                               | 88.51            | 90.78   | 89.76   |
| Jun      | 60.13  | 57.69                               | 65.81                             | 62.62                               | 74.13            | 87.38   | 84.92   |
| Jul      | 47.73  | 49.70                               | 65.52                             | 58.67                               | 63.35            | 87.84   | 81.96   |
| Aug      | 44.33  | 44.51                               | 63.00                             | 55.48                               | 53.38            | 85.39   | 79.41   |
| Sep      | 22.18  | 44.80                               | 57.90                             | 53.16                               | 44.88            | 79.12   | 77.09   |
| Oct      | 54.60  | 50.52                               | 52.52                             | 52.07                               | 130.29           | 72.09   | 74.84   |
| Nov      | 45.88  | 55.99                               | 48.11                             | 51.58                               | 60.83            | 65.14   | 71.67   |
| Dec      | 83.88  | 61.21                               | 45.06                             | 50.72                               | 94.18            | 60.55   | 67.95   |

| MONTH    | SN    | SN <sup>r</sup> (S <sup>HBm</sup> ) | SN <sup>r</sup> (S <sup>W</sup> ) | SN <sup>r</sup> (S <sup>B13</sup> ) | PX <sub>GD</sub> | PX <sub>GD</sub> <sup>r</sup> (S <sup>W</sup> ) | PX <sub>GD</sub> <sup>r</sup> (S <sup>B13</sup> ) |
|----------|-------|-------------------------------------|-----------------------------------|-------------------------------------|------------------|---|---|
| 1994 Jan | 81.53 | 59.83                               | 42.62                             | 48.52                               | 102.71           | 58.68   | 63.56   |
| Feb      | 45.18 | 50.80                               | 41.14                             | 45.12                               | 41.11            | 57.92   | 58.22   |
| Mar      | 39.88 | 40.68                               | 40.49                             | 41.10                               | 37.74            | 56.54   | 52.38   |
| Apr      | 17.88 | 30.37                               | 40.72                             | 37.25                               | 23.45            | 53.17   | 46.84   |
| May      | 18.50 | 24.69                               | 39.63                             | 33.83                               | 22.80            | 48.84   | 42.79   |
| Jun      | 18.29 | 23.34                               | 36.04                             | 30.84                               | 29.56            | 45.31   | 40.54   |
| Jul      | 30.82 | 26.12                               | 30.76                             | 28.50                               | 63.20            | 39.82   | 38.82   |
| Aug      | 25.86 | 28.60                               | 27.39                             | 27.49                               | 35.10            | 36.53   | 38.12   |
| Sep      | 25.00 | 30.62                               | 26.59                             | 27.69                               | 30.25            | 37.22   | 38.70   |
| Oct      | 57.27 | 31.44                               | 26.55                             | 28.08                               | 64.03            | 38.48   | 39.46   |
| Nov      | 17.05 | 28.34                               | 26.92                             | 27.96                               | 23.15            | 40.10   | 39.90   |
| Dec      | 26.55 | 27.06                               | 26.98                             | 27.34                               | 47.04            | 40.88   | 39.82   |
| 1995 Jan | 12.17 | 25.61                               | 26.18                             | 26.46                               | 18.19            | 38.96   | 39.02   |
| Feb      | 33.67 | 25.49                               | 24.85                             | 25.40                               | 46.64            | 36.26   | 38.09   |
| Mar      | 32.23 | 25.83                               | 23.46                             | 23.95                               | 48.70            | 34.50   | 36.87   |
| Apr      | 24.59 | 23.99                               | 21.21                             | 21.93                               | 42.72            | 32.16   | 34.71   |
| May      | 20.67 | 21.50                               | 19.44                             | 20.10                               | 42.42            | 30.21   | 32.15   |
| Jun      | 17.40 | 17.52                               | 18.31                             | 18.42                               | 28.62            | 28.28   | 29.14   |
| Jul      | 12.56 | 14.91                               | 17.24                             | 16.64                               | 18.13            | 26.70   | 25.96   |
| Aug      | 12.18 | 13.30                               | 15.71                             | 14.72                               | 15.32            | 24.80   | 22.78   |
| Sep      | 5.31  | 12.17                               | 13.45                             | 12.87                               | 7.90             | 21.52   | 19.68   |
| Oct      | 23.00 | 12.02                               | 11.56                             | 11.40                               | 30.26            | 18.57   | 17.20   |
| Nov      | 9.00  | 10.30                               | 10.17                             | 10.08                               | 9.92             | 16.05   | 15.16   |
| Dec      | 7.38  | 8.74                                | 9.25                              | 8.95                                | 14.07            | 14.11   | 13.67   |
| 1996 Jan | 5.73  | 7.24                                | 8.86                              | 8.19                                | 13.28            | 13.32   | 12.81   |
| Feb      | 3.38  | 5.88                                | 8.96                              | 7.85                                | 5.87             | 13.66   | 12.54   |
| Mar      | 8.11  | 6.01                                | 8.85                              | 7.69                                | 10.68            | 13.69   | 12.45   |
| Apr      | 3.44  | 6.50                                | 7.69                              | 7.34                                | 10.04            | 12.12   | 12.02   |
| May      | 8.44  | 7.91                                | 7.31                              | 7.38                                | 14.52            | 12.38   | 12.23   |
| Jun      | 7.57  | 8.66                                | 8.00                              | 7.94                                | 9.99             | 13.85   | 13.11   |
| Jul      | 12.92 | 8.67                                | 8.02                              | 8.35                                | 17.93            | 13.50   | 13.67   |
| Aug      | 14.29 | 8.99                                | 8.13                              | 8.53                                | 23.58            | 14.16   | 14.28   |
| Sep      | 0.54  | 8.39                                | 8.35                              | 8.55                                | 0.45             | 15.58   | 15.03   |
| Oct      | 0.00  | 8.45                                | 9.05                              | 8.89                                | 0.00             | 17.20   | 16.35   |
| Nov      | 22.75 | 9.52                                | 9.66                              | 9.37                                | 46.47            | 18.66   | 17.99   |
| Dec      | 10.35 | 9.07                                | 9.64                              | 9.48                                | 12.77            | 19.37   | 19.12   |

| MONTH    | SN     | SN <sup>r</sup> (S <sup>HBm</sup> ) | SN <sup>r</sup> (S <sup>W</sup> ) | SN <sup>r</sup> (S <sup>B13</sup> ) | PX <sub>GD</sub> | PX <sub>GD</sub> <sup>r</sup> (S <sup>W</sup> ) | PX <sub>GD</sub> <sup>r</sup> (S <sup>B13</sup> ) |
|----------|--------|-------------------------------------|-----------------------------------|-------------------------------------|------------------|---|---|
| 1997 Jan | 3.16   | 9.47                                | 9.37                              | 9.39                                | 6.10             | 19.93   | 20.11   |
| Feb      | 8.60   | 9.91                                | 9.53                              | 9.62                                | 29.00            | 20.69   | 21.47   |
| Mar      | 8.21   | 9.84                                | 12.17                             | 10.96                               | 21.53            | 24.55   | 23.98   |
| Apr      | 20.05  | 10.49                               | 15.24                             | 12.81                               | 38.17            | 29.27   | 26.88   |
| May      | 6.54   | 10.89                               | 16.90                             | 14.57                               | 21.36            | 31.80   | 29.39   |
| Jun      | 8.89   | 13.95                               | 19.28                             | 17.17                               | 20.10            | 34.99   | 32.82   |
| Jul      | 5.30   | 17.79                               | 21.70                             | 20.55                               | 21.27            | 38.42   | 37.10   |
| Aug      | 25.67  | 24.04                               | 23.55                             | 24.11                               | 38.52            | 40.36   | 41.18   |
| Sep      | 52.44  | 31.42                               | 27.57                             | 28.11                               | 78.15            | 44.00   | 45.44   |
| Oct      | 21.76  | 34.04                               | 31.63                             | 32.02                               | 35.54            | 47.84   | 49.43   |
| Nov      | 40.93  | 36.62                               | 35.47                             | 36.00                               | 71.73            | 51.89   | 53.40   |
| Dec      | 49.31  | 39.37                               | 40.26                             | 40.14                               | 64.08            | 57.29   | 57.41   |
| 1998 Jan | 22.31  | 40.46                               | 44.81                             | 44.01                               | 37.02            | 62.31   | 61.02   |
| Feb      | 33.81  | 46.57                               | 50.76                             | 48.69                               | 44.79            | 69.08   | 65.69   |
| Mar      | 79.35  | 53.43                               | 56.13                             | 54.01                               | 92.92            | 75.95   | 71.64   |
| Apr      | 46.45  | 57.01                               | 59.48                             | 59.01                               | 59.02            | 80.46   | 77.81   |
| May      | 72.41  | 64.64                               | 62.35                             | 63.54                               | 97.70            | 83.12   | 83.50   |
| Jun      | 57.89  | 70.80                               | 66.18                             | 68.16                               | 73.30            | 87.14   | 89.48   |
| Jul      | 65.44  | 75.31                               | 70.63                             | 73.00                               | 88.65            | 92.18   | 95.85   |
| Aug      | 108.25 | 81.34                               | 74.09                             | 76.82                               | 133.56           | 96.03   | 100.94  |
| Sep      | 98.93  | 83.39                               | 76.38                             | 78.86                               | 148.01           | 98.80   | 103.62  |
| Oct      | 55.62  | 82.10                               | 78.76                             | 80.24                               | 74.00            | 101.36  | 104.69  |
| Nov      | 75.92  | 81.67                               | 82.53                             | 82.30                               | 97.14            | 105.73  | 106.19  |
| Dec      | 106.33 | 82.15                               | 88.63                             | 85.50                               | 134.97           | 113.61  | 109.32  |
| 1999 Jan | 71.91  | 81.24                               | 96.27                             | 89.68                               | 87.26            | 123.05  | 113.74  |
| Feb      | 67.33  | 85.46                               | 100.30                            | 94.22                               | 86.88            | 127.89  | 118.67  |
| Mar      | 100.71 | 94.11                               | 99.82                             | 98.83                               | 117.32           | 126.38  | 123.73  |
| Apr      | 82.42  | 104.71                              | 102.90                            | 104.77                              | 96.06            | 128.41  | 130.64  |
| May      | 126.79 | 118.76                              | 111.45                            | 112.43                              | 165.44           | 138.28  | 140.14  |
| Jun      | 149.94 | 126.58                              | 116.00                            | 118.93                              | 194.72           | 143.81  | 148.21  |
| Jul      | 156.69 | 129.02                              | 117.44                            | 123.08                              | 193.90           | 144.51  | 152.78  |
| Aug      | 113.82 | 130.06                              | 121.94                            | 126.03                              | 144.35           | 147.88  | 155.09  |
| Sep      | 81.88  | 128.34                              | 129.49                            | 129.59                              | 101.02           | 155.24  | 157.60  |
| Oct      | 146.53 | 131.30                              | 139.44                            | 135.18                              | 169.61           | 165.21  | 161.90  |
| Nov      | 190.18 | 133.77                              | 146.09                            | 140.23                              | 238.48           | 170.31  | 164.74  |
| Dec      | 101.17 | 135.63                              | 148.92                            | 144.02                              | 126.30           | 170.07  | 165.28  |

| MONTH    | SN     | SN <sup>r</sup> (S <sup>HBm</sup> ) | SN <sup>r</sup> (S <sup>W</sup> ) | SN <sup>r</sup> (S <sup>B13</sup> ) | PX <sub>GD</sub> | PX <sub>GD</sub> <sup>r</sup> (S <sup>W</sup> ) | PX <sub>GD</sub> <sup>r</sup> (S <sup>B13</sup> ) |
|----------|--------|-------------------------------------|-----------------------------------|-------------------------------------|------------------|---|---|
| 2000 Jan | 111.85 | 144.97                              | 155.60                            | 150.78                              | 112.90           | 173.65  | 168.71  |
| Feb      | 135.23 | 155.48                              | 163.09                            | 160.74                              | 142.12           | 178.08  | 175.76  |
| Mar      | 213.94 | 169.75                              | 167.88                            | 170.20                              | 238.70           | 180.33  | 182.57  |
| Apr      | 208.11 | 186.84                              | 170.40                            | 176.40                              | 213.83           | 180.90  | 186.00  |
| May      | 160.70 | 194.71                              | 168.20                            | 179.10                              | 170.13           | 175.53  | 185.70  |
| Jun      | 183.90 | 198.42                              | 167.16                            | 180.80                              | 184.27           | 171.47  | 184.92  |
| Jul      | 283.00 | 196.72                              | 170.05                            | 180.52                              | 290.29           | 172.80  | 182.79  |
| Aug      | 167.42 | 181.64                              | 171.29                            | 175.57                              | 154.19           | 172.43  | 175.94  |
| Sep      | 143.08 | 166.65                              | 169.59                            | 168.12                              | 145.22           | 168.01  | 166.34  |
| Oct      | 145.86 | 153.47                              | 165.93                            | 161.29                              | 139.06           | 162.97  | 158.01  |
| Nov      | 138.10 | 141.20                              | 162.24                            | 155.82                              | 140.22           | 158.96  | 151.65  |
| Dec      | 128.18 | 140.98                              | 162.20                            | 152.48                              | 127.15           | 158.51  | 147.62  |
| 2001 Jan | 154.35 | 144.46                              | 155.91                            | 149.53                              | 143.97           | 151.88  | 144.19  |
| Feb      | 122.38 | 145.86                              | 148.96                            | 148.49                              | 102.25           | 144.66  | 143.06  |
| Mar      | 186.10 | 154.28                              | 155.32                            | 152.53                              | 172.45           | 151.99  | 147.90  |
| Apr      | 148.08 | 154.61                              | 162.38                            | 157.98                              | 159.11           | 160.84  | 154.92  |
| May      | 132.27 | 155.62                              | 164.70                            | 162.98                              | 128.56           | 165.51  | 161.99  |
| Jun      | 211.31 | 167.51                              | 169.78                            | 168.82                              | 214.98           | 172.37  | 170.17  |
| Jul      | 104.53 | 171.52                              | 175.64                            | 175.08                              | 100.47           | 178.60  | 178.58  |
| Aug      | 179.07 | 184.44                              | 180.81                            | 182.12                              | 170.73           | 183.55  | 187.35  |
| Sep      | 284.12 | 198.15                              | 183.01                            | 187.66                              | 304.71           | 185.71  | 193.95  |
| Oct      | 174.17 | 197.14                              | 184.28                            | 190.50                              | 191.94           | 186.20  | 196.66  |
| Nov      | 165.55 | 200.08                              | 189.72                            | 193.31                              | 199.28           | 189.88  | 197.89  |
| Dec      | 222.73 | 198.92                              | 190.62                            | 194.69                              | 232.73           | 189.33  | 196.44  |
| 2002 Jan | 200.37 | 193.85                              | 193.33                            | 195.39                              | 187.90           | 191.64  | 193.92  |
| Feb      | 200.36 | 194.44                              | 199.58                            | 195.76                              | 177.33           | 197.65  | 191.29  |
| Mar      | 160.92 | 190.74                              | 198.73                            | 194.87                              | 149.13           | 194.36  | 187.25  |
| Apr      | 203.79 | 191.22                              | 196.02                            | 195.10                              | 194.24           | 188.89  | 184.71  |
| May      | 207.09 | 193.29                              | 195.32                            | 195.65                              | 181.59           | 185.50  | 183.35  |
| Jun      | 158.08 | 196.52                              | 189.58                            | 193.63                              | 148.74           | 177.02  | 180.45  |
| Jul      | 223.00 | 202.57                              | 180.68                            | 189.67                              | 222.29           | 167.41  | 176.58  |
| Aug      | 210.44 | 200.94                              | 172.48                            | 183.85                              | 193.12           | 159.53  | 170.94  |
| Sep      | 232.33 | 191.26                              | 165.10                            | 175.09                              | 203.31           | 151.94  | 162.20  |
| Oct      | 161.00 | 173.05                              | 158.44                            | 163.61                              | 162.16           | 144.50  | 150.66  |
| Nov      | 162.00 | 149.78                              | 149.12                            | 150.09                              | 147.67           | 136.03  | 137.33  |
| Dec      | 88.45  | 126.52                              | 143.55                            | 137.75                              | 80.84            | 131.33  | 125.04  |

| MONTH    | SN     | SN <sup>r</sup> (S <sup>HBm</sup> ) | SN <sup>r</sup> (S <sup>W</sup> ) | SN <sup>r</sup> (S <sup>B13</sup> ) | PX <sub>GD</sub> | PX <sub>GD</sub> <sup>r</sup> (S <sup>W</sup> ) | PX <sub>GD</sub> <sup>r</sup> (S <sup>B13</sup> ) |
|----------|--------|-------------------------------------|-----------------------------------|-------------------------------------|------------------|---|---|
| 2003 Jan | 121.08 | 111.84                              | 139.67                            | 127.63                              | 109.07           | 127.96  | 115.02  |
| Feb      | 82.89  | 101.76                              | 133.21                            | 119.76                              | 67.03            | 122.76  | 107.85  |
| Mar      | 101.25 | 100.63                              | 122.66                            | 113.82                              | 77.33            | 113.83  | 103.11  |
| Apr      | 103.67 | 105.72                              | 112.48                            | 110.04                              | 87.50            | 104.88  | 100.84  |
| May      | 83.44  | 112.03                              | 105.66                            | 108.35                              | 85.00            | 99.01   | 101.00  |
| Jun      | 147.93 | 118.68                              | 100.90                            | 107.34                              | 132.48           | 94.89   | 101.90  |
| Jul      | 140.08 | 118.12                              | 98.45                             | 105.39                              | 157.65           | 92.86   | 101.63  |
| Aug      | 138.31 | 110.24                              | 95.55                             | 101.07                              | 133.06           | 90.98   | 98.66   |
| Sep      | 51.38  | 96.21                               | 93.49                             | 95.51                               | 48.96            | 90.43   | 94.15   |
| Oct      | 97.61  | 85.73                               | 90.29                             | 89.52                               | 101.85           | 89.12   | 88.96   |
| Nov      | 61.77  | 75.94                               | 88.13                             | 84.00                               | 66.97            | 87.98   | 83.69   |
| Dec      | 74.44  | 71.95                               | 84.25                             | 78.57                               | 62.74            | 84.67   | 78.28   |
| 2004 Jan | 76.27  | 70.54                               | 78.06                             | 73.73                               | 78.32            | 78.28   | 73.34   |
| Feb      | 58.20  | 68.01                               | 72.76                             | 70.60                               | 52.66            | 73.24   | 70.54   |
| Mar      | 76.33  | 67.76                               | 70.02                             | 69.18                               | 78.67            | 71.23   | 69.80   |
| Apr      | 51.82  | 67.09                               | 70.09                             | 68.92                               | 54.73            | 70.98   | 69.93   |
| May      | 83.30  | 68.78                               | 71.00                             | 69.47                               | 90.39            | 71.79   | 70.83   |
| Jun      | 55.12  | 68.37                               | 70.03                             | 69.77                               | 47.71            | 71.47   | 71.66   |
| Jul      | 84.31  | 70.58                               | 66.86                             | 69.09                               | 88.89            | 69.02   | 71.57   |
| Aug      | 66.94  | 72.49                               | 64.66                             | 67.93                               | 80.83            | 67.37   | 70.81   |
| Sep      | 56.78  | 70.85                               | 61.95                             | 65.96                               | 52.95            | 65.57   | 69.15   |
| Oct      | 93.89  | 70.40                               | 59.58                             | 63.32                               | 91.98            | 63.49   | 66.80   |
| Nov      | 87.50  | 63.69                               | 59.05                             | 60.06                               | 96.34            | 61.79   | 63.50   |
| Dec      | 25.25  | 53.64                               | 60.36                             | 57.15                               | 25.59            | 62.20   | 60.28   |
| 2005 Jan | 49.38  | 46.72                               | 60.71                             | 55.15                               | 56.65            | 61.63   | 57.53   |
| Feb      | 32.20  | 42.72                               | 59.67                             | 54.11                               | 34.69            | 59.02   | 55.25   |
| Mar      | 37.38  | 45.66                               | 58.30                             | 53.98                               | 53.43            | 57.35   | 53.97   |
| Apr      | 34.00  | 53.53                               | 53.70                             | 53.68                               | 30.23            | 53.55   | 52.59   |
| May      | 88.43  | 62.49                               | 47.99                             | 53.26                               | 73.98            | 47.81   | 51.04   |
| Jun      | 81.50  | 65.40                               | 47.03                             | 53.22                               | 73.95            | 46.16   | 50.20   |
| Jul      | 66.22  | 60.72                               | 47.22                             | 52.00                               | 49.03            | 45.72   | 48.70   |
| Aug      | 60.14  | 52.29                               | 44.96                             | 48.69                               | 57.93            | 42.89   | 45.61   |
| Sep      | 30.75  | 41.89                               | 42.97                             | 44.22                               | 35.81            | 39.93   | 41.54   |
| Oct      | 9.36   | 34.69                               | 42.68                             | 40.00                               | 18.07            | 38.88   | 37.70   |
| Nov      | 35.08  | 31.61                               | 40.20                             | 36.02                               | 32.30            | 37.81   | 34.46   |
| Dec      | 54.56  | 29.45                               | 34.77                             | 31.96                               | 50.09            | 35.07   | 31.57   |



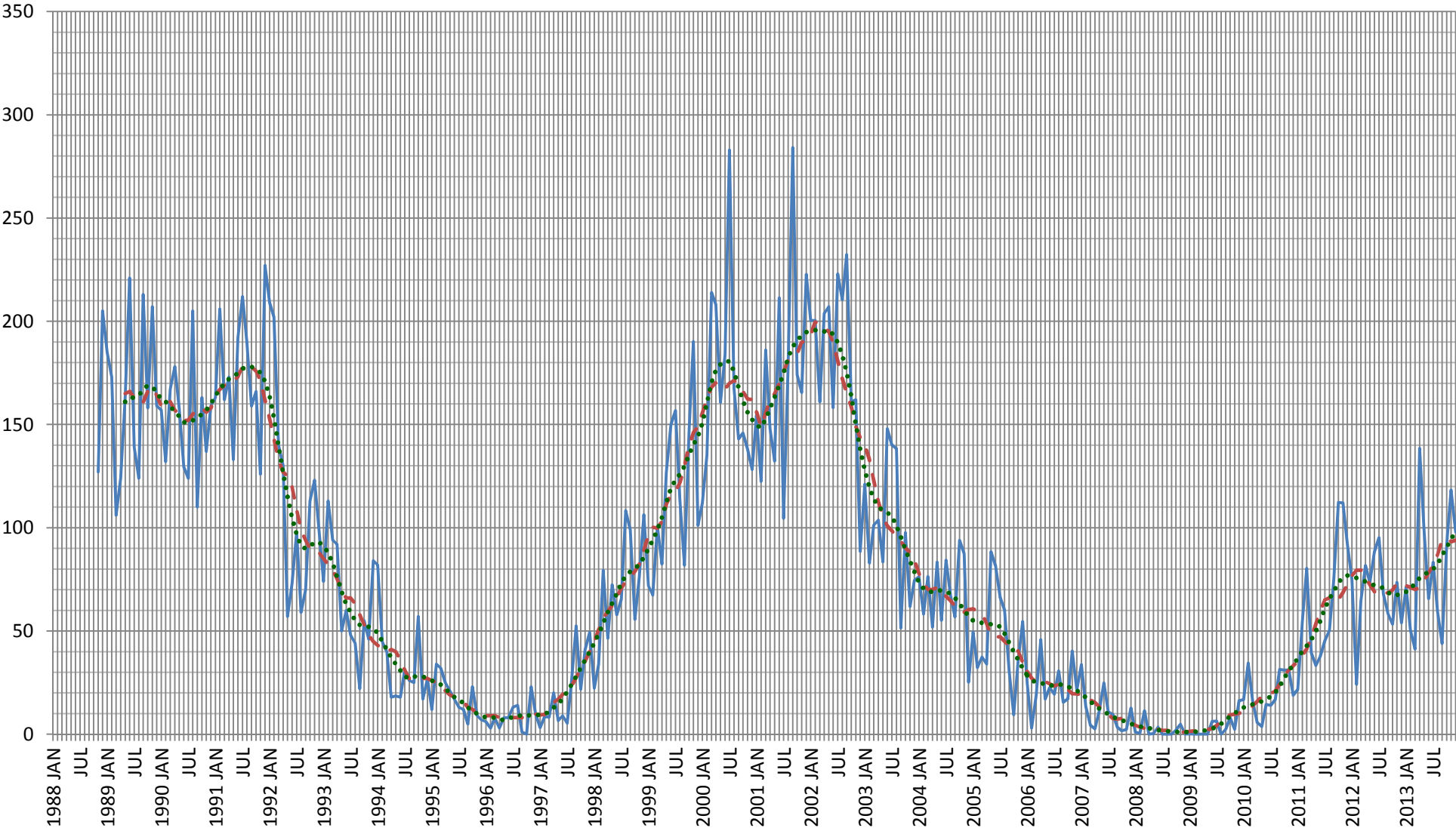
| MONTH    | SN    | SN <sup>r</sup> (S <sup>HBm</sup> ) | SN <sup>r</sup> (S <sup>W</sup> ) | SN <sup>r</sup> (S <sup>B13</sup> ) | PX <sub>GD</sub> | PX <sub>GD</sub> <sup>r</sup> (S <sup>W</sup> ) | PX <sub>GD</sub> <sup>r</sup> (S <sup>B13</sup> ) |
|----------|-------|-------------------------------------|-----------------------------------|-------------------------------------|------------------|---|---|
| 2006 Jan | 24.54 | 27.10                               | 30.36                             | 28.49                               | 21.51            | 32.65   | 29.33   |
| Feb      | 2.93  | 24.66                               | 27.18                             | 26.11                               | 1.98             | 30.37   | 27.95   |
| Mar      | 18.83 | 23.85                               | 25.31                             | 25.18                               | 15.14            | 28.38   | 27.77   |
| Apr      | 45.75 | 24.09                               | 25.00                             | 24.84                               | 43.20            | 27.31   | 28.19   |
| May      | 17.00 | 23.94                               | 25.55                             | 24.29                               | 35.53            | 27.46   | 28.46   |
| Jun      | 22.58 | 24.16                               | 24.39                             | 23.57                               | 46.57            | 26.60   | 28.10   |
| Jul      | 19.36 | 22.81                               | 23.39                             | 23.53                               | 18.19            | 25.90   | 27.65   |
| Aug      | 30.69 | 22.75                               | 24.22                             | 24.07                               | 34.17            | 26.73   | 27.38   |
| Sep      | 15.43 | 23.05                               | 24.05                             | 23.96                               | 11.81            | 26.70   | 26.38   |
| Oct      | 17.17 | 24.59                               | 21.65                             | 23.06                               | 16.32            | 24.53   | 24.60   |
| Nov      | 40.33 | 26.24                               | 19.62                             | 22.08                               | 37.70            | 21.89   | 22.66   |
| Dec      | 21.50 | 24.33                               | 19.49                             | 21.12                               | 24.01            | 20.07   | 20.84   |
| 2007 Jan | 33.73 | 21.82                               | 19.23                             | 19.71                               | 30.82            | 19.54   | 19.37   |
| Feb      | 13.50 | 16.77                               | 18.00                             | 17.77                               | 12.69            | 18.77   | 17.87   |
| Mar      | 4.36  | 12.66                               | 16.61                             | 15.78                               | 3.64             | 17.39   | 16.35   |
| Apr      | 2.62  | 11.20                               | 15.46                             | 14.10                               | 2.73             | 16.53   | 15.22   |
| May      | 11.42 | 11.36                               | 13.23                             | 12.44                               | 12.51            | 14.58   | 14.09   |
| Jun      | 24.90 | 12.41                               | 11.28                             | 11.05                               | 25.94            | 12.63   | 13.12   |
| Jul      | 10.86 | 11.29                               | 9.54                              | 9.72                                | 26.07            | 10.81   | 11.98   |
| Aug      | 9.60  | 9.23                                | 7.64                              | 8.37                                | 7.83             | 9.08  | 10.56   |
| Sep      | 3.27  | 6.93                                | 7.39                              | 7.50                                | 4.98             | 8.88  | 9.41  |
| Oct      | 1.69  | 4.99                                | 7.57                              | 6.81                                | 2.58             | 9.06  | 8.37  |
| Nov      | 2.30  | 4.42                                | 6.99                              | 5.99                                | 4.57             | 8.45  | 7.16  |
| Dec      | 12.67 | 4.96                                | 5.63                              | 5.07                                | 10.28            | 7.04  | 5.83  |
| 2008 Jan | 0.93  | 4.52                                | 4.29                              | 4.27                                | 0.98             | 5.04  | 4.59  |
| Feb      | 0.50  | 4.17                                | 3.43                              | 3.74                                | 1.00             | 3.63  | 3.83  |
| Mar      | 11.36 | 4.09                                | 2.90                              | 3.33                                | 10.62            | 3.10  | 3.39  |
| Apr      | 0.00  | 2.73                                | 2.77                              | 2.88                                | 0.00             | 2.88  | 2.92  |
| May      | 0.25  | 2.16                                | 2.89                              | 2.47                                | 0.67             | 2.91  | 2.52  |
| Jun      | 3.44  | 1.62                                | 2.47                              | 2.04                                | 3.96             | 2.52  | 2.15  |
| Jul      | 0.00  | 0.80                                | 1.91                              | 1.67                                | 0.00             | 2.06  | 1.83  |
| Aug      | 0.00  | 1.00                                | 1.86                              | 1.48                                | 0.00             | 1.98  | 1.64  |
| Sep      | 0.00  | 1.20                                | 1.36                              | 1.24                                | 0.00             | 1.50  | 1.42  |
| Oct      | 2.00  | 1.42                                | 0.89                              | 1.11                                | 2.30             | 1.06  | 1.30  |
| Nov      | 4.85  | 1.60                                | 0.88                              | 1.07                                | 5.58             | 1.03  | 1.23  |
| Dec      | 0.00  | 1.18                                | 0.98                              | 0.98                                | 0.00             | 1.13  | 1.13  |

| MONTH    | SN     | SN <sup>r</sup> (S <sup>HBm</sup> ) | SN <sup>r</sup> (S <sup>W</sup> ) | SN <sup>r</sup> (S <sup>B13</sup> ) | PX <sub>GD</sub> | PX <sub>GD</sub> <sup>r</sup> (S <sup>W</sup> ) | PX <sub>GD</sub> <sup>r</sup> (S <sup>B13</sup> ) |
|----------|--------|-------------------------------------|-----------------------------------|-------------------------------------|------------------|---|---|
| 2009 Jan | 0.13   | 0.76                                | 1.36                              | 1.05                                | 0.15             | 1.57  | 1.20  |
| Feb      | 0.00   | 0.33                                | 1.63                              | 1.20                                | 0.00             | 1.87  | 1.38  |
| Mar      | 0.00   | 0.40                                | 1.73                              | 1.35                                | 0.00             | 1.99  | 1.55  |
| Apr      | 0.00   | 1.18                                | 2.08                              | 1.65                                | 0.00             | 2.39  | 1.89  |
| May      | 0.00   | 1.96                                | 2.23                              | 2.04                                | 0.00             | 2.56  | 2.35  |
| Jun      | 6.21   | 2.89                                | 2.80                              | 2.69                                | 7.14             | 3.22  | 3.10  |
| Jul      | 6.33   | 3.55                                | 4.16                              | 3.64                                | 7.28             | 4.79  | 4.19  |
| Aug      | 0.00   | 3.57                                | 6.29                              | 5.02                                | 0.00             | 7.23  | 5.77  |
| Sep      | 2.44   | 4.59                                | 8.40                              | 6.84                                | 2.81             | 9.66  | 7.86  |
| Oct      | 8.00   | 6.36                                | 9.32                              | 8.60                                | 9.20             | 10.71   | 9.89  |
| Nov      | 2.33   | 9.67                                | 9.70                              | 10.17                               | 2.68             | 11.16   | 11.70   |
| Dec      | 16.21  | 14.10                               | 10.20                             | 11.65                               | 18.64            | 11.73   | 13.40   |
| 2010 Jan | 16.75  | 16.86                               | 10.86                             | 12.97                               | 19.26            | 12.49   | 14.92   |
| Feb      | 34.40  | 17.90                               | 11.88                             | 13.92                               | 39.56            | 13.66   | 16.00   |
| Mar      | 16.30  | 16.05                               | 13.78                             | 14.47                               | 18.75            | 15.85   | 16.65   |
| Apr      | 5.64   | 13.18                               | 15.95                             | 14.98                               | 6.49             | 18.34   | 17.23   |
| May      | 3.67   | 11.67                               | 18.11                             | 15.93                               | 4.22             | 20.83   | 18.32   |
| Jun      | 14.45  | 12.70                               | 19.42                             | 17.10                               | 16.62            | 22.34   | 19.67   |
| Jul      | 14.00  | 16.02                               | 19.74                             | 18.29                               | 16.10            | 22.70   | 21.03   |
| Aug      | 16.73  | 20.55                               | 20.79                             | 20.09                               | 19.24            | 23.91   | 23.10   |
| Sep      | 31.40  | 24.53                               | 24.30                             | 23.31                               | 36.11            | 27.95   | 26.81   |
| Oct      | 31.00  | 26.16                               | 28.37                             | 27.23                               | 35.65            | 32.63   | 31.31   |
| Nov      | 31.17  | 28.25                               | 31.01                             | 30.65                               | 35.85            | 35.66   | 35.25   |
| Dec      | 18.91  | 32.33                               | 33.21                             | 33.69                               | 21.75            | 38.19   | 38.74   |
| 2011 Jan | 21.64  | 37.55                               | 35.48                             | 36.84                               | 24.89            | 40.80   | 42.37   |
| Feb      | 54.73  | 44.10                               | 38.18                             | 40.12                               | 62.94            | 43.91   | 46.14   |
| Mar      | 80.27  | 48.11                               | 41.39                             | 42.89                               | 92.31            | 47.60   | 49.32   |
| Apr      | 39.38  | 46.86                               | 46.60                             | 45.71                               | 45.29            | 53.59   | 52.56   |
| May      | 33.22  | 45.01                               | 53.35                             | 49.70                               | 38.20            | 61.36   | 57.16   |
| Jun      | 37.67  | 45.05                               | 59.77                             | 54.93                               | 43.32            | 68.74   | 63.17   |
| Jul      | 45.27  | 50.81                               | 65.04                             | 60.68                               | 52.06            | 74.80   | 69.78   |
| Aug      | 50.27  | 62.94                               | 65.99                             | 65.48                               | 57.81            | 75.88   | 75.30   |
| Sep      | 75.00  | 77.00                               | 64.05                             | 69.34                               | 86.25            | 73.66   | 79.74   |
| Oct      | 112.29 | 88.45                               | 65.16                             | 73.25                               | 129.13           | 74.93   | 84.24   |
| Nov      | 112.00 | 89.72                               | 68.60                             | 76.03                               | 128.80           | 78.89   | 87.44   |
| Dec      | 92.14  | 83.85                               | 72.38                             | 76.84                               | 105.96           | 83.24   | 88.36   |

| MONTH    | SN     | SN <sup>r</sup> (S <sup>HBm</sup> ) | SN <sup>r</sup> (S <sup>W</sup> ) | SN <sup>r</sup> (S <sup>B13</sup> ) | PX <sub>GD</sub> | PX <sub>GD</sub> <sup>r</sup> (S <sup>W</sup> ) | PX <sub>GD</sub> <sup>r</sup> (S <sup>B13</sup> ) |
|----------|--------|-------------------------------------|-----------------------------------|-------------------------------------|------------------|---|---|
| 2012 Jan | 74.88  | 74.71                               | 76.58                             | 76.47                               | 86.11            | 88.06   | 87.94   |
| Feb      | 24.17  | 65.49                               | 79.40                             | 75.73                               | 27.80            | 91.31   | 87.09   |
| Mar      | 64.46  | 65.78                               | 79.46                             | 75.00                               | 74.13            | 91.37   | 86.25   |
| Apr      | 81.70  | 70.97                               | 76.32                             | 73.90                               | 93.96            | 87.76   | 84.99   |
| May      | 73.42  | 75.96                               | 72.25                             | 72.82                               | 84.43            | 83.09   | 83.74   |
| Jun      | 88.33  | 80.11                               | 69.06                             | 72.21                               | 101.58           | 79.42   | 83.04   |
| Jul      | 95.22  | 78.07                               | 67.32                             | 71.61                               | 109.50           | 77.41   | 82.35   |
| Aug      | 68.08  | 72.75                               | 68.26                             | 70.74                               | 78.29            | 78.50   | 81.35   |
| Sep      | 58.57  | 67.39                               | 68.38                             | 68.74                               | 67.36            | 78.64   | 79.05   |
| Oct      | 53.33  | 63.75                               | 69.78                             | 67.20                               | 61.33            | 80.25   | 77.28   |
| Nov      | 73.50  | 62.12                               | 73.23                             | 67.44                               | 84.53            | 84.22   | 77.56   |
| Dec      | 54.00  | 59.83                               | 73.38                             | 67.95                               | 62.10            | 84.38   | 78.14   |
| 2013 Jan | 71.13  | 63.70                               | 71.93                             | 68.87                               | 81.80            | 82.72   | 79.20   |
| Feb      | 50.50  | 68.56                               | 71.08                             | 70.69                               | 58.08            | 81.74   | 81.29   |
| Mar      | 41.20  | 74.54                               | 70.10                             | 73.04                               | 47.38            | 80.62   | 84.00   |
| Apr      | 138.43 | 85.17                               | 71.09                             | 75.56                               | 159.19           | 81.76   | 86.89   |
| May      | 99.56  | 85.59                               | 74.56                             | 77.38                               | 114.49           | 85.74   | 88.98   |
| Jun      | 65.64  | 80.75                               | 78.26                             | 78.60                               | 75.49            | 90.00   | 90.39   |
| Jul      | 83.29  | 76.59                               | 81.49                             | 79.94                               | 95.78            | 93.71   | 91.93   |
| Aug      | 59.44  | 72.00                               | 87.03                             | 82.48                               | 68.36            | 100.09  | 94.85   |
| Sep      | 43.88  | 74.74                               | 93.73                             | 86.50                               | 50.46            | 107.79  | 99.48   |
| Oct      | 91.78  | 84.77                               | 94.89                             | 90.46                               | 105.54           | 109.13  | 104.03  |
| Nov      | 118.25 | 96.81                               | 93.21                             | 94.39                               | 135.99           | 107.19  | 108.54  |
| Dec      | 98.00  | 105.67                              | 93.91                             | 98.55                               | 112.70           | 108.00  | 113.33  |

OBSERVED and SMOOTHED GDSO PETTISINDICES (SN, SN[SW] and SN[SB13]) 1988-2013

SOLID = OBSERVED, DASHED = SW, DOTTED = SB13



CORRECTED and SMOOTHED **GDSO PETTISINDICES** (PXGD, PXGD[SW] and PXGD [SB13]) 1988-2013

SOLID = CORRECTED, DASHED = SW, DOTTED = SB13

