

PENNSYLVANIA COMPENSATION RATING BUREAU

Retrospective Test of Trend Projections for Severity Ratios

Attached is a retrospective test of the predictive accuracy of various trend procedures. Please note that instead of using ultimate loss ratios, as in Exhibit 11a, Exhibit 11b uses ultimate severity ratios, i.e., ultimate loss ratios adjusted by dividing out the frequency component. Please note that our analysis is limited to Policy Years 2001 through 2012, the years shown on Exhibit 6, page 6.

Results for both indemnity and medical are shown using both linear and exponential fits. All possible combinations of from four to ten data points, which permitted a test of the projected severity ratio three years hence, were used. Our current review trends policy year 2012 3.25 years, policy year 2011 4.25 years, and policy year 2010 5.25 years. An average of those three values is then calculated.

Current estimates of policy year ultimate severity ratios are compared with predicted values based on trending through earlier years. The results are shown for three loss development approaches: incurred, paid to twenty-sixth and the average of the incurred and paid to twenty-sixth methods.

As an illustration, the incurred loss development approach generates an indemnity severity ratio of 0.7640 for policy year 2007. Fitting the loss ratios for policy years 2001 to 2004 using a straight line and projecting that to 2007 yields a severity ratio of 0.7858, which overstates our current estimate for 2007 by 0.0218.

**Indemnity  
Actual Ultimate Severity Ratios  
Including Average of Paid and Incurred**

| INDEMNITY | Policy<br>Year | Severity<br>Ratio<br>(Avg Pd & Inc) | Severity<br>Ratio<br>(Incur) | Severity<br>Ratio<br>(Pd-26) |
|-----------|----------------|-------------------------------------|------------------------------|------------------------------|
|           | 2001           | 0.6479                              | 0.6337                       | 0.6622                       |
|           | 2002           | 0.6756                              | 0.6645                       | 0.6865                       |
|           | 2003           | 0.6859                              | 0.6746                       | 0.6973                       |
|           | 2004           | 0.7229                              | 0.7147                       | 0.7313                       |
|           | 2005           | 0.7156                              | 0.7000                       | 0.7311                       |
|           | 2006           | 0.7289                              | 0.7122                       | 0.7458                       |
|           | 2007           | 0.7870                              | 0.7640                       | 0.8100                       |
|           | 2008           | 0.8220                              | 0.7877                       | 0.8565                       |
|           | 2009           | 0.8161                              | 0.7774                       | 0.8548                       |
|           | 2010           | 0.8166                              | 0.7754                       | 0.8577                       |
|           | 2011           | 0.8392                              | 0.7886                       | 0.8898                       |
|           | 2012           | 0.8537                              | 0.7942                       | 0.9131                       |

Trend # Years = 3

**Indemnity  
Linear Fit  
Trended Severity Ratios**

| Years Used (# Yrs) | 3 Yr Trend To | Severity Ratio (Avg Pd & Inc) | Severity Ratio (Incur) | Severity Ratio (Pd-26) |
|--------------------|---------------|-------------------------------|------------------------|------------------------|
| 01-04 (4)          | 2007          | 0.7890                        | 0.7858                 | 0.7925                 |
| 02-05 (4)          | 2008          | 0.7707                        | 0.7544                 | 0.7871                 |
| 03-06 (4)          | 2009          | 0.7681                        | 0.7445                 | 0.7918                 |
| 04-07 (4)          | 2010          | 0.8311                        | 0.7948                 | 0.8674                 |
| 05-08 (4)          | 2011          | 0.9332                        | 0.8827                 | 0.9840                 |
| 06-09 (4)          | 2012          | 0.9220                        | 0.8590                 | 0.9849                 |
| 01-05 (5)          | 2008          | 0.7809                        | 0.7689                 | 0.7930                 |
| 02-06 (5)          | 2009          | 0.7739                        | 0.7536                 | 0.7946                 |
| 03-07 (5)          | 2010          | 0.8322                        | 0.8013                 | 0.8631                 |
| 04-08 (5)          | 2011          | 0.8901                        | 0.8407                 | 0.9396                 |
| 05-09 (5)          | 2012          | 0.9210                        | 0.8634                 | 0.9787                 |
| 01-06 (6)          | 2009          | 0.7844                        | 0.7680                 | 0.8011                 |
| 02-07 (6)          | 2010          | 0.8260                        | 0.7986                 | 0.8535                 |
| 03-08 (6)          | 2011          | 0.8830                        | 0.8396                 | 0.9265                 |
| 04-09 (6)          | 2012          | 0.8979                        | 0.8414                 | 0.9545                 |
| 01-07 (7)          | 2010          | 0.8277                        | 0.8045                 | 0.8511                 |
| 02-08 (7)          | 2011          | 0.8727                        | 0.8338                 | 0.9119                 |
| 03-09 (7)          | 2012          | 0.8955                        | 0.8440                 | 0.9471                 |
| 01-08 (8)          | 2011          | 0.8700                        | 0.8359                 | 0.9044                 |
| 02-09 (8)          | 2012          | 0.8889                        | 0.8417                 | 0.9363                 |
| 01-09 (9)          | 2012          | 0.8876                        | 0.8451                 | 0.9302                 |

**Indemnity**  
**Linear Fit**  
**Differences: (Actual - Trended)**

| Years Used (# Yrs) | 3 Yr Trend To | Severity Ratio (Avg Pd & Inc) | Severity Ratio (Incur) | Severity Ratio (Pd-26) |
|--------------------|---------------|-------------------------------|------------------------|------------------------|
| 01-04 (4)          | 2007          | -0.0020                       | -0.0218                | 0.0175                 |
| 02-05 (4)          | 2008          | 0.0513                        | 0.0333                 | 0.0694                 |
| 03-06 (4)          | 2009          | 0.0480                        | 0.0329                 | 0.0630                 |
| 04-07 (4)          | 2010          | -0.0145                       | -0.0194                | -0.0097                |
| 05-08 (4)          | 2011          | -0.0940                       | -0.0941                | -0.0942                |
| 06-09 (4)          | 2012          | -0.0683                       | -0.0648                | -0.0718                |
| 01-05 (5)          | 2008          | 0.0411                        | 0.0188                 | 0.0635                 |
| 02-06 (5)          | 2009          | 0.0422                        | 0.0238                 | 0.0602                 |
| 03-07 (5)          | 2010          | -0.0156                       | -0.0259                | -0.0054                |
| 04-08 (5)          | 2011          | -0.0509                       | -0.0521                | -0.0498                |
| 05-09 (5)          | 2012          | -0.0673                       | -0.0692                | -0.0656                |
| 01-06 (6)          | 2009          | 0.0317                        | 0.0094                 | 0.0537                 |
| 02-07 (6)          | 2010          | -0.0094                       | -0.0232                | 0.0042                 |
| 03-08 (6)          | 2011          | -0.0438                       | -0.0510                | -0.0367                |
| 04-09 (6)          | 2012          | -0.0442                       | -0.0472                | -0.0414                |
| 01-07 (7)          | 2010          | -0.0111                       | -0.0291                | 0.0066                 |
| 02-08 (7)          | 2011          | -0.0335                       | -0.0452                | -0.0221                |
| 03-09 (7)          | 2012          | -0.0418                       | -0.0498                | -0.0340                |
| 01-08 (8)          | 2011          | -0.0308                       | -0.0473                | -0.0146                |
| 02-09 (8)          | 2012          | -0.0352                       | -0.0475                | -0.0232                |
| 01-09 (9)          | 2012          | -0.0339                       | -0.0509                | -0.0171                |

**Indemnity  
Exponential Fit  
Trended Loss Ratios**

| Years<br>Used<br>(# Yrs) | 3 Yr<br>Trend<br>To | Severity<br>Ratio<br>(Incur) | Severity<br>Ratio<br>(Incur) | Severity<br>Ratio<br>(Pd-26) |
|--------------------------|---------------------|------------------------------|------------------------------|------------------------------|
| 01-04 (4)                | 2007                | 0.7967                       | 0.7950                       | 0.7990                       |
| 02-05 (4)                | 2008                | 0.7743                       | 0.7577                       | 0.7911                       |
| 03-06 (4)                | 2009                | 0.7706                       | 0.7464                       | 0.7951                       |
| 04-07 (4)                | 2010                | 0.8347                       | 0.7966                       | 0.8732                       |
| 05-08 (4)                | 2011                | 0.9513                       | 0.8958                       | 1.0079                       |
| 06-09 (4)                | 2012                | 0.9356                       | 0.8670                       | 1.0053                       |
| 01-05 (5)                | 2008                | 0.7872                       | 0.7755                       | 0.7990                       |
| 02-06 (5)                | 2009                | 0.7774                       | 0.7565                       | 0.7988                       |
| 03-07 (5)                | 2010                | 0.8380                       | 0.8055                       | 0.8707                       |
| 04-08 (5)                | 2011                | 0.8993                       | 0.8462                       | 0.9534                       |
| 05-09 (5)                | 2012                | 0.9358                       | 0.8729                       | 0.9997                       |
| 01-06 (6)                | 2009                | 0.7904                       | 0.7738                       | 0.8072                       |
| 02-07 (6)                | 2010                | 0.8322                       | 0.8036                       | 0.8611                       |
| 03-08 (6)                | 2011                | 0.8933                       | 0.8468                       | 0.9405                       |
| 04-09 (6)                | 2012                | 0.9082                       | 0.8472                       | 0.9703                       |
| 01-07 (7)                | 2010                | 0.8363                       | 0.8123                       | 0.8604                       |
| 02-08 (7)                | 2011                | 0.8828                       | 0.8414                       | 0.9248                       |
| 03-09 (7)                | 2012                | 0.9073                       | 0.8517                       | 0.9638                       |
| 01-08 (8)                | 2011                | 0.8821                       | 0.8462                       | 0.9183                       |
| 02-09 (8)                | 2012                | 0.9009                       | 0.8501                       | 0.9524                       |
| 01-09 (9)                | 2012                | 0.9016                       | 0.8561                       | 0.9474                       |

**Indemnity**  
**Exponential Fit**  
**Differences: (Actual - Trended)**

| Years Used (# Yrs) | 3 Yr Trend To | Severity Ratio (Avg Pd & Inc) | Severity Ratio (Incur) | Severity Ratio (Pd-26) |
|--------------------|---------------|-------------------------------|------------------------|------------------------|
| 01-04 (4)          | 2007          | -0.0097                       | -0.0310                | 0.0110                 |
| 02-05 (4)          | 2008          | 0.0477                        | 0.0300                 | 0.0654                 |
| 03-06 (4)          | 2009          | 0.0455                        | 0.0310                 | 0.0597                 |
| 04-07 (4)          | 2010          | -0.0181                       | -0.0212                | -0.0155                |
| 05-08 (4)          | 2011          | -0.1121                       | -0.1072                | -0.1181                |
| 06-09 (4)          | 2012          | -0.0819                       | -0.0728                | -0.0922                |
| 01-05 (5)          | 2008          | 0.0348                        | 0.0122                 | 0.0575                 |
| 02-06 (5)          | 2009          | 0.0387                        | 0.0209                 | 0.0560                 |
| 03-07 (5)          | 2010          | -0.0214                       | -0.0301                | -0.0130                |
| 04-08 (5)          | 2011          | -0.0601                       | -0.0576                | -0.0636                |
| 05-09 (5)          | 2012          | -0.0821                       | -0.0787                | -0.0866                |
| 01-06 (6)          | 2009          | 0.0257                        | 0.0036                 | 0.0476                 |
| 02-07 (6)          | 2010          | -0.0156                       | -0.0282                | -0.0034                |
| 03-08 (6)          | 2011          | -0.0541                       | -0.0582                | -0.0507                |
| 04-09 (6)          | 2012          | -0.0545                       | -0.0530                | -0.0572                |
| 01-07 (7)          | 2010          | -0.0197                       | -0.0369                | -0.0027                |
| 02-08 (7)          | 2011          | -0.0436                       | -0.0528                | -0.0350                |
| 03-09 (7)          | 2012          | -0.0536                       | -0.0575                | -0.0507                |
| 01-08 (8)          | 2011          | -0.0429                       | -0.0576                | -0.0285                |
| 02-09 (8)          | 2012          | -0.0472                       | -0.0559                | -0.0393                |
| 01-09 (9)          | 2012          | -0.0479                       | -0.0619                | -0.0343                |

**Medical**  
**Actual Ultimate Severity Ratios**  
**Including Average of Paid and Incurred**

| MEDICAL | Policy<br>Year | Severity<br>Ratio<br>(Avg Pd & Inc) | Severity<br>Ratio<br>(Incur) | Severity<br>Ratio<br>(Pd-26) |
|---------|----------------|-------------------------------------|------------------------------|------------------------------|
|         | 2001           | 0.5695                              | 0.5521                       | 0.5870                       |
|         | 2002           | 0.6144                              | 0.5987                       | 0.6303                       |
|         | 2003           | 0.6633                              | 0.6420                       | 0.6848                       |
|         | 2004           | 0.7268                              | 0.7045                       | 0.7491                       |
|         | 2005           | 0.7311                              | 0.7098                       | 0.7524                       |
|         | 2006           | 0.7333                              | 0.7067                       | 0.7598                       |
|         | 2007           | 0.8209                              | 0.7918                       | 0.8498                       |
|         | 2008           | 0.8343                              | 0.7965                       | 0.8722                       |
|         | 2009           | 0.8464                              | 0.8045                       | 0.8881                       |
|         | 2010           | 0.8968                              | 0.8588                       | 0.9347                       |
|         | 2011           | 0.9468                              | 0.8969                       | 0.9965                       |
|         | 2012           | 0.9670                              | 0.9133                       | 1.0206                       |

Trend # Years = 3

**Medical  
Linear Fit  
Trended Severity Ratios**

| Years Used (# Yrs) | 3 Yr Trend To | Severity Ratio (Avg Pd & Inc) | Severity Ratio (Incur) | Severity Ratio (Pd-26) |
|--------------------|---------------|-------------------------------|------------------------|------------------------|
| 01-04 (4)          | 2007          | 0.8779                        | 0.8496                 | 0.9062                 |
| 02-05 (4)          | 2008          | 0.8700                        | 0.8419                 | 0.8979                 |
| 03-06 (4)          | 2009          | 0.8101                        | 0.7805                 | 0.8393                 |
| 04-07 (4)          | 2010          | 0.8811                        | 0.8447                 | 0.9171                 |
| 05-08 (4)          | 2011          | 0.9586                        | 0.9065                 | 1.0108                 |
| 06-09 (4)          | 2012          | 0.9674                        | 0.9090                 | 1.0258                 |
| 01-05 (5)          | 2008          | 0.8788                        | 0.8520                 | 0.9055                 |
| 02-06 (5)          | 2009          | 0.8466                        | 0.8142                 | 0.8786                 |
| 03-07 (5)          | 2010          | 0.8959                        | 0.8619                 | 0.9295                 |
| 04-08 (5)          | 2011          | 0.9217                        | 0.8749                 | 0.9685                 |
| 05-09 (5)          | 2012          | 0.9590                        | 0.9015                 | 1.0164                 |
| 01-06 (6)          | 2009          | 0.8668                        | 0.8360                 | 0.8973                 |
| 02-07 (6)          | 2010          | 0.9109                        | 0.8753                 | 0.9460                 |
| 03-08 (6)          | 2011          | 0.9307                        | 0.8873                 | 0.9739                 |
| 04-09 (6)          | 2012          | 0.9385                        | 0.8851                 | 0.9917                 |
| 01-07 (7)          | 2010          | 0.9213                        | 0.8871                 | 0.9551                 |
| 02-08 (7)          | 2011          | 0.9423                        | 0.8990                 | 0.9854                 |
| 03-09 (7)          | 2012          | 0.9482                        | 0.8980                 | 0.9981                 |
| 01-08 (8)          | 2011          | 0.9516                        | 0.9103                 | 0.9928                 |
| 02-09 (8)          | 2012          | 0.9602                        | 0.9106                 | 1.0094                 |
| 01-09 (9)          | 2012          | 0.9704                        | 0.9230                 | 1.0175                 |



**Medical  
Linear Fit  
Differences: (Actual - Trended)**

| Years Used (# Yrs) | 3 Yr Trend To | Severity Ratio (Avg Pd & Inc) | Severity Ratio (Incur) | Severity Ratio (Pd-26) |
|--------------------|---------------|-------------------------------|------------------------|------------------------|
| 01-04 (4)          | 2007          | -0.0570                       | -0.0578                | -0.0564                |
| 02-05 (4)          | 2008          | -0.0357                       | -0.0454                | -0.0257                |
| 03-06 (4)          | 2009          | 0.0363                        | 0.0240                 | 0.0488                 |
| 04-07 (4)          | 2010          | 0.0158                        | 0.0141                 | 0.0176                 |
| 05-08 (4)          | 2011          | -0.0118                       | -0.0096                | -0.0143                |
| 06-09 (4)          | 2012          | -0.0004                       | 0.0043                 | -0.0052                |
| 01-05 (5)          | 2008          | -0.0445                       | -0.0555                | -0.0333                |
| 02-06 (5)          | 2009          | -0.0002                       | -0.0097                | 0.0095                 |
| 03-07 (5)          | 2010          | 0.0009                        | -0.0031                | 0.0052                 |
| 04-08 (5)          | 2011          | 0.0251                        | 0.0220                 | 0.0280                 |
| 05-09 (5)          | 2012          | 0.0080                        | 0.0118                 | 0.0042                 |
| 01-06 (6)          | 2009          | -0.0204                       | -0.0315                | -0.0092                |
| 02-07 (6)          | 2010          | -0.0141                       | -0.0165                | -0.0113                |
| 03-08 (6)          | 2011          | 0.0161                        | 0.0096                 | 0.0226                 |
| 04-09 (6)          | 2012          | 0.0285                        | 0.0282                 | 0.0289                 |
| 01-07 (7)          | 2010          | -0.0245                       | -0.0283                | -0.0204                |
| 02-08 (7)          | 2011          | 0.0045                        | -0.0021                | 0.0111                 |
| 03-09 (7)          | 2012          | 0.0188                        | 0.0153                 | 0.0225                 |
| 01-08 (8)          | 2011          | -0.0048                       | -0.0134                | 0.0037                 |
| 02-09 (8)          | 2012          | 0.0068                        | 0.0027                 | 0.0112                 |
| 01-09 (9)          | 2012          | -0.0034                       | -0.0097                | 0.0031                 |

**Medical  
Exponential Fit  
Trended Loss Ratios**

| Years Used (# Yrs) | 3 Yr Trend To | Severity Ratio (Avg Pd & Inc) | Severity Ratio (Incur) | Severity Ratio (Pd-26) |
|--------------------|---------------|-------------------------------|------------------------|------------------------|
| 01-04 (4)          | 2007          | 0.9220                        | 0.8917                 | 0.9522                 |
| 02-05 (4)          | 2008          | 0.8989                        | 0.8688                 | 0.9287                 |
| 03-06 (4)          | 2009          | 0.8186                        | 0.7883                 | 0.8484                 |
| 04-07 (4)          | 2010          | 0.8876                        | 0.8499                 | 0.9249                 |
| 05-08 (4)          | 2011          | 0.9788                        | 0.9222                 | 1.0358                 |
| 06-09 (4)          | 2012          | 0.9871                        | 0.9243                 | 1.0504                 |
| 01-05 (5)          | 2008          | 0.9187                        | 0.8905                 | 0.9468                 |
| 02-06 (5)          | 2009          | 0.8672                        | 0.8326                 | 0.9015                 |
| 03-07 (5)          | 2010          | 0.9117                        | 0.8763                 | 0.9466                 |
| 04-08 (5)          | 2011          | 0.9339                        | 0.8844                 | 0.9836                 |
| 05-09 (5)          | 2012          | 0.9775                        | 0.9152                 | 1.0401                 |
| 01-06 (6)          | 2009          | 0.8998                        | 0.8668                 | 0.9325                 |
| 02-07 (6)          | 2010          | 0.9383                        | 0.8998                 | 0.9762                 |
| 03-08 (6)          | 2011          | 0.9507                        | 0.9046                 | 0.9967                 |
| 04-09 (6)          | 2012          | 0.9529                        | 0.8959                 | 1.0100                 |
| 01-07 (7)          | 2010          | 0.9610                        | 0.9240                 | 0.9976                 |
| 02-08 (7)          | 2011          | 0.9734                        | 0.9259                 | 1.0206                 |
| 03-09 (7)          | 2012          | 0.9699                        | 0.9160                 | 1.0237                 |
| 01-08 (8)          | 2011          | 0.9950                        | 0.9495                 | 1.0403                 |
| 02-09 (8)          | 2012          | 0.9926                        | 0.9379                 | 1.0471                 |
| 01-09 (9)          | 2012          | 1.0153                        | 0.9624                 | 1.0679                 |

**Medical**  
**Exponential Fit**  
**Differences: (Actual - Trended)**

| Years Used (# Yrs) | 3 Yr Trend To | Severity Ratio (Avg Pd & Inc) | Severity Ratio (Incur) | Severity Ratio (Pd-26) |
|--------------------|---------------|-------------------------------|------------------------|------------------------|
| 01-04 (4)          | 2007          | -0.1011                       | -0.0999                | -0.1024                |
| 02-05 (4)          | 2008          | -0.0646                       | -0.0723                | -0.0565                |
| 03-06 (4)          | 2009          | 0.0278                        | 0.0162                 | 0.0397                 |
| 04-07 (4)          | 2010          | 0.0092                        | 0.0089                 | 0.0098                 |
| 05-08 (4)          | 2011          | -0.0320                       | -0.0253                | -0.0393                |
| 06-09 (4)          | 2012          | -0.0201                       | -0.0110                | -0.0298                |
| 01-05 (5)          | 2008          | -0.0844                       | -0.0940                | -0.0746                |
| 02-06 (5)          | 2009          | -0.0208                       | -0.0281                | -0.0134                |
| 03-07 (5)          | 2010          | -0.0149                       | -0.0175                | -0.0119                |
| 04-08 (5)          | 2011          | 0.0129                        | 0.0125                 | 0.0129                 |
| 05-09 (5)          | 2012          | -0.0105                       | -0.0019                | -0.0195                |
| 01-06 (6)          | 2009          | -0.0534                       | -0.0623                | -0.0444                |
| 02-07 (6)          | 2010          | -0.0415                       | -0.0410                | -0.0415                |
| 03-08 (6)          | 2011          | -0.0039                       | -0.0077                | -0.0002                |
| 04-09 (6)          | 2012          | 0.0141                        | 0.0174                 | 0.0106                 |
| 01-07 (7)          | 2010          | -0.0642                       | -0.0652                | -0.0629                |
| 02-08 (7)          | 2011          | -0.0266                       | -0.0290                | -0.0241                |
| 03-09 (7)          | 2012          | -0.0029                       | -0.0027                | -0.0031                |
| 01-08 (8)          | 2011          | -0.0482                       | -0.0526                | -0.0438                |
| 02-09 (8)          | 2012          | -0.0256                       | -0.0246                | -0.0265                |
| 01-09 (9)          | 2012          | -0.0483                       | -0.0491                | -0.0473                |