

Belinfante-Uretsky
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 March 28, 1995

UNITARY X

This spreadsheet calculates the per line and balanced 50/50 CL X-factor as well as the TS X-Factor
 Chart PLX1 calculates the per line X, given beginning and ending CL/MOU rates from trend. Chart PLX1 also calculates an ending CCL rate, which is needed as input to balanced 50/50 chart.
 Chart BFX1 calculates the balanced 50/50 X, given beginning CL/MOU rate, the ending CCL rate from Chart PLX1, and the SL/Cs from Chart PLX1.

TRENDLINE ESTIMATES

| TREND | Annualization Factors | CL/MOU | TS/MOU | Tot SW/MOU | CL MOU/Line | CL Rev | CL MOU | Sub Lines | TS Rev | TS MOU |
|-------|-----------------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 19 | 1.0000 | \$0.034824 | \$0.027877 | \$0.082909 | 1.883517 | \$7,407,332 | 212,098,592 | 112,807,890 | \$5,875,125 | 202,850,860 |
| 32 | 1.0833 | \$0.033277 | \$0.027548 | \$0.080885 | 1.889898 | \$7,717,084 | 231,903,285 | 118,553,885 | \$6,210,548 | 225,481,548 |
| 50 | 1.5000 | \$0.031124 | \$0.028980 | \$0.058122 | 2.148588 | \$8,167,468 | 282,414,187 | 122,248,888 | \$7,038,287 | 280,987,809 |
| 63.5 | 1.1250 | \$0.028802 | \$0.028529 | \$0.058183 | 2.272381 | \$8,522,424 | 287,903,988 | 128,888,188 | \$7,728,874 | 291,280,121 |
| 80 | 1.3750 | \$0.027841 | \$0.028012 | \$0.053837 | 2.438124 | \$8,877,275 | 322,444,300 | 132,358,585 | \$8,883,827 | 333,088,180 |

ACTUALS

| TREND | Unadjusted CL Rev | Unadjusted SL/C Rev | Actual Lines | SL/Cs |
|-------|-------------------|---------------------|--------------|--------|
| 19 | \$7,141,522 | \$2,484,858 | 113,318,244 | \$1.83 |
| 32 | \$8,048,472 | \$3,848,948 | 116,083,882 | \$2.82 |
| 50 | \$8,220,317 | \$4,583,878 | 121,854,374 | \$3.13 |
| 63.5 | \$8,528,394 | \$5,876,820 | 128,432,881 | \$3.74 |
| 80 | \$8,883,314 | \$8,089,004 | 138,008,705 | \$3.80 |

Calculation of Annual Change in GNPPi

| | GNPPI | Change in GNPPI | Estimated GNP-PI | |
|-------|-------|-----------------|------------------|--------|
| 4Q/83 | 227.8 | | | |
| 4Q/84 | 237.1 | 0.0417 | | |
| 4Q/84 | 110 | | 109.3 | |
| 4Q/85 | 113.8 | 0.0345 | 113.3 | 0.0381 |
| 2Q/86 | 114.7 | | 115.3 | |
| 2Q/87 | 118.8 | 0.0340 | 118.5 | 0.0381 |
| 3Q/87 | 119.7 | | 120.5 | |
| 3Q/88 | 124.9 | 0.0434 | 124.9 | 0.0381 |
| 4Q/88 | 128.2 | | 128.0 | |
| 4Q/89 | 131.4 | 0.0412 | 130.5 | 0.0381 |

ANNUAL FACTORS

| PERIOD | Change in GNPPI | g-factor |
|--------|-----------------|----------|
| 1 | 3.8121% | 5.1912% |
| 2 | 3.8121% | 5.1912% |
| 3 | 3.8121% | 5.1912% |
| 4 | 3.8121% | 5.1912% |
| 5 | 3.8121% | 5.1912% |

CHART PLX1

| | |
|-----------------------------------|-----------|
| 1 CL X- FACTOR | 4.0% |
| 2 Beginning CLMOU rate from trend | \$0.03492 |
| 3 Ending CLMOU Rate from trend | \$0.02784 |
| 4 Ending CLMOU Rate for Chosen X | \$0.02843 |
| 5 Delta for Ending CLMOU | \$0.00141 |
| 6 % Delta | 5.08% |
| 7 | |
| 8 PARAMETERS | |
| 9 Growth in CLMOU | 8.5893% |
| 10 Growth in Subscriber Lines | 3.2303% |
| 11 Growth in MOU/Line: g-factor | 5.1912% |

12
13 CALCULATIONS

| 14 | Period 2 | Period 3 | Period 4 | Period 5 | Period 6 |
|--|-------------|-------------|------------|--------------|-------------|
| 15 | 6/85 - 5/86 | 7/86 - 6/87 | 1988 | 4/89 - 12/89 | 7/90 - 6/91 |
| 16 Step 1: Factors | | | | | |
| 17 GNP-PI percent change | 3.6% | 3.6% | 3.6% | 3.6% | 3.6% |
| 18 CL X- Factor | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% |
| 19 g-factor | 5.19% | 5.19% | 5.19% | 5.19% | 5.19% |
| 20 Annualization Factor | 1.000 | 1.083 | 1.500 | 1.125 | 1.375 |
| 21 Step 2: Calculating CLMOU(t) from PCI | | | | | |
| 22 CLMOU (t-1) | NA | \$0.034924 | \$0.032909 | \$0.030310 | \$0.028497 |
| 23 PCI (t-1) | NA | 100.00 | 94.23 | 86.79 | 81.60 |
| 24 1 + % Change in PCI | NA | 94.23% | 92.10% | 94.02% | 92.74% |
| 25 PCI (t) | 100.00 | 94.23 | 86.79 | 81.60 | 75.67 |
| 26 CLMOU (t) | \$0.034924 | \$0.032909 | \$0.030310 | \$0.028497 | \$0.026427 |
| 27 Step 3: Calc of SLCMOU(t) | | | | | |
| 28 Monthly SLC | \$1.83 | \$2.62 | \$3.13 | \$3.74 | \$3.80 |
| 29 CLMOU per line per month | 157.0 | 165.8 | 178.9 | 189.4 | 203.0 |
| 30 Lagged CLMOU/line/month * (1+g) | 157.0 | 165.8 | 178.9 | 189.4 | 203.0 |
| 31 SLCMOU(t) | \$0.011641 | \$0.015793 | \$0.017476 | \$0.019759 | \$0.018730 |
| 32 Step 4: Calc CCL Rate | \$0.023283 | \$0.017117 | \$0.012835 | \$0.008738 | \$0.007607 |

33
34
35 CHART TS

| | |
|------------------------------------|--------------|
| 36 | |
| 37 TS X- FACTOR | 4.0% |
| 38 Beginning TSMOU rate from trend | \$0.027977 |
| 39 Ending TSMOU Rate from trend | \$0.026012 |
| 40 Ending TSMOU Rate for Chosen X | \$0.027381 |
| 41 Delta for Ending TSMOU | (\$0.001369) |
| 42 % Delta | -5.265% |

| 44 | Period 2 | Period 3 | Period 4 | Period 5 | Period 6 |
|-----------------------------|-------------|-------------|------------|--------------|-------------|
| 45 CALCULATIONS | 6/85 - 5/86 | 7/86 - 6/87 | 1988 | 4/89 - 12/89 | 7/90 - 6/91 |
| 46 | | | | | |
| 47 Step 1: Factors | | | | | |
| 48 Annualization Factor | 1.000 | 1.083 | 1.500 | 1.125 | 1.375 |
| 49 GNP-PI Percentage Change | 3.6% | 3.6% | 3.6% | 3.6% | 3.6% |
| 50 TS X- Factor | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% |
| 51 Step 2: Calculate TSMOU | | | | | |
| 52 TSMOU (t-1) | NA | \$0.027977 | \$0.027849 | \$0.027672 | \$0.027541 |
| 53 PCI (t-1) | NA | 100.00 | 99.54 | 98.91 | 98.44 |
| 54 1 + % Change in PCI | NA | 99.542% | 99.367% | 99.525% | 99.419% |
| 55 PCI (t) | 100.00 | 99.54 | 98.91 | 98.44 | 97.87 |
| 56 TSMOU (t) | \$0.027977 | \$0.027849 | \$0.027672 | \$0.027541 | \$0.027381 |

CHART BFX1

| | |
|---|-------------|
| 1 CL X-Factor | 5.0% |
| 2 Beginning CL/MOU rate from trend | \$0.03492 |
| 3 Ending CCL/MOU Rate from PLX1 Non-Unitary | \$0.00911 |
| 4 Ending CCL/MOU rate for chosen X | \$0.00912 |
| 5 Delta for Ending CL/MOU | (\$0.00000) |
| 6 % Delta | -0.05% |
| 7 | |
| 8 PARAMETERS | |
| 9 Growth in CL MOU | 8.5993% |
| 10 Growth in Subscriber Lines | 3.2303% |
| 11 Growth in MOU/Line: g-factor | 5.1912% |

12 CALCULATIONS

| 14 | Period 2 | Period 3 | Period 4 | Period 5 | Period 6 |
|---|-------------|-------------|------------|--------------|-------------|
| 15 | 6/85 - 5/88 | 7/86 - 6/87 | 1988 | 4/89 - 12/89 | 7/90 - 6/91 |
| 16 Step 1: Factors | | | | | |
| 17 GNP-PI percent change | 3.6% | 3.6% | 3.6% | 3.6% | 3.6% |
| 18 CL X-Factor | 5.0% | 5.0% | 5.0% | 5.0% | 5.0% |
| 19 g-factor | 5.19% | 5.19% | 5.19% | 5.19% | 5.19% |
| 20 Annualization Factor | 1.000 | 1.083 | 1.500 | 1.125 | 1.375 |
| 21 Step 2: Calculating CL/MOU(t) from PCI | | | | | |
| 22 CL/MOU (t-1) | NA | \$0.034924 | \$0.033443 | \$0.031497 | \$0.030111 |
| 23 PCI (t-1) | NA | 100.00 | 95.76 | 90.19 | 86.22 |
| 24 1 + % Change in PCI | NA | 95.76% | 94.18% | 95.60% | 94.65% |
| 25 PCI (t) | 100.00 | 95.76 | 90.19 | 86.22 | 81.61 |
| 26 CL/MOU (t) | \$0.034924 | \$0.033443 | \$0.031497 | \$0.030111 | \$0.028500 |
| 27 Step 3: Calc of SLC/MOU(t) | | | | | |
| 28 Monthly SLC | \$1.83 | \$2.62 | \$3.13 | \$3.74 | \$3.80 |
| 29 CL MOU per line per month | 157.0 | 165.8 | 178.9 | 189.4 | 203.0 |
| 30 Lagged CL MOU/line/month * (1 + g/2) | 157.0 | 161.4 | 172.3 | 184.1 | 196.2 |
| 31 SLC/MOU(t) | \$0.011641 | \$0.016226 | \$0.018143 | \$0.020322 | \$0.019384 |
| 32 Step 4: Calc CCL Rate | \$0.023283 | \$0.017218 | \$0.013353 | \$0.009789 | \$0.009116 |

34 CHART TS

| | |
|-------------------------------------|------------|
| 36 | |
| 37 TS X-FACTOR | 5.0% |
| 38 Beginning TS/MOU rate from trend | \$0.027977 |
| 39 Ending TS/MOU Rate from trend | \$0.028012 |
| 40 Ending TS/MOU Rate for Chosen X | \$0.028007 |
| 41 Delta for Ending TS/MOU | \$0.000004 |
| 42 % Delta | 0.016% |

44 CALCULATIONS

| 46 | Period 2 | Period 3 | Period 4 | Period 5 | Period 6 |
|-----------------------------|-------------|-------------|------------|--------------|-------------|
| 47 | 6/85 - 5/88 | 7/86 - 6/87 | 1988 | 4/89 - 12/89 | 7/90 - 6/91 |
| 47 Step 1: Factors | | | | | |
| 48 Annualization Factor | 1.000 | 1.083 | 1.500 | 1.125 | 1.375 |
| 49 GNP-PI Percentage Change | 3.6% | 3.6% | 3.6% | 3.6% | 3.6% |
| 50 TS X-Factor | 5.0% | 5.0% | 5.0% | 5.0% | 5.0% |
| 51 Step 2: Calculate TS/MOU | | | | | |
| 52 TS/MOU (t-1) | NA | \$0.027977 | \$0.027545 | \$0.026958 | \$0.026526 |
| 53 PCI (t-1) | NA | 100.00 | 98.46 | 96.36 | 94.81 |
| 54 1 + % Change in PCI | NA | 98.456% | 97.869% | 98.397% | 98.045% |
| 55 PCI (t) | 100.00 | 98.46 | 96.36 | 94.81 | 92.96 |
| 56 TS/MOU (t) | \$0.027977 | \$0.027545 | \$0.026958 | \$0.026526 | \$0.026007 |

Belinfante - Uretsky
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 March 29, 1995

NON-UNITARY X

This spreadsheet calculates the per line and balanced 50/50 CL X-factor as well as the TS X-Factor
 Chart PLX1 calculates the per line X, given beginning and ending CL/MOU rates from trend. Chart PLX1 also calculates an ending CCL rate, which is needed as input to balanced 50/50 chart.
 Chart BFX1 calculates the balanced 50/50 X, given beginning CL/MOU rate, the ending CCL rate from Chart PLX1, and the SLCs from Chart PLX1.

TREND LINE ESTIMATES

| TREND | Annualization Factors | CL/MOU | TS/MOU | Tot SW/MOU | CL MOU/Line | CL Rev | CL MOU | Sub Lines | TS Rev | TS MOU |
|-------|-----------------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 19 | 1.0000 | \$0.034924 | \$0.027977 | \$0.082909 | \$1.883517 | \$7,407,332 | 212,098,552 | 112,807,890 | \$5,875,125 | 202,850,880 |
| 32 | 1.0833 | \$0.033277 | \$0.027548 | \$0.080855 | \$1.899699 | \$7,717,084 | 231,903,265 | 116,553,865 | \$6,210,548 | 225,461,548 |
| 50 | 1.5000 | \$0.031124 | \$0.028980 | \$0.058122 | \$2.148598 | \$8,187,468 | 282,414,197 | 122,248,868 | \$7,038,287 | 280,987,808 |
| 63.5 | 1.1250 | \$0.029802 | \$0.028529 | \$0.058153 | \$2.272381 | \$8,522,424 | 287,903,986 | 128,898,158 | \$7,728,874 | 291,280,121 |
| 80 | 1.3750 | \$0.027841 | \$0.028012 | \$0.053837 | \$2.438124 | \$8,977,275 | 322,444,300 | 132,359,585 | \$8,883,827 | 333,088,180 |

ACTUALS

| TREND | Unadjusted CL Rev | Unadjusted SLC Rev | Actual Lines | SLCs |
|-------|-------------------|--------------------|--------------|--------|
| 19 | \$7,141,822 | \$2,484,658 | 113,318,244 | \$1.83 |
| 32 | \$8,049,472 | \$3,646,949 | 118,083,882 | \$2.62 |
| 50 | \$8,220,317 | \$4,583,679 | 121,854,374 | \$3.13 |
| 63.5 | \$8,528,394 | \$5,878,820 | 128,432,081 | \$3.74 |
| 80 | \$8,883,314 | \$6,089,004 | 133,009,705 | \$3.80 |

Calculation of Annual Change in GNPPI

| | GNPPI | Change in GNPPI | Estimated GNP-PI | |
|-------|-------|-----------------|------------------|--------|
| 4Q/83 | 227.6 | | | |
| 4Q/84 | 237.1 | 0.0417 | | |
| 6.5 | 110 | | 109.3 | |
| 18.5 | 113.8 | 0.0345 | 113.3 | 0.0361 |
| 24.5 | 114.7 | | 115.3 | |
| 36.5 | 118.6 | 0.0340 | 119.5 | 0.0361 |
| 39.5 | 119.7 | | 120.5 | |
| 51.5 | 124.9 | 0.0434 | 124.9 | 0.0361 |
| 54.5 | 128.2 | | 128.0 | |
| 66.5 | 131.4 | 0.0412 | 130.5 | 0.0361 |

ANNUAL FACTORS

| PERIOD | Change in GNPPI | g-factor |
|--------|-----------------|----------|
| 2 | 3.8121% | 5.1912% |
| 3 | 3.8121% | 5.1912% |
| 4 | 3.8121% | 5.1912% |
| 5 | 3.8121% | 5.1912% |
| 6 | 3.8121% | 5.1912% |

CHART PLX1

| | |
|-----------------------------------|-----------|
| 1 CL X-FACTOR | 3.0% |
| 2 Beginning CLMOU rate from trend | \$0.03492 |
| 3 Ending CLMOU Rate from trend | \$0.02784 |
| 4 Ending CLMOU Rate for Chosen X | \$0.02784 |
| 5 Delta for Ending CLMOU | \$0.00000 |
| 6 % Delta | 0.00% |

| | |
|---------------------------------|---------|
| 7 | |
| 8 PARAMETERS | |
| 9 Growth in CLMOU | 8.5893% |
| 10 Growth in Subscriber Lines | 3.2303% |
| 11 Growth in MOU/Line: g-factor | 5.1912% |

12
13 CALCULATIONS

| 14 | Period 2 | Period 3 | Period 4 | Period 5 | Period 6 |
|--|-------------|-------------|------------|--------------|-------------|
| 15 | 6/85 - 5/86 | 7/86 - 6/87 | 1988 | 4/89 - 12/89 | 7/90 - 6/91 |
| 16 Step 1: Factors | | | | | |
| 17 GNP-PI percent change | 3.6% | 3.6% | 3.6% | 3.6% | 3.6% |
| 18 CL X-Factor | 3.0% | 3.0% | 3.0% | 3.0% | 3.0% |
| 19 g-factor | 5.19% | 5.19% | 5.19% | 5.19% | 5.19% |
| 20 Annualization Factor | 1.000 | 1.083 | 1.500 | 1.125 | 1.375 |
| 21 Step 2: Calculating CLMOU(t) from PCI | | | | | |
| 22 CLMOU (t-1) | NA | \$0.034924 | \$0.033277 | \$0.031124 | \$0.029602 |
| 23 PCI (t-1) | NA | 100.00 | 95.28 | 89.12 | 84.76 |
| 24 1 + % Change in PCI | NA | 95.28% | 93.53% | 95.11% | 94.05% |
| 25 PCI (t) | 100.00 | 95.28 | 89.12 | 84.76 | 79.72 |
| 26 CLMOU (t) | \$0.034924 | \$0.033277 | \$0.031124 | \$0.029602 | \$0.027841 |
| 27 Step 3: Calc of SLCMOU(t) | | | | | |
| 28 Monthly SLC | \$1.83 | \$2.62 | \$3.13 | \$3.74 | \$3.80 |
| 29 CLMOU per line per month | 157.0 | 165.8 | 178.9 | 189.4 | 203.0 |
| 30 Lagged CLMOU/line/month * (1+g) | 157.0 | 165.8 | 178.9 | 189.4 | 203.0 |
| 31 SLCMOU(t) | \$0.011841 | \$0.015793 | \$0.017476 | \$0.019759 | \$0.018730 |
| 32 Step 4: Calc CCL Rate | \$0.023293 | \$0.017485 | \$0.013649 | \$0.009843 | \$0.009111 |

33
34
35 CHART TS

| | |
|------------------------------------|------------|
| 36 | |
| 37 TS X-FACTOR | 5.0% |
| 38 Beginning TSMOU rate from trend | \$0.027977 |
| 39 Ending TSMOU Rate from trend | \$0.026012 |
| 40 Ending TSMOU Rate for Chosen X | \$0.026012 |
| 41 Delta for Ending TSMOU | \$0.000000 |
| 42 % Delta | 0.00% |

| 44 | Period 2 | Period 3 | Period 4 | Period 5 | Period 6 |
|-----------------------------|-------------|-------------|------------|--------------|-------------|
| 45 CALCULATIONS | 6/85 - 5/86 | 7/86 - 6/87 | 1988 | 4/89 - 12/89 | 7/90 - 6/91 |
| 46 | | | | | |
| 47 Step 1: Factors | | | | | |
| 48 Annualization Factor | 1.000 | 1.083 | 1.500 | 1.125 | 1.375 |
| 49 GNP-PI Percentage Change | 3.6% | 3.6% | 3.6% | 3.6% | 3.6% |
| 50 TS X-Factor | 5.0% | 5.0% | 5.0% | 5.0% | 5.0% |
| 51 Step 2: Calculate TSMOU | | | | | |
| 52 TSMOU (t-1) | NA | \$0.027977 | \$0.027546 | \$0.026960 | \$0.026529 |
| 53 PCI (t-1) | NA | 100.00 | 98.46 | 96.37 | 94.83 |
| 54 1 + % Change in PCI | NA | 98.460% | 97.874% | 96.401% | 96.049% |
| 55 PCI (t) | 100.00 | 98.46 | 96.37 | 94.83 | 92.98 |
| 56 TSMOU (t) | \$0.027977 | \$0.027546 | \$0.026960 | \$0.026529 | \$0.026012 |

CHART BFX1

| | |
|------------------------------------|-----------|
| 1 CL X-Factor | 5.0% |
| 2 Beginning CL/MOU rate from trend | \$0.03492 |
| 3 Ending CCL/MOU Rate from PLX1 | \$0.00911 |
| 4 Ending CCL/MOU rate for chosen X | \$0.00911 |
| 5 Delta for Ending CL/MOU | \$0.00000 |
| 6 % Delta | 0.00% |

| | |
|---------------------------------|---------|
| 8 PARAMETERS | |
| 9 Growth In CL MOU | 8.5893% |
| 10 Growth In Subscriber Lines | 3.2303% |
| 11 Growth In MOU/Line: g-factor | 5.1912% |

13 CALCULATIONS

| 14 | Period 2 | Period 3 | Period 4 | Period 5 | Period 6 |
|---|-------------|-------------|------------|--------------|-------------|
| 15 | 6/85 - 5/86 | 7/86 - 6/87 | 1988 | 4/89 - 12/89 | 7/90 - 6/91 |
| 16 Step 1: Factors | | | | | |
| 17 GNP-PI percent change | 3.6% | 3.6% | 3.6% | 3.6% | 3.6% |
| 18 CL X-Factor | 5.0% | 5.0% | 5.0% | 5.0% | 5.0% |
| 19 g-factor | 5.19% | 5.19% | 5.19% | 5.19% | 5.19% |
| 20 Annualization Factor | 1.000 | 1.083 | 1.500 | 1.125 | 1.375 |
| 21 Step 2: Calculating CL/MOU(t) from PCI | | | | | |
| 22 CL/MOU (t-1) | NA | \$0.034924 | \$0.033442 | \$0.031494 | \$0.030108 |
| 23 PCI (t-1) | NA | 100.00 | 95.76 | 90.18 | 86.21 |
| 24 1 + % Change in PCI | NA | 95.76% | 94.17% | 95.60% | 94.85% |
| 25 PCI (t) | 100.00 | 95.76 | 90.18 | 86.21 | 81.59 |
| 26 CL/MOU (t) | \$0.034924 | \$0.033442 | \$0.031494 | \$0.030108 | \$0.028496 |
| 27 Step 3: Calc of SLC/MOU(t) | | | | | |
| 28 Monthly SLC | \$1.83 | \$2.62 | \$3.13 | \$3.74 | \$3.80 |
| 29 CL MOU per line per month | 157.0 | 165.8 | 178.9 | 189.4 | 203.0 |
| 30 Lagged CL MOU/line/month * (1+g/2) | 157.0 | 161.4 | 172.3 | 184.1 | 196.2 |
| 31 SLC/MOU(t) | \$0.011641 | \$0.016226 | \$0.018143 | \$0.020322 | \$0.019384 |
| 32 Step 4: Calc CCL Rate | \$0.023283 | \$0.017217 | \$0.013351 | \$0.009766 | \$0.009111 |

35 CHART TS

| | |
|-------------------------------------|------------|
| 37 TS X-FACTOR | 5.0% |
| 38 Beginning TS/MOU rate from trend | \$0.027977 |
| 39 Ending TS/MOU Rate from trend | \$0.026012 |
| 40 Ending TS/MOU Rate for Chosen X | \$0.026012 |
| 41 Delta for Ending TS/MOU | \$0.000000 |
| 42 % Delta | 0.00% |

45 CALCULATIONS

| 46 | Period 2 | Period 3 | Period 4 | Period 5 | Period 6 |
|-----------------------------|-------------|-------------|------------|--------------|-------------|
| 47 | 6/85 - 5/86 | 7/86 - 6/87 | 1988 | 4/89 - 12/89 | 7/90 - 6/91 |
| 48 Annualization Factor | 1.000 | 1.083 | 1.500 | 1.125 | 1.375 |
| 49 GNP-PI Percentage Change | 3.6% | 3.6% | 3.6% | 3.6% | 3.6% |
| 50 TS X-Factor | 5.0% | 5.0% | 5.0% | 5.0% | 5.0% |
| 51 Step 2: Calculate TS/MOU | | | | | |
| 52 TS/MOU (t-1) | NA | \$0.027977 | \$0.027546 | \$0.026960 | \$0.026529 |
| 53 PCI (t-1) | NA | 100.00 | 98.46 | 96.37 | 94.83 |
| 54 1 + % Change in PCI | NA | 98.460% | 97.874% | 98.401% | 98.049% |
| 55 PCI (t) | 100.00 | 98.46 | 96.37 | 94.83 | 92.98 |
| 56 TS/MOU (t) | \$0.027977 | \$0.027546 | \$0.026960 | \$0.026529 | \$0.026012 |

Balinfaris-Urweley
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 March 29, 1995

CALCULATION OF "TREND" VARIABLE for middle of each excess period:

| | | | |
|----------|------|------|------------|
| 1 Jan 1 | 1984 | | |
| 2 Feb 1 | 1984 | | |
| 3 Mar 1 | 1984 | | |
| 4 Apr 1 | 1984 | | |
| 5 May 1 | 1984 | | |
| 6 June 1 | 1984 | 1 | |
| 7 July 1 | 1984 | 2 | 1 |
| 8 Aug 1 | 1984 | 3 | 2 |
| 9 Sep 1 | 1984 | 4 | 3 |
| 10 Oct 1 | 1984 | 5 | 4 |
| 11 Nov 1 | 1984 | 6 | 5 |
| 12 Dec 1 | 1984 | 7 | end of 6 |
| 1 Jan 1 | 1985 | 8 | |
| 2 Feb 1 | 1985 | 9 | |
| 3 Mar 1 | 1985 | 10 | |
| 4 Apr 1 | 1985 | 11 | |
| 5 May 1 | 1985 | 12 | |
| 6 June 1 | 1985 | 13 | |
| 7 July 1 | 1985 | 14 | 1 |
| 8 Aug 1 | 1985 | 15 | 2 |
| 9 Sep 1 | 1985 | 16 | 3 |
| 10 Oct 1 | 1985 | 17 | 4 |
| 11 Nov 1 | 1985 | 18 | 5 |
| 12 Dec 1 | 1985 | 19 | end of 6 |
| 1 Jan 1 | 1986 | 20 | |
| 2 Feb 1 | 1986 | 21 | |
| 3 Mar 1 | 1986 | 22 | |
| 4 Apr 1 | 1986 | 23 | |
| 5 May 1 | 1986 | 24 | |
| 6 June 1 | 1986 | 25 | |
| 7 July 1 | 1986 | 26 | |
| 8 Aug 1 | 1986 | 27 | 1 |
| 9 Sep 1 | 1986 | 28 | 2 |
| 10 Oct 1 | 1986 | 29 | 3 |
| 11 Nov 1 | 1986 | 30 | 4 |
| 12 Dec 1 | 1986 | 31 | 5 |
| 1 Jan 1 | 1987 | 32 | end of 6 |
| 2 Feb 1 | 1987 | 33 | |
| 3 Mar 1 | 1987 | 34 | |
| 4 Apr 1 | 1987 | 35 | |
| 5 May 1 | 1987 | 36 | |
| 6 June 1 | 1987 | 37 | |
| 7 July 1 | 1987 | 38 | |
| 8 Aug 1 | 1987 | 39 | |
| 9 Sep 1 | 1987 | 40 | |
| 10 Oct 1 | 1987 | 41 | |
| 11 Nov 1 | 1987 | 42 | |
| 12 Dec 1 | 1987 | 43 | |
| 1 Jan 1 | 1988 | 44 | |
| 2 Feb 1 | 1988 | 45 | 1 |
| 3 Mar 1 | 1988 | 46 | 2 |
| 4 Apr 1 | 1988 | 47 | 3 |
| 5 May 1 | 1988 | 48 | 4 |
| 6 June 1 | 1988 | 49 | 5 |
| 7 July 1 | 1988 | 50 | end of 6 |
| 8 Aug 1 | 1988 | 51 | |
| 9 Sep 1 | 1988 | 52 | |
| 10 Oct 1 | 1988 | 53 | |
| 11 Nov 1 | 1988 | 54 | |
| 12 Dec 1 | 1988 | 55 | |
| 1 Jan 1 | 1989 | 56 | |
| 2 Feb 1 | 1989 | 57 | |
| 3 Mar 1 | 1989 | 58 | |
| 4 Apr 1 | 1989 | 59 | |
| 5 May 1 | 1989 | 60 | 1 |
| 6 June 1 | 1989 | 61 | 2 |
| 7 July 1 | 1989 | 62 | 3 |
| 8 Aug 1 | 1989 | 63 | 4 |
| 9 Sep 1 | 1989 | 63.5 | end of 4.5 |
| 10 Oct 1 | 1989 | 64 | |
| 11 Nov 1 | 1989 | 65 | |
| 12 Dec 1 | 1989 | 66 | |
| 1 Jan 1 | 1990 | 67 | |
| 2 Feb 1 | 1990 | 68 | |
| 3 Mar 1 | 1990 | 69 | |
| 4 Apr 1 | 1990 | 70 | |
| 5 May 1 | 1990 | 71 | |
| 6 June 1 | 1990 | 72 | |
| 7 July 1 | 1990 | 73 | |
| 8 Aug 1 | 1990 | 74 | |
| 9 Sep 1 | 1990 | 75 | 1 |
| 10 Oct 1 | 1990 | 76 | 2 |
| 11 Nov 1 | 1990 | 77 | 3 |
| 12 Dec 1 | 1990 | 78 | 4 |
| 1 Jan 1 | 1991 | 79 | 5 |
| 2 Feb 1 | 1991 | 80 | end of 6 |
| 3 Mar 1 | 1991 | 81 | |
| 4 Apr 1 | 1991 | 82 | |
| 5 May 1 | 1991 | 83 | |
| 6 June 1 | 1991 | 84 | |
| 7 July 1 | 1991 | 85 | |
| 8 Aug 1 | 1991 | 86 | |
| 9 Sep 1 | 1991 | 87 | |
| 10 Oct 1 | 1991 | 88 | |
| 11 Nov 1 | 1991 | 89 | |
| 12 Dec 1 | 1991 | 90 | |
| | | 91 | |

REGRESSION TREND FOR Tot CL MOU/LINE EXCLUDING FIRST DATA POINT

| Intercept Dummy | TREND | Tot CL MOU/Ln | Ln(CL MOU/Ln) | Estimated Ln(CL MOU/Ln) | Estimated CL MOU/Line | Regression Output: | |
|-----------------|-------|---------------|---------------|-------------------------|-----------------------|---------------------|-------------|
| 1 | 19 | 1.90037259 | 0.64204997 | 0.63314102 | 1.883517 | Constant | 0 |
| 1 | 32 | 1.83536727 | 0.66029711 | 0.66796842 | 1.969669 | Std Err of Y Est | 0.02307249 |
| 1 | 50 | 2.18507447 | 0.78164991 | 0.76388329 | 2.146596 | R Squared | 0.96336797 |
| 1 | 63.5 | 2.30730170 | 0.83607875 | 0.82081944 | 2.272361 | No. of Observations | 5 |
| 1 | 80 | 2.40162236 | 0.87614449 | 0.86040806 | 2.436124 | Degree of Freedom | 3 |
| | | | | | | X Coefficient(s) | 0.55300867 |
| | | | | | | Std Err of Coef. | 0.02540614 |
| | | | | | | t-value | 21.76501857 |
| | | | | | | Annual growth rate | 5.18% |

NOTES:

This data agrees with Chart REG and Chart TREND in LEC Price Cap Order.
 Constant toggle in LOTUS is set to zero in order to force LOTUS to compute constant as coefficient of dummy variable. Otherwise, LOTUS will not output standard error associated with constant.

SOURCES:

Chart RATE and Chart DATA in LEC Price Cap Order

REGRESSION TREND FOR CL REV EXCLUDING FIRST DATA POINT

| Intercept Dummy | TREND | CL Rev (\$000) | Ln(CL Rev) | Estimated Ln(CL Rev) | Estimated CL Rev | Regression Output: | |
|-----------------|-------|----------------|------------|----------------------|------------------|---------------------|--------------|
| 1 | 19 | \$7,141,522 | 15.7814 | 15.8180 | \$7,407,332 | Constant | 0 |
| 1 | 32 | \$8,049,472 | 15.9011 | 15.8589 | \$7,717,084 | Std Err of Y Est | 0.03326213 |
| 1 | 50 | \$8,220,317 | 15.9221 | 15.9157 | \$8,167,468 | R Squared | 0.87599852 |
| 1 | 63.5 | \$8,526,394 | 15.9589 | 15.9582 | \$8,522,424 | No. of Observations | 5 |
| 1 | 80 | \$8,663,314 | 15.9974 | 16.0102 | \$8,977,275 | Degree of Freedom | 3 |
| | | | | | | X Coefficient(s) | 15.75810716 |
| | | | | | | Std Err of Coef. | 0.03662926 |
| | | | | | | t-value | 430.20518202 |
| | | | | | | Annual growth rate | 4.80361383 |

REGRESSION TREND FOR CL MOU EXCLUDING FIRST DATA POINT

| Intercept Dummy | TREND | CL MOU (000 MOU) | Ln(CL MOU) | Estimated Ln(CL MOU) | Estimated CL MOU | Regression Output: | |
|-----------------|-------|------------------|------------|----------------------|------------------|---------------------|--------------|
| 1 | 19 | 215,343,084 | 19.1877 | 19.1726 | 212,096,552 | Constant | 0 |
| 1 | 32 | 224,625,813 | 19.2299 | 19.2618 | 231,903,285 | Std Err of Y Est | 0.023625872 |
| 1 | 50 | 265,823,867 | 19.3983 | 19.3854 | 282,414,197 | R Squared | 0.985182916 |
| 1 | 63.5 | 291,716,955 | 19.4913 | 19.4781 | 287,903,966 | No. of Observations | 5 |
| 1 | 80 | 319,439,082 | 19.5821 | 19.5914 | 322,444,300 | Degree of Freedom | 3 |
| | | | | | | X Coefficient(s) | 19.042090968 |
| | | | | | | Std Err of Coef. | 0.0260175415 |
| | | | | | | t-value | 731.89432600 |
| | | | | | | Annual growth rate | 14.12334890 |

REGRESSION TREND FOR LINES EXCLUDING FIRST DATA POINT

| Intercept Dummy | TREND | Lines | Ln(Lines) | Estimated Ln(Lines) | Estimated Lines | Regression Output: | |
|-----------------|-------|-------------|-----------|---------------------|-----------------|---------------------|---------------|
| 1 | 19 | 113,316,244 | 18.5457 | 18.5394 | 112,607,690 | Constant | 0 |
| 1 | 32 | 116,083,682 | 18.5696 | 18.5739 | 119,553,685 | Std Err of Y Est | 0.006030783 |
| 1 | 50 | 121,654,374 | 18.6187 | 18.6216 | 122,246,668 | R Squared | 0.993459712 |
| 1 | 63.5 | 126,432,081 | 18.6552 | 18.6573 | 126,698,156 | No. of Observations | 5 |
| 1 | 80 | 133,009,705 | 18.7059 | 18.7010 | 132,359,585 | Degree of Freedom | 3 |
| | | | | | | X Coefficient(s) | 18.489082302 |
| | | | | | | Std Err of Coef. | 0.0066412855 |
| | | | | | | t-value | 2783.96136004 |
| | | | | | | Annual growth rate | 21.34702327 |

REGRESSION TREND FOR TS REV EXCLUDING FIRST DATA POINT

| Intercept Dummy | TREND | TS Rev | Ln TS Rev | Estimated Ln TS Rev | Estimated TS Rev | Regression Output: | | |
|-----------------|-------|-------------|-------------|---------------------|------------------|--------------------------|--------------|-------------|
| 1 | 19 | \$5,804,770 | 15.53913018 | 15.55180321 | \$5,875,125 | Constant | | 0 |
| 1 | 32 | \$6,129,746 | 15.62866387 | 15.64175944 | \$6,210,546 | Std Err of Y Est | | 0.03470018 |
| 1 | 50 | \$7,229,553 | 15.79368777 | 15.76659115 | \$7,036,287 | R Squared | | 0.989171817 |
| 1 | 63.5 | \$8,001,639 | 15.89515695 | 15.89021492 | \$7,726,874 | No. of Observations | | 5 |
| 1 | 80 | \$8,353,356 | 15.93817393 | 15.97484398 | \$8,663,627 | Degrees of Freedom | | 3 |
| | | | | | | X Coefficient(s) | 15.419836415 | 0.006935095 |
| | | | | | | Std Err of Coef. | 0.0382129126 | 0.00071411 |
| | | | | | | t-value | 403.52423689 | 9.711516473 |
| | | | | | | Inst. annual growth rate | | 8.6470% |

REGRESSION TREND FOR TS MOU EXCLUDING FIRST DATA POINT

| Intercept Dummy | TREND | TSMOU | Ln TSMOU | Estimated Ln TSMOU | Estimated TSMOU | Regression Output: | | |
|-----------------|-------|-------------|-------------|--------------------|-----------------|--------------------------|--------------|-------------|
| 1 | 19 | 201,188,517 | 19.11975292 | 19.12798169 | 202,850,880 | Constant | | 0 |
| 1 | 32 | 225,136,070 | 19.23221553 | 19.23398018 | 225,461,548 | Std Err of Y Est | | 0.01458883 |
| 1 | 50 | 263,972,545 | 19.39135588 | 19.37998428 | 260,987,809 | R Squared | | 0.995924809 |
| 1 | 63.5 | 295,351,330 | 19.50367615 | 19.48972731 | 291,260,121 | No. of Observations | | 5 |
| 1 | 80 | 327,897,259 | 19.60621088 | 19.62385771 | 333,068,180 | Degrees of Freedom | | 3 |
| | | | | | | X Coefficient(s) | 18.9735285 | 0.008129115 |
| | | | | | | Std Err of Coef. | 0.0160656713 | 0.00030023 |
| | | | | | | t-value | 1180.9981784 | 27.07629267 |
| | | | | | | Inst. annual growth rate | | 10.2031% |

REGRESSION TREND FOR GNP-PI EXCLUDING FIRST DATA POINT

| Intercept Dummy | TREND | GNP-PI | Ln GNP-PI | Estimated Ln GNP-PI | Estimated GNP-PI | Regression Output: | | |
|-----------------|-------|--------|------------|---------------------|------------------|---------------------|--------------|-------------|
| 1 | 6.5 | 110 | 4.70048037 | 4.69427343 | 109.3 | Constant | | 0 |
| 1 | 18.5 | 113.8 | 4.73444252 | 4.72975772 | 113.3 | Std Err of Y Est | | 0.008223489 |
| 1 | 24.5 | 114.7 | 4.74232002 | 4.74749987 | 115.3 | R Squared | | 0.99066843 |
| 1 | 36.5 | 118.6 | 4.77575649 | 4.78298417 | 119.5 | No. of Observations | | 6 |
| 1 | 39.5 | 119.7 | 4.78498861 | 4.79185524 | 120.5 | Degrees of Freedom | | 6 |
| 1 | 51.5 | 124.9 | 4.82751342 | 4.82733954 | 124.9 | X Coefficient(s) | 4.6750527685 | 0.002957025 |
| 1 | 54.5 | 126.2 | 4.83796795 | 4.83621061 | 126.0 | Std Err of Coef. | 0.0048876301 | 0.000117164 |
| 1 | 66.5 | 131.4 | 4.87824611 | 4.87199491 | 130.5 | | | |

TREND LINE ESTIMATES

| TREND | CLMOU | TSMOU | Tot SW/MOU | CLMOU/Line | CL Rev | CLMOU | Sub Lines | TS Rev | TSMOU |
|-------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| 19 | \$0.034924 | \$0.027977 | \$0.062909 | 1.863517 | \$7,407,332 | 212,098,552 | 112,807,890 | \$5,875,125 | 202,850,880 |
| 32 | \$0.033277 | \$0.027546 | \$0.060655 | 1.989699 | \$7,717,084 | 231,903,295 | 116,553,895 | \$6,210,546 | 225,461,548 |
| 50 | \$0.031124 | \$0.026960 | \$0.058122 | 2.146596 | \$8,167,468 | 262,414,197 | 122,246,688 | \$7,036,287 | 260,987,809 |
| 63.5 | \$0.029602 | \$0.026529 | \$0.056153 | 2.272381 | \$8,522,424 | 287,903,968 | 126,998,156 | \$7,726,874 | 291,260,121 |
| 80 | \$0.027841 | \$0.026012 | \$0.053837 | 2.436124 | \$8,977,275 | 322,444,300 | 132,359,585 | \$8,663,627 | 333,068,180 |

APPENDIX E

EVALUATION OF THE USTA UPDATE OF THE FRENTRUP-URETSKY STUDY

by Alexander Belinfante¹

I. INTRODUCTION AND BACKGROUND

As part of the Order establishing price caps for the LECs,² the Commission relied upon a short-run study (Frentrup-Uretsky study) of switched access productivity for the local exchange carriers.³ As part of the record in this proceeding, USTA filed an update of that study.⁴ This update restates the historical data used in the original study, and replaces the last data point, which consisted of projected data for 1990/91, with three new data points for 1990, 1991, and 1992. The update purports to show that the unitary balanced 50/50 X-Factor, which was estimated as 3.5% in the original study, declined to 2.7% over the extended period.

This appendix evaluates that update and compares the estimation techniques used with those of our own revised version of the Frentrup-Uretsky study.⁵ Our analysis shows that the USTA study contains several flaws and discrepancies from the methodology used in our study. If the methodology used in the revised version of our study is used with the USTA data, the estimated unitary balanced 50/50 X-Factor is 3.3%, not 2.7%. This compares with our revised estimate of 3.4% based on the original data set, including the 1984/85 data point, indicating that there has been at best a very small change in the X-Factor as a result of the additional data. We have not, however, examined the accuracy of USTA's newly provided 1990-92 data or its restatement of the 1984-89 data.

The table in Attachment A summarizes the X-Factors from the USTA study as compared with our revised estimates of the X-Factors using both the USTA data set and the

1 Mr. Belinfante is Senior Economist, Common Carrier Bureau, Federal Communications Commission.

2 Policy and Rules Concerning Rates for Dominant Carriers, CC Docket No. 87-313, 5 FCC Rcd 6786 (Second Report and Order).

3 Appendix C, "A Study of Local Exchange Carrier Post-Divestiture Switched Access Productivity," by J. Christopher Frentrup and Mark I. Uretsky, 5 FCC Rcd 6885. This is referred to hereafter as the Frentrup-Uretsky study.

4 National Economic Research Associates, Inc., "An Update of the FCC Short-Term Productivity Study for Local Exchange Carriers: 1984-1992", prepared for United States Telephone Association, September 1994.

5 See Appendix D. That appendix discusses the reasons for some changes in methodologies between the Frentrup-Uretsky study and our revised study.

original Frentrup-Uretsky data set for various time periods. The top part of the table shows estimates using various methodologies with the full USTA data set. It shows that most of the differences between their estimate and ours are due to six differences in methodology. Each column adjusts for one more of the six differences in methodology than the preceding column. The column labeled "Fully Corrected" uses the same methodology as our revised study. The bottom part of the table shows the impact of the period selected for analysis as well as the differences in the data sets. Attachment B contains the spreadsheet provided to us by USTA, modified to reflect the calculations required by the methodology of our revised study.

II. METHODOLOGICAL DIFFERENCES

The most significant difference is in the calculation of the common line minutes of use per line growth factor, which is the "g-factor" in the common line PCI formula. The original Frentrup-Uretsky study and our update of that study both use adjusted minutes to calculate g. (The adjustments are for the impacts of exogenous changes.) On the other hand, the USTA study calculates the g factor based on unadjusted minutes. Consequently, the g-factor estimated in the USTA study is 6.19%, as compared to 4.04% using the adjusted minutes. Using unadjusted minutes instead of adjusted minutes has the effect of reducing the common line balanced 50/50 X-Factor by more than 1% and the common line per line X-Factor by over 2%. If the adjusted minutes are used, the unitary balanced 50/50 X-Factor becomes 3.3%, which is virtually the same as that derived using our methodology. This indicates that the combined effect of all of the other differences in methodology is small. Because the rates that are being used to determine the X-Factor are based on the adjusted minutes, it is appropriate to use those adjusted minutes to determine the g-factor.

One difference between the USTA study and the Frentrup-Uretsky study is the use of a trend value of g in the USTA study versus individual annual g values that were used in the Frentrup-Uretsky study. In our revised study, we also used a trend value for g. However, we used the exact formula $e^{12b}-1$, where b is the monthly regression slope of the natural logarithms on time, instead of the approximate formula $(1+b)^{12}-1$ used in the USTA study.⁶ This is the smallest discrepancy between the two studies. This approximation has a negligible effect on the X-Factor.⁷

6 Use of the exact formula is equivalent to calculating the percentage change of two points of the trended variable that are spaced exactly one year apart.

7 Carried out to a second decimal place the effect is 0.01%. However, use of the trend value for g, used in both the USTA study and our revised study, does cause the X-Factor to be somewhat lower than the estimate from the Frentrup-Uretsky study, which uses individual annual values for g.

Another computational discrepancy is the failure of the USTA study to use annualization factors to account for the differences in the time spacing between the periods used in the studies. These factors are used in both the original Frentrup-Uretsky study and in our revised study. Correcting this omission slightly increases the traffic sensitive X-Factor, decreases the common line X-Factor, and slightly decreases the unitary X.

Both the USTA study and our revised study use different estimates of the change in GNP-PI from those used in the Frentrup-Uretsky study. The Frentrup-Uretsky study used individual annual values for the change in GNP-PI. The USTA study uses the average value of the changes in GNP-PI observed for use in the 8 periods in the study. Our revised study instead computes a trend line of the GNP-PI values⁸ at the end points of the time intervals used to calculate the changes, and determines the average annual change in GNP-PI from the slope of the regression line. This has the advantage of taking into account the changes in GNP-PI in the intervals between the periods used in the study.⁹ Our revised method results in a somewhat lower estimate of X than would result from the methodology of either the USTA study or the Frentrup-Uretsky study.

The next difference between the USTA study and our revised study is that the common line X-Factor is calculated from the total CL rate in the USTA study, but it is calculated from the CCL rate in our revised study. This difference has no impact on the per line X-Factors, but it does affect the balanced 50-50 common line X-Factor. Our estimate is somewhat lower than what it would have been if USTA's methodology were used.

The final difference in methodologies is in the computation of the unitary X-Factors. The USTA study appears to follow the methodology of the Frentrup-Uretsky study of finding the X-Factor that would equate a weighted average of the percentage changes in the PCIs using the unitary X-Factor with a weighted average of the percentage changes in the PCIs using the individual X-Factors. Our revised approach is to choose a unitary X-Factor which will result in the same total revenue from both the common line and traffic sensitive baskets that would result from using the individual X-Factors. It thus has the advantage of being revenue neutral. Our revised approach has the effect of increasing the unitary X-Factors somewhat.

III. DATA SET AND TIME PERIOD DIFFERENCES

A comparison of the estimated X-Factors using our revised methodology with the USTA data set for 1984-92 and the original Frentrup-Uretsky data set for 1984-91 shows that the USTA data set yields slightly lower estimated values for X. The source of this difference

⁸ For the earliest and latest periods, where GNP-PI is reported using a different base, the index values were converted to the base used for the remaining observations.

⁹ Our method has a slight disadvantage of not weighting all 8 periods in the study equally, because 3 of the end points of the periods coincide, resulting in 13 observations instead of 16.

was investigated by looking at the effect of using different time periods from the two data sets. The last year of the Frentrup-Uretsky study consisted of projected data for the 1990/91 tariff year. This was replaced by actual data for the calendar years 1990, 1991, and 1992 in the USTA study. By removing the data beginning in 1990 and concentrating on the period the two studies have in common, 1984-89, we can see the impact of USTA's revisions to the historical data. This removal results in the estimates from the Frentrup-Uretsky data going down slightly and the estimates from the USTA study going up slightly. The net effect is that the estimates from the USTA data set are slightly higher than those from the Frentrup-Uretsky data set for 1984-89.

A remaining question is the impact of the 1984/85 data point. As noted in Appendix D, removal of that data point results in a significant increase in the X-Factor as estimated from the Frentrup-Uretsky data set. Removal of that data point also results in a significant, but not quite as large, increase in the X-Factor as estimated from the USTA data set. Further evidence that the 1984/85 data point is an outlier can be seen in the charts in Attachment C, which show trend estimates of total adjusted switched access rates, using USTA's data, first including and then excluding the 1984/85 data point. The trend line is clearly a better fit when the 1984/84 data point is excluded.

Correcting X-Factors for USTA Update of FCC Short-Term Study

Including all years of USTA study (1984-92)

| | As Reported by USTA | Calculate g from Adjusted MOU | Correct Formula for g | Annualization Factors Used | Use Trend for GNP-PI | Base Common Line X on CCL | Fully Corrected Base Unitary X on Revenues |
|------------------------------|------------------------|----------------------------------|--------------------------|-------------------------------|-------------------------|------------------------------|--|
| Unitary Balanced 50/50 | 2.7% | 3.3% | 3.3% | 3.3% | 3.0% | 3.0% | 3.3% |
| Unitary Per Line | 1.6% | 2.7% | 2.7% | 2.7% | 2.4% | 2.4% | 2.3% |
| Common Line - Balanced 50/50 | 3.0% | 4.0% | 4.0% | 3.9% | 3.6% | 3.4% | 3.4% |
| Common Line - Per Line | -0.1% | 2.0% | 2.0% | 1.9% | 1.6% | 1.6% | 1.6% |
| Traffic Sensitive | 3.4% | 3.4% | 3.4% | 3.5% | 3.2% | 3.2% | 3.2% |

Different time periods and/or data using our revised methodology

| | Frentrup-Uretsky Data 1984-91 | Frentrup-Uretsky Data 1984-89 | USTA Data 1984-89 | USTA Data 1985-92 | Frentrup-Uretsky Data 1985-91 |
|------------------------------|----------------------------------|----------------------------------|----------------------|----------------------|----------------------------------|
| Unitary Balanced 50/50 | 3.4% | 3.3% | 3.4% | 4.6% | 5.0% |
| Unitary Per Line | 2.5% | 2.3% | 2.4% | 3.5% | 4.0% |
| Common Line - Balanced 50/50 | 3.5% | 3.3% | 3.4% | 4.3% | 5.0% |
| Common Line - Per Line | 1.6% | 1.4% | 1.5% | 2.5% | 3.0% |
| Traffic Sensitive | 3.4% | 3.2% | 3.3% | 5.0% | 5.0% |

WORKPAPERS

Belinfante
 c:\pc\pathue
 March 29, 1995

using total revenue to calculate unitary X's
 using ccl rate for common line X
 using annualization factors
 using trended gnppi
 using corrected formula for g
 using adjusted instead of unadj. CL minutes

g = 4.04% based on adj. CL minutes
 gnppi = 3.78%
 alpha (% slc) = 65.71% based on unadj. rev.

LEC 8 PERIOD ANALYSIS

INDIVX

| | CL | TS | | |
|----------------|---------------------------------------|--------------|---|----------------|
| Per Line X = | 1.6% | 3.2% | back-solve for 4 Xs based on fitted values from regressions | |
| Compromise X = | 3.4% | 3.2% | (formula cells = M37,M44,Q37) | |
| | | | (b23,b24,c23,c24) | |
| | CL PCI | % change CCL | % change TS | % change TotSw |
| Per Line | 98.22% | 2.24% | 0.58% | 0.68% |
| | difference in ending rate from target | | | |
| | 7.30098E-16 | -3.63886E-13 | | |
| UNITARYX | -3.62766E-13 | -3.63886E-13 | | |

weighted average of CCL and TS % changes based on unadj. rev.

Per Line X = 2.3% back-solve for X based on total revenues
 Compromise X = 3.3% back-solve for X based on total revenues

(formula cells = b49, c49)
 % change CCL % change TS % change TotSw

Compromise -0.68% 0.46% 0.16% weighted average of CCL and TS % changes
 -0.00518793

| | | | | | |
|-------------|------|---|--------------------------|------|---|
| -2.80688266 | 7 | 1 | 18.84356038 | 7 | 1 |
| -2.67211322 | 19 | 1 | 8 PERIOD 18.87110574 | 19 | 1 |
| -2.63703958 | 32 | 1 | TOTAL SW/MOU 18.92439838 | 32 | 1 |
| -2.71890020 | 50 | 1 | REGRESSION 19.08892351 | 50 | 1 |
| -2.74161328 | 63.5 | 1 | ----- 19.17276960 | 63.5 | 1 |
| -2.78584210 | 74 | 1 | 19.23756254 | 74 | 1 |
| -2.76115241 | 86 | 1 | 19.26786217 | 86 | 1 |
| -2.79317982 | 98 | 1 | 19.33420795 | 98 | 1 |

Regression Output:

Constant
Std Err of Y Est
R Squared
No. of Observations
Degrees of Freedom

X Coefficient(s) -0.0007
Std Err of Coef. 0.0007

0.0669
0.0625
-0.90%

0.0338328916
0.0124395468
0.0119518928

| | |
|--------|---------|
| indiv | unitary |
| 0.0244 | 0.0244 |
| 0.0245 | 0.0247 |
| 0.0247 | 0.0251 |
| 0.0249 | 0.0257 |
| 0.0250 | 0.0261 |
| 0.0252 | 0.0265 |
| 0.0253 | 0.0269 |
| 0.0255 | 0.0273 |
| 0.0245 | 0.0245 |
| 0.0247 | 0.0246 |
| 0.0249 | 0.0248 |
| 0.0250 | 0.0249 |
| 0.0252 | 0.0250 |
| 0.0253 | 0.0251 |
| 0.0255 | 0.0252 |

Regression Output:

0 Constant 0
0.0597 Std Err of Y Est 0.02784650
0.1624 R Squared 0.98182011
8 No. of Observations 8
6 Degrees of Freedom 6

X Coefficient(s) 0.0058335963 18.779357582
Std Err of Coef. 0.0003240712 0.019990966

149109688.26
253544528.42
7.23% 7.25%

| | | | | | | | |
|-------------|------|---|------------|------------|------|---|------------|
| 18.51567708 | 7 | 1 | | 0.32788330 | 7 | 1 | |
| 18.54569309 | 19 | 1 | 8 PERIOD | 0.32541266 | 19 | 1 | 8 PERIOD |
| 18.56964941 | 32 | 1 | LINES | 0.35474897 | 32 | 1 | ADJMOU/LNS |
| 18.61669458 | 50 | 1 | REGRESSION | 0.47222893 | 50 | 1 | REGRESSION |
| 18.64858065 | 63.5 | 1 | ----- | 0.52418895 | 63.5 | 1 | ----- |
| 18.69192902 | 74 | 1 | | 0.54563352 | 74 | 1 | |
| 18.71591324 | 86 | 1 | | 0.55194894 | 86 | 1 | |
| 18.74011062 | 98 | 1 | | 0.59409732 | 98 | 1 | |

Regression Output:

Constant
Std Err of Y Est
R Squared
No. of Observations
Degrees of Freedom

0.0025347664
0.0000737794
109582588.35
138012221.28
3.08%

0 Constant
0.00633965 Std Err of Y Est
0.99494241 R Squared
8 No. of Observations
6 Degrees of Freedom
18.494445689
0.0045512258
3.09%

Regression Output:

0
0.0268
0.9492
8
6
0.0033
0.2849
1.3607060256
1.84
4.03%
4.04%

X Coefficient(s)
Std Err of Coef.

X Coefficient(s)
Std Err of Coef.

| slc/mou (per line) | ccl rate (per line) | unitary ccl rate |
|--------------------|---------------------|------------------|
| \$0.0087 | \$0.0338 | \$0.0338 |
| \$0.0155 | \$0.0262 | \$0.0260 |
| \$0.0213 | \$0.0197 | \$0.0191 |
| \$0.0239 | \$0.0159 | \$0.0150 |
| \$0.0277 | \$0.0113 | \$0.0101 |
| \$0.0266 | \$0.0118 | \$0.0104 |
| \$0.0256 | \$0.0122 | \$0.0106 |
| \$0.0246 | \$0.0124 | \$0.0106 |
| \$0.0158 | \$0.0260 | \$0.0260 |
| \$0.0217 | \$0.0194 | \$0.0194 |
| \$0.0246 | \$0.0155 | \$0.0156 |
| \$0.0283 | \$0.0111 | \$0.0112 |
| \$0.0271 | \$0.0117 | \$0.0119 |
| \$0.0261 | \$0.0121 | \$0.0123 |
| \$0.0251 | \$0.0124 | \$0.0127 |

| trend cl mou/line | grow at g | grow at g/2 |
|-------------------|--------------|--------------|
| 1.3607060256 | 1.3607060256 | 1.3607060256 |
| 1.4156512324 | 1.4156512324 | 1.388178629 |
| 1.4776817116 | 1.4776817116 | 1.4466408952 |
| 1.5680822666 | 1.5680822666 | 1.5226583471 |
| 1.6394938889 | 1.6394938889 | 1.6037439106 |
| 1.6972771723 | 1.6972771723 | 1.6684212691 |
| 1.7658130966 | 1.7658130966 | 1.7315451344 |
| 1.8371164964 | 1.8371164964 | 1.8014647965 |

| | | |
|--------------|------|---|
| 18.983854765 | 7 | 1 |
| 19.014130002 | 19 | 1 |
| 19.056162757 | 32 | 1 |
| 19.176045827 | 50 | 1 |
| 19.228182476 | 63.5 | 1 |
| 19.261286722 | 74 | 1 |
| 19.278169324 | 86 | 1 |
| 19.333764956 | 98 | 1 |

8 PERIOD
TS MOU
REGRESSION

Regression Output:

| | | |
|---------------------|--|--------------|
| Constant | | 0 |
| Std Err of Y Est | | 0.0201637748 |
| R Squared | | 0.9800171722 |
| No. of Observations | | 8 |
| Degrees of Freedom | | 6 |

| | | |
|------------------|--------------|--------------|
| X Coefficient(s) | 0.0040253682 | 18.950337648 |
| Std Err of Coef. | 0.0002346614 | 0.0144755475 |

251970791.68

| end period | | |
|----------------|--------------|----------------|
| Revenues | per line | balanced 50/50 |
| Individual X's | | |
| SLC | \$6,247,576 | \$6,247,576 |
| CCL | \$3,153,979 | \$3,153,979 |
| CL | \$9,401,556 | \$9,401,556 |
| TS | \$6,413,771 | \$6,413,771 |
| total | \$15,815,326 | \$15,815,326 |
| Unitary X's | | |
| SLC | \$6,247,576 | \$6,247,576 |
| CCL | \$2,690,805 | \$3,212,527 |
| CL | \$8,938,382 | \$9,460,104 |
| TS | \$6,876,944 | \$6,355,223 |
| total | \$15,815,326 | \$15,815,326 |
| difference | \$0 | \$0 |

| slc rev/line | period | cl rate | ts rate | totsw rate | cl unadj mou | lines | cl unadj rev |
|--------------|--------|----------|----------|------------|--------------|-------------|--------------|
| \$0.0118 | 1 | \$0.0391 | \$0.0213 | \$0.0604 | 183,602,357 | 109,965,483 | \$10,172,842 |
| \$0.0219 | 2 | \$0.0429 | \$0.0262 | \$0.0691 | 199,946,832 | 113,316,244 | \$10,878,568 |
| \$0.0314 | 3 | \$0.0458 | \$0.0258 | \$0.0716 | 198,878,262 | 116,063,662 | \$10,213,735 |
| \$0.0375 | 4 | \$0.0397 | \$0.0263 | \$0.0659 | 244,467,327 | 121,654,374 | \$10,012,595 |
| \$0.0454 | 5 | \$0.0383 | \$0.0262 | \$0.0645 | 279,513,375 | 125,595,961 | \$9,807,040 |
| \$0.0452 | 6 | \$0.0366 | \$0.0251 | \$0.0617 | 305,839,946 | 131,160,067 | \$9,568,617 |
| \$0.0451 | 7 | \$0.0379 | \$0.0253 | \$0.0632 | 326,675,691 | 134,343,866 | \$9,395,161 |
| \$0.0453 | 8 | \$0.0376 | \$0.0236 | \$0.0612 | 349,305,191 | 137,634,286 | \$9,481,498 |
| | | -1.33% | 3.34% | | | | |
| | | -0.56% | -0.67% | | | | |

| Adj TS MOU | Adjst MOU | Adjst MOU/Lines | g | Cumulative Average |
|----------------------|-------------|-----------------|--------|--------------------|
| 175,623,800 Subtract | 152,635,057 | 1.3880 | | |
| 181,022,158 WATS DA | 156,897,886 | 1.3846 | -0.25% | |
| 188,793,193 | 165,486,202 | 1.4258 | 2.98% | 1.37% |
| 212,838,842 | 195,080,628 | 1.6036 | 12.47% | 5.07% |
| 224,229,912 | 212,142,675 | 1.6891 | 5.33% | 5.13% |
| 231,777,107 | 226,343,098 | 1.7257 | 2.17% | 4.54% 6 Period Avg |
| 235,723,325 | 233,306,168 | 1.7366 | 0.63% | 3.89% |
| 249,199,654 | 249,310,072 | 1.8114 | 4.30% | 3.95% 8 Period Avg |

| slc rev | ts unadj rev | gnp-pi | START QUARTER | END QUARTER | analysis period | data source period | mid-month |
|-------------|--------------|---------|---------------|-------------|------------------|--------------------|-----------|
| \$1,296,104 | \$5,461,496 | 4.0695% | 218.7 | 227.6 | 1 = 6/84 - 5/85 | 82/4 83/4 | 7 |
| \$2,484,658 | \$6,562,000 | 4.1740% | 227.6 | 237.1 | 2 = 6/85 - 5/86 | 83/4 84/4 | 19 |
| \$3,646,949 | \$7,102,456 | 3.4545% | 110 | 113.8 | 3 = 7/86 - 6/87 | 84/4 85/4 | 32 |
| \$4,563,679 | \$8,231,744 | 3.4002% | 114.7 | 118.6 | 4 = 1988 | 86/2 87/2 | 50 |
| \$5,703,289 | \$8,637,220 | 4.3442% | 119.7 | 124.9 | 5 = 4/89 - 12/89 | 87/3 88/3 | 63.5 |
| \$5,926,881 | \$8,492,946 | 4.8662% | 123.3 | 129.3 | 6 = 1990 | 88/2 89/2 | 74 |
| \$6,062,676 | \$8,609,845 | 4.8018% | 131.2 | 137.5 | 7 = 1991 | 89/4 90/4 | 86 |
| \$6,230,468 | \$9,054,015 | 3.3972% | 114.8 | 118.7 | 8 = 1992 | 90/4 91/4 | 98 |
| | | 4.0626% | | | | | |

| mid-month | change from previous period | annualization factor |
|-----------|-----------------------------|----------------------|
| 7 | | |
| 19 | 12 | 1 |
| 32 | 13 | 1.0833333333 |
| 50 | 18 | 1.5 |
| 63.5 | 13.5 | 1.125 |
| 74 | 10.5 | 0.875 |
| 86 | 12 | 1 |
| 98 | 12 | 1 |

| | | | | |
|-------|--------------|-------|---|------------|
| 101.5 | 4.6196993004 | -17.5 | 1 | |
| 105.6 | 4.659588075 | -5.5 | 1 | |
| 110.0 | 4.7004803658 | 6.5 | 1 | |
| 113.8 | 4.7344425217 | 18.5 | 1 | |
| 114.7 | 4.7423200241 | 24.5 | 1 | |
| 118.6 | 4.7757564866 | 36.5 | 1 | |
| 119.7 | 4.7849886126 | 39.5 | 1 | 13 PERIOD |
| 123.3 | 4.8146204102 | 48.5 | 1 | GNPPI |
| 124.9 | 4.8275134171 | 51.5 | 1 | REGRESSION |
| 129.3 | 4.8621352858 | 60.5 | 1 | ----- |
| 131.2 | 4.8767228765 | 66.5 | 1 | |
| 137.5 | 4.9236239171 | 78.5 | 1 | |
| 142.2 | 4.9570317348 | 90.5 | 1 | |

Regression Output:

| | | | |
|---------------------|--------------|--------------|------------|
| Constant | | | 0 |
| Std Err of Y Est | | | 0.00675619 |
| R Squared | | | 0.99581919 |
| No. of Observations | | | 13 |
| Degrees of Freedom | | | 11 |
| X Coefficient(s) | 0.0030885119 | 4.6722538337 | |
| Std Err of Coef. | 0.0000603383 | 0.002977354 | |
| | 109.27563122 | | |
| | 144.74 | | |
| | 3.77% | 3.78% | |