



Determination of Seasonal Adjustment Factors for Vehicle Class Counts



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Traffic Forecasting and Analysis Section
Office of Transportation Data and Analysis

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Seasonal adjustment factors are used to adjust short duration vehicle class counts to annual average daily volume (AADT). Prior to 2007 we were relying on factors developed in the 1980's. They were developed using the five weigh in motion (WIM) sites we had at that time. The factors were averaged from each of the five locations. This resulted in adjustment factors for each vehicle type by month for Monday through Friday 48 hour counts. In 2007, we revisited the adjustment factors based on 15 continuous classification counter (CCC) sites. In 2010, we updated the adjustment factors from 8 WIMs and 24 CCC sites.

Vehicle classification counts are typically taken for 48 hours weekdays (Monday-Friday) in the months from April-October. The volume is calculated for each of FHWA's fifteen vehicle types. The fifteen vehicle types are then grouped into Mn/DOT's eight vehicle categories for estimating equivalent single axle loads (ESALS). The eight vehicle categories need to be adjusted for the month of the year and the effects of weekend traffic. These adjustment factors are derived from CCC and WIM sites and can be applied to the raw counts in the MNESAL program. The factors, when multiplied times the raw counts, produce an estimate of AADT by vehicle type.

All the data from CCC and WIM sites for 365 days are used. Some CCC and WIM sites might not be operating for the entire year. In that case, the missing data is taken from the previous year.

- The 2007 analysis was done using the 2006 traffic volumes from the following CCC sites: 103, 172, 175, 179, 198, 199, 204, 213, 219, 220, 221, 225, 227, 353, and 388.
- The 2008 analysis was done using the 2007 traffic volumes from the following CCC sites: 103, 179, 197, 198, 199, 200, 204, 213, 219, 220, 221, 225, 353 and WIM sites 26 and 29.
- The 2009 analysis was done using the 2008 traffic volumes from the following CCC sites: 101,175, 179, 187, 191, 198, 199, 200, 204, 212, 213, 219, 220, 221, 225, 352, 353, 381, and 382.
- The 2010 analysis was done using the 2009 traffic volumes from the following CCC sites: 53, 54, 56, 57, 101, 175, 179, 187, 188, 191, 197, 198, 199, 200, 204, 208, 212, 213, 219, 220, 221, 223, 225, 227, 335, 341, 352, 353, 381, 382, 388 and WIM sites 27, 29, 31, 33, 34, 35, and 36. In 2010, the four CCC sites on the county system were added to the analysis. They are all in rural areas and will be used to produce county seasonal adjustment factors for each vehicle type.
- The most recent analysis using the 2010 traffic volumes from the following CCC sites: 101, 175, 179, 187, 191, 197, 198, 204, 208, 212, 213, 219, 220, 221, 223, 225, 335, 341, 352, 353, 381, 382, 388 and WIM sites 31, 33, 34, 35, 36, 37, 39, and 40.

Once the factors were produced, they were categorized into urban and rural areas. These factors were used to adjust the 24 hour counts to AADT. The evaluation of factors was done by comparing the 2007, 2008, 2009 factors with 2010 factors in different area types. After the evaluation was completed, the rural and urban factors were selected to be used in the MNESAL spreadsheet.

The 16 hour adjustment factors were used to adjust 16 hour counts to 24 hours for each of Mn/DOT's 8 vehicle types. These factors were developed from CCC sites from 1998 to 2008. The 16 hour traffic volume is the summation of each vehicle type counted from 6:00 AM to 10:00 PM. The 16 hour factors were obtained from the summation of 24 hour volumes by vehicle type divided by the 16 hour volume for each vehicle type. Once all the factors are produced, the 24 hour volume is obtained from the 16 hour counts multiplied by the seasonal factors for each vehicle type.

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The following table documents the production of 16 hour adjustment factors for each vehicle type

16 HOUR PERIOD	6AM-10PM	24 HOUR	Percent 16 of 24	Factor
CARS+PICKUP	19066481	20869944	91.36%	1.09
2ASU	665126	717022	92.76%	1.08
3+ASU	266453	286046	93.15%	1.07
3A Semi	70757	77490	91.31%	1.10
4A Semi	131406	143909	91.31%	1.10
5+A SEMI	842025	985345	85.45%	1.17
TT/BUS	198387	216505	91.63%	1.09
TWINS	37099	48151	77.05%	1.30

There is a command to choose from four groups of factors based on 16 hour urban, 16 hour rural, 24 hour urban, or 24 hour rural areas in the MNESAL spreadsheet. The traffic forecasting section in Mn/DOT's central office will notify the district traffic forecasters of the updated adjustment factors, and will explain how developing and improving the seasonal adjustment factors will improve the accuracy of traffic forecasts. As more data becomes available and a need develops for county road seasonal adjustment factors, they too will be produced.

In addition, the heavy commercial percentages occurring from Sunday to Saturday in rural and urban area are important to analyze. This can explain the peak heavy commercial percentage during the week. The table below tabulates the heavy commercial percentage for 7 days of the week in rural and urban area.

Heavy Commercial Percentage		
Day	Rural	Urban
Sunday	5.57%	4.28%
Monday	12.68%	9.71%
Tuesday	13.66%	10.08%
Wednesday	13.20%	9.61%
Thursday	12.59%	9.25%
Friday	9.95%	8.74%
Saturday	5.98%	4.89%

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The following tables show the 24 hour seasonal adjustment factors for MnDOT's eight vehicle type categories in urban and rural areas for the new MNESAL, 2007-2010 data and the previously used MNESAL factors.

2010 24 Hour Seasonal Adjustment Factors for Urban Areas in MNESAL												
Body Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CARS+PICKUP	1.08	1.04	1.04	0.97	0.97	0.96	0.91	0.90	0.93	0.88	0.97	1.00
2ASU	0.96	0.88	0.92	0.90	0.89	0.86	0.80	0.76	0.83	0.76	0.79	0.84
3+ASU	1.23	1.16	1.21	0.86	0.75	0.67	0.59	0.54	0.64	0.64	0.80	1.09
3A Semi	1.24	1.18	1.02	0.88	0.86	0.80	0.74	0.70	0.72	0.71	0.87	1.17
4A Semi	1.24	1.18	1.02	0.88	0.86	0.80	0.74	0.70	0.72	0.71	0.87	1.17
5+A SEMI	1.02	0.99	1.00	0.79	0.75	0.71	0.69	0.65	0.70	0.76	0.76	0.99
TT/BUS	1.51	1.31	1.19	1.03	0.92	0.82	0.76	0.71	0.74	0.77	0.94	1.07
TWINS	1.07	1.02	1.02	0.84	0.78	0.74	0.69	0.65	0.67	0.77	0.93	1.09

2010 24 Hour Seasonal Adjustment Factors for Rural Areas in MNESAL												
Body Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CARS+PICKUP	1.31	1.23	1.19	1.06	0.98	0.92	0.84	0.88	0.91	0.95	1.08	1.12
2ASU	1.02	0.93	0.96	0.89	0.85	0.87	0.83	0.83	0.76	0.77	0.88	1.00
3+ASU	1.24	1.17	1.12	0.89	0.76	0.71	0.70	0.66	0.65	0.64	0.86	1.09
3A Semi	1.25	1.15	1.11	0.97	0.84	0.77	0.72	0.72	0.72	0.83	1.07	1.25
4A Semi	1.25	1.15	1.11	0.97	0.84	0.77	0.72	0.72	0.72	0.83	1.07	1.25
5+A SEMI	0.93	0.86	0.87	0.82	0.79	0.79	0.82	0.78	0.80	0.73	0.87	0.90
TT/BUS	1.60	1.44	1.31	0.99	0.81	0.75	0.67	0.68	0.70	0.68	0.96	1.40
TWINS	0.95	0.86	0.92	0.86	0.86	0.75	0.80	0.76	0.75	0.70	0.82	0.76

2009 24 Hour Seasonal Adjustment Factors for Urban Areas in MNESAL												
Body Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CARS+PICKUP	1.11	1.07	1.05	0.99	0.95	0.95	0.90	0.87	0.92	0.95	1.00	1.09
2ASU	0.97	0.92	0.92	0.87	0.79	0.85	0.80	0.77	0.77	0.78	0.83	0.92
3+ASU	1.14	1.16	1.15	0.92	0.73	0.73	0.65	0.65	0.62	0.65	0.77	1.04
3A Semi	1.29	1.16	1.18	0.97	0.82	0.82	0.75	0.67	0.70	0.81	0.87	1.22
4A Semi	1.29	1.16	1.18	0.97	0.82	0.82	0.75	0.67	0.70	0.81	0.87	1.22
5+A SEMI	0.93	0.95	0.92	0.84	0.75	0.76	0.69	0.70	0.70	0.75	0.85	0.98
TT/BUS	1.31	1.19	1.10	0.96	0.80	0.76	0.70	0.66	0.66	0.76	0.92	1.35
TWINS	0.93	0.91	0.91	0.81	0.77	0.83	0.76	0.72	0.73	0.79	0.86	0.95

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2009 24 Hour Seasonal Adjustment Factors for Rural Areas in MNESAL

Body Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CARS+PICKUP	1.23	1.19	1.18	1.11	0.93	0.89	0.82	0.84	0.92	0.98	1.05	1.20
2ASU	1.04	1.03	1.01	0.94	0.81	0.84	0.81	0.83	0.87	0.88	0.96	1.01
3+ASU	1.30	1.31	1.17	1.03	0.79	0.68	0.76	0.71	0.65	0.66	0.82	1.10
3A Semi	1.35	1.35	1.34	1.13	0.78	0.77	0.71	0.78	0.86	1.04	1.27	1.47
4A Semi	1.35	1.35	1.34	1.13	0.78	0.77	0.71	0.78	0.86	1.04	1.27	1.47
5+A SEMI	0.89	0.85	0.86	0.84	0.79	0.78	0.80	0.78	0.72	0.75	0.82	0.91
TT/BUS	1.80	1.72	1.46	1.07	0.73	0.72	0.66	0.70	0.74	0.85	1.08	1.66
TWINS	1.13	0.95	0.98	0.88	0.79	0.77	0.74	0.75	0.71	0.80	0.80	0.93

2008 24 Hour Seasonal Adjustment Factors for Urban Areas

Body Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CARS+PICKUP	1.13	1.07	1.07	1.02	0.95	1.00	0.91	0.88	0.95	0.94	0.98	1.06
2ASU	0.99	0.88	0.93	0.91	0.80	0.85	0.81	0.80	0.78	0.78	0.81	0.94
3+ASU	1.14	1.05	1.14	0.98	0.72	0.70	0.64	0.69	0.64	0.66	0.78	1.14
3A Semi	1.29	1.11	1.21	1.04	0.78	0.80	0.71	0.65	0.75	0.79	0.99	1.45
4A Semi	1.29	1.11	1.21	1.04	0.78	0.80	0.71	0.65	0.75	0.79	0.99	1.45
5+A SEMI	0.93	1.00	0.93	0.90	0.74	0.77	0.69	0.75	0.71	0.75	0.81	1.02
TT/BUS	1.26	0.99	0.97	0.97	0.72	0.73	0.68	0.72	0.72	0.75	0.98	1.56
TWINS	0.86	0.86	0.86	0.86	0.78	0.81	0.77	0.77	0.77	0.75	0.80	0.96

2008 24 Hour Seasonal Adjustment Factors for Rural Areas

Body Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CARS+PICKUP	1.18	1.13	1.15	1.19	0.95	0.92	0.85	0.85	0.94	0.97	1.06	1.18
2ASU	0.90	0.89	0.92	0.91	0.72	0.83	0.77	0.82	0.89	0.94	0.92	1.02
3+ASU	1.19	1.20	1.06	1.12	0.81	0.70	0.81	0.74	0.63	0.60	0.73	1.03
3A Semi	1.05	1.08	1.16	0.97	0.71	0.79	0.69	0.90	1.04	1.26	1.58	1.77
4A Semi	1.05	1.08	1.16	0.97	0.71	0.79	0.69	0.90	1.04	1.26	1.58	1.77
5+A SEMI	0.85	0.84	0.84	0.86	0.74	0.80	0.85	0.76	0.70	0.76	0.80	0.91
TT/BUS	1.50	1.40	1.39	1.05	0.64	0.67	0.66	0.67	0.72	0.82	1.13	1.83
TWINS	0.86	0.97	0.94	0.80	0.68	0.73	0.74	0.79	0.70	0.93	0.79	0.96

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2007 24 Hour Seasonal Adjustment Factors for Urban Areas

Body Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CARS+PICKUP	1.10	1.04	1.02	0.98	0.98	0.95	0.90	0.89	0.85	0.98	1.05	1.13
2ASU	0.90	0.92	0.88	0.84	0.80	0.91	0.80	0.75	0.67	0.81	0.88	0.95
3+ASU	1.19	1.20	1.15	0.88	0.79	0.84	0.68	0.67	0.58	0.61	0.74	1.00
3A Semi	1.12	1.10	1.03	0.90	0.84	0.86	0.79	0.67	0.67	0.89	0.83	1.08
4A Semi	1.12	1.10	1.03	0.90	0.84	0.86	0.79	0.67	0.67	0.89	0.83	1.08
5+A SEMI	0.87	0.88	0.86	0.81	0.79	0.83	0.71	0.71	0.66	0.75	0.90	0.94
TT/BUS	1.41	1.33	1.16	1.03	0.93	0.86	0.77	0.62	0.59	0.78	0.88	1.17
TWINS	0.89	0.85	0.82	0.75	0.78	0.91	0.83	0.72	0.70	0.75	0.89	0.88

2007 24 Hour Seasonal Adjustment Factors for Rural Areas

Body Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CARS+PICKUP	1.31	1.26	1.22	1.13	0.97	0.88	0.81	0.84	0.95	1.03	1.13	1.20
2ASU	1.04	1.08	1.07	0.97	0.88	0.85	0.85	0.83	0.81	0.83	0.93	0.96
3+ASU	1.34	1.44	1.28	0.93	0.81	0.61	0.71	0.69	0.70	0.70	0.85	1.25
3A Semi	1.57	1.54	1.49	1.22	0.90	0.82	0.73	0.68	0.74	0.88	1.10	1.27
4A Semi	1.57	1.54	1.49	1.22	0.90	0.82	0.73	0.68	0.74	0.88	1.10	1.27
5+A SEMI	0.98	0.90	0.86	0.82	0.78	0.72	0.77	0.75	0.76	0.74	0.88	0.93
TT/BUS	2.05	2.06	1.55	1.11	0.87	0.74	0.71	0.67	0.70	0.79	1.01	1.58
TWINS	1.42	0.95	0.94	0.94	0.86	0.87	0.83	0.66	0.69	0.61	0.76	0.89

Previously Used Seasonal Adjustment Factors

Body Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CARS+PICKUP	1.14	1.06	1.04	0.99	0.94	0.87	0.87	0.83	0.92	0.96	0.99	1.02
2ASU	1.19	1.07	1.06	0.92	0.74	0.72	0.80	0.78	0.65	0.72	0.87	1.00
3+ASU	1.09	1.05	1.29	1.15	0.72	0.60	0.70	0.65	0.61	0.63	0.84	1.06
3A Semi	1.18	1.13	1.31	0.94	0.66	0.68	0.75	0.73	0.72	0.86	0.93	1.27
4A Semi	1.04	1.00	1.09	0.94	0.71	0.66	0.71	0.63	0.76	0.75	0.85	1.03
5+A SEMI	1.00	0.94	0.94	0.87	0.75	0.69	0.80	0.69	0.70	0.74	0.78	0.91
TT/BUS	1.19	1.07	1.06	0.92	0.74	0.72	0.80	0.78	0.65	0.72	0.87	1.00
TWINS	1.00	0.94	0.94	0.87	0.75	0.69	0.80	0.69	0.70	0.74	0.78	0.91

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Seasonal Adjustment Factors Graphs

The graphs on the following pages show how the seasonal adjustment factors in different area types compare with the 2010 MNESAL factors and data from 2007, 2008, and 2009. The purple line represents the average of the 2010 MNESAL data for rural or urban areas. Each graph represents the factors for an individual vehicle type. The vehicle types are:

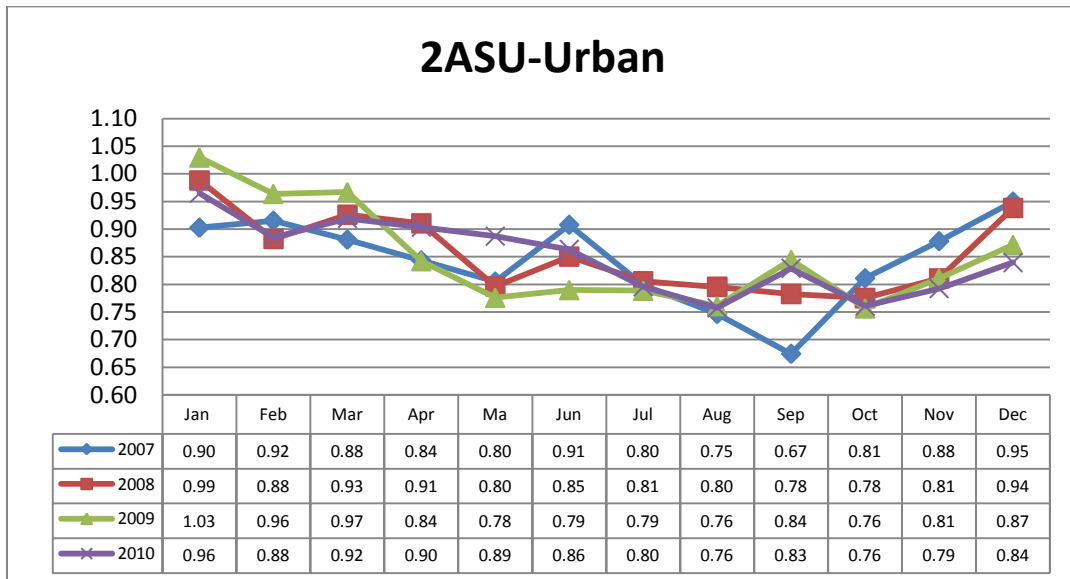
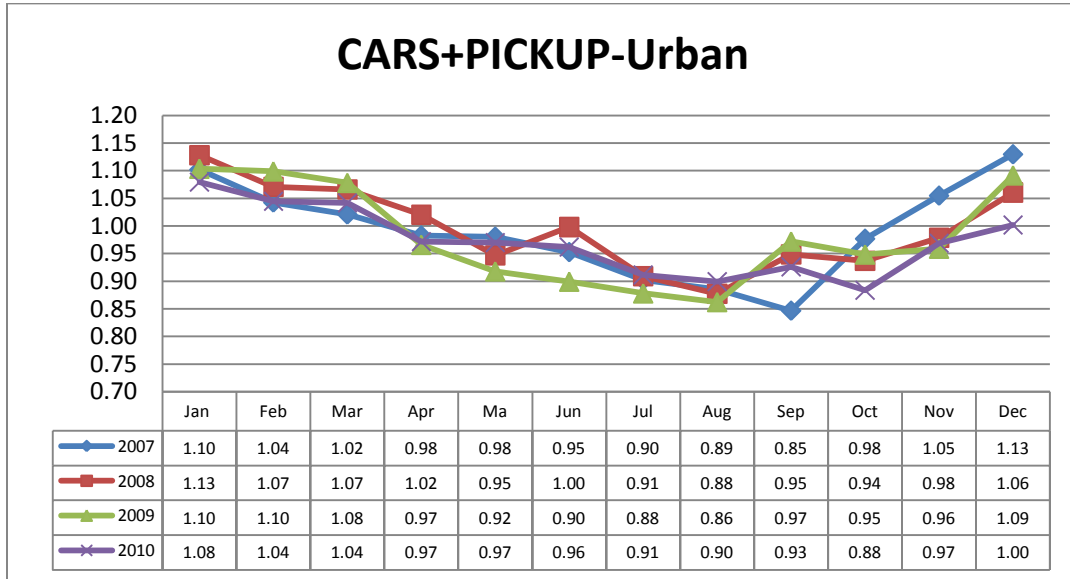
- CARS + PICKUP
- 2 AXLE SINGLE UNIT (2ASU)
- 3 OR MORE AXLE SINGLE UNIT (3+ASU)
- 3 AXLE SEMI (3A SEMI)
- 4 AXLE SEMI (4A SEMI)
- 5 OR MORE AXLE SEMI (5+A SEMI)
- SINGLE UNIT TRUCKS WITH TRAILERS/BUSES (TT/BUS)
- SEMIS HAULING TWO TRAILERS (TWINS)

In this study, the urban factor is used in the Twin Cities Metropolitan Area and within the city limits of towns with populations over 5000. All other areas are considered rural.

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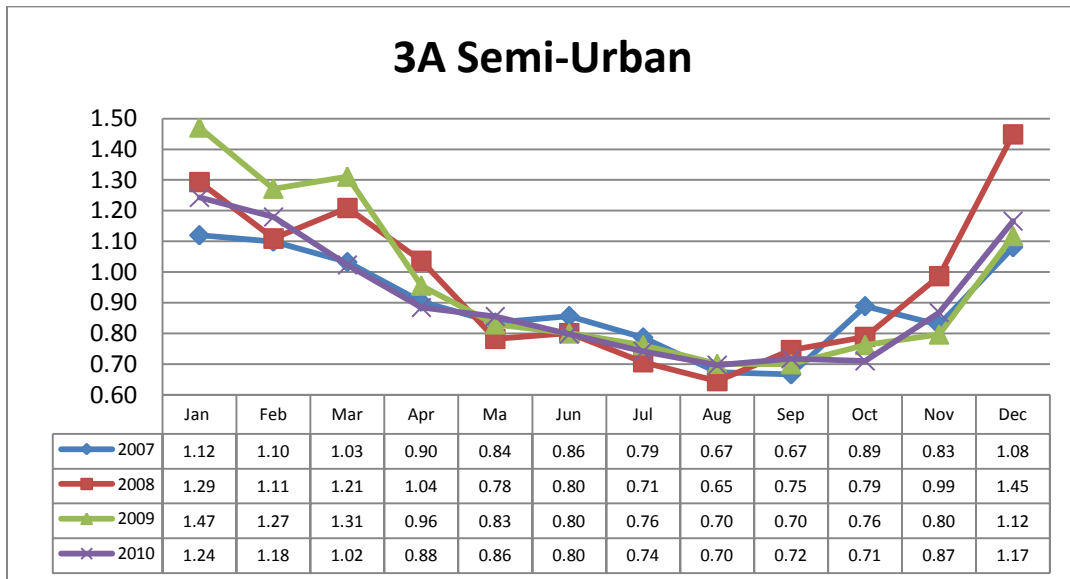
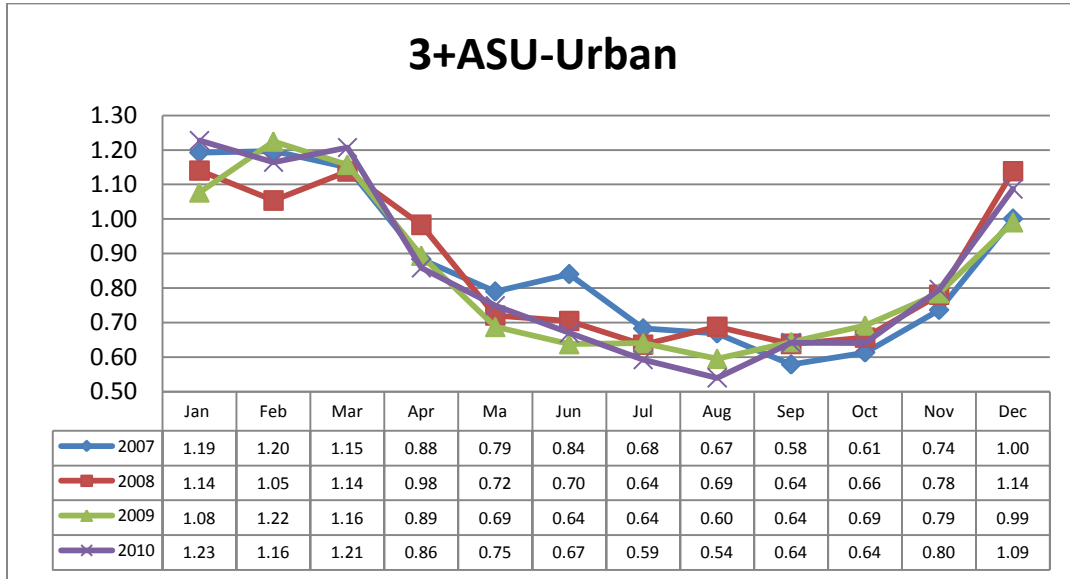
Urban Monthly Seasonal Adjustment Factors Comparison



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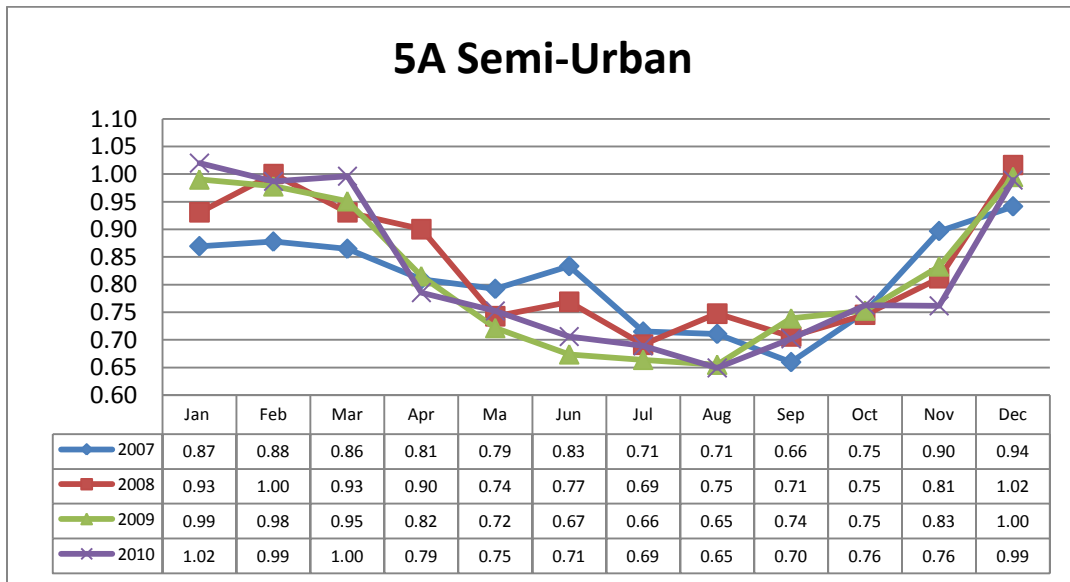
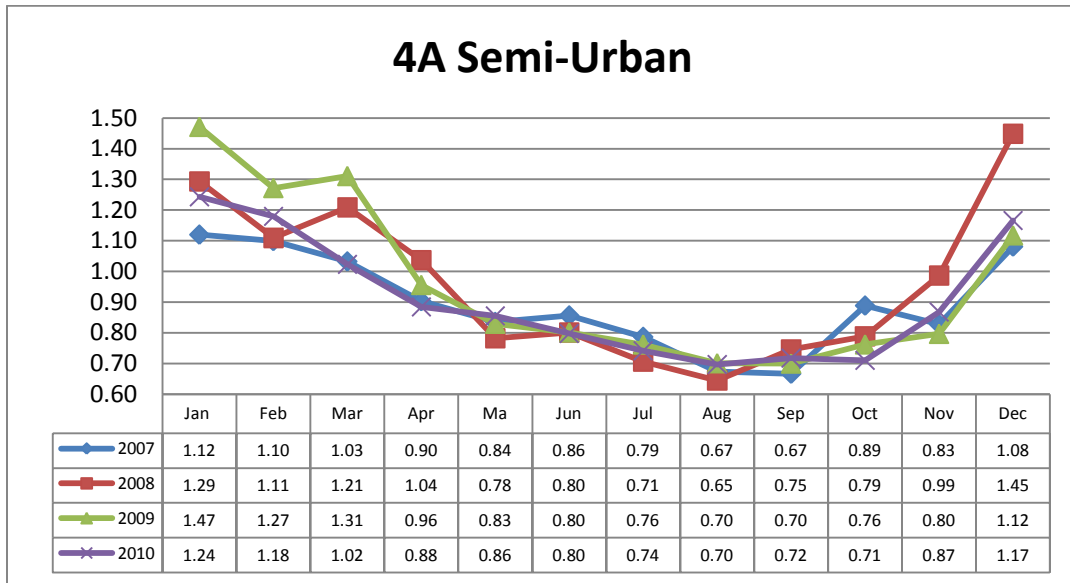
Urban Monthly Seasonal Adjustment Factors Comparison



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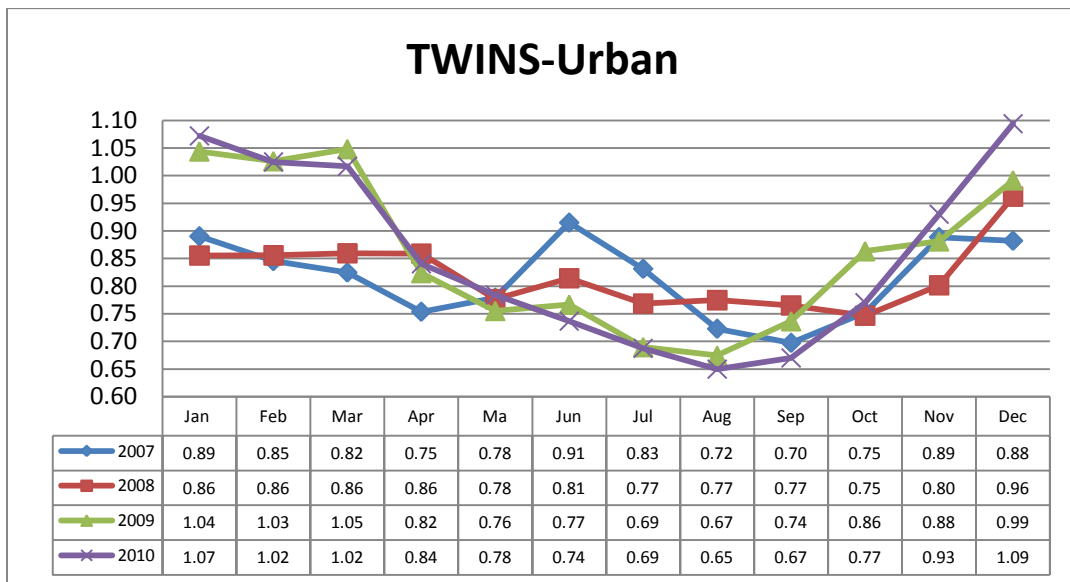
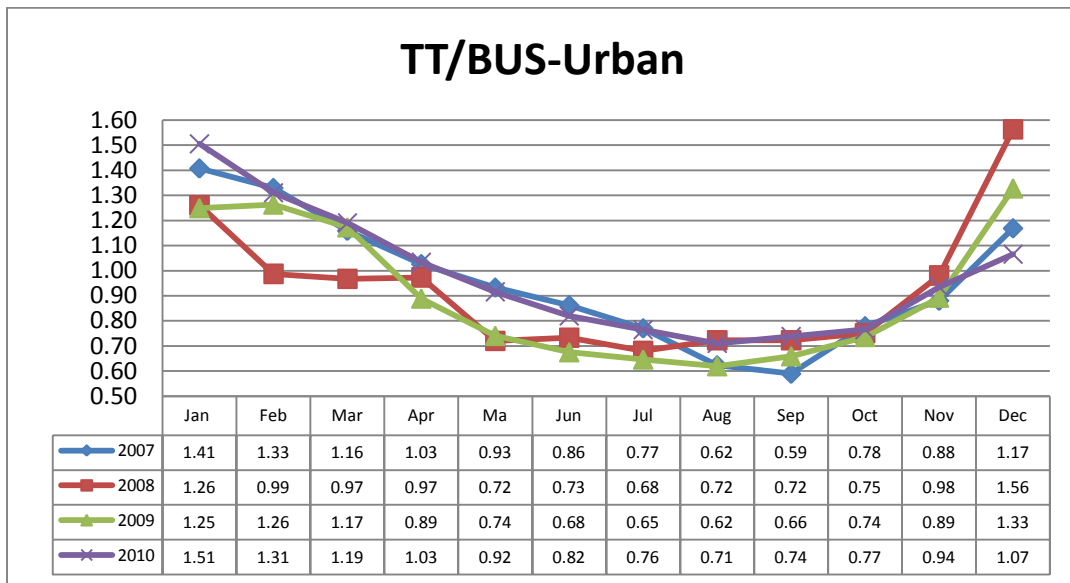
Urban Monthly Seasonal Adjustment Factors Comparison



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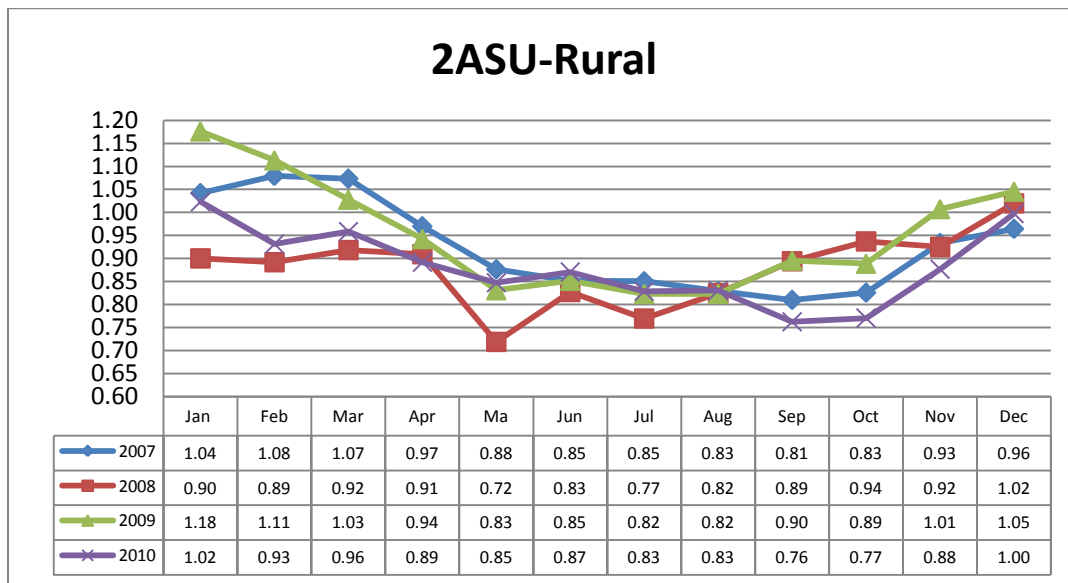
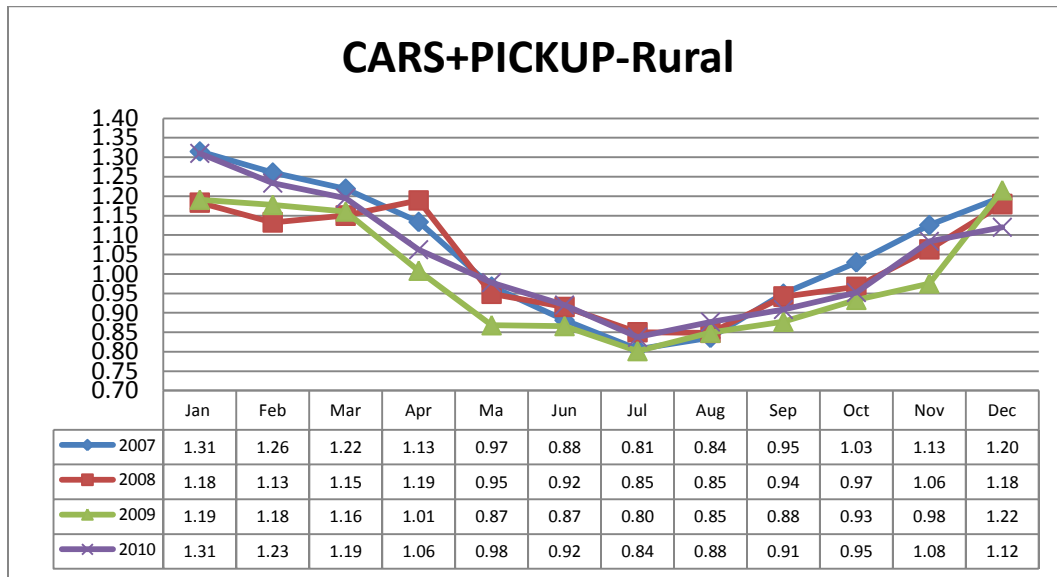
Urban Monthly Seasonal Adjustment Factors Comparison



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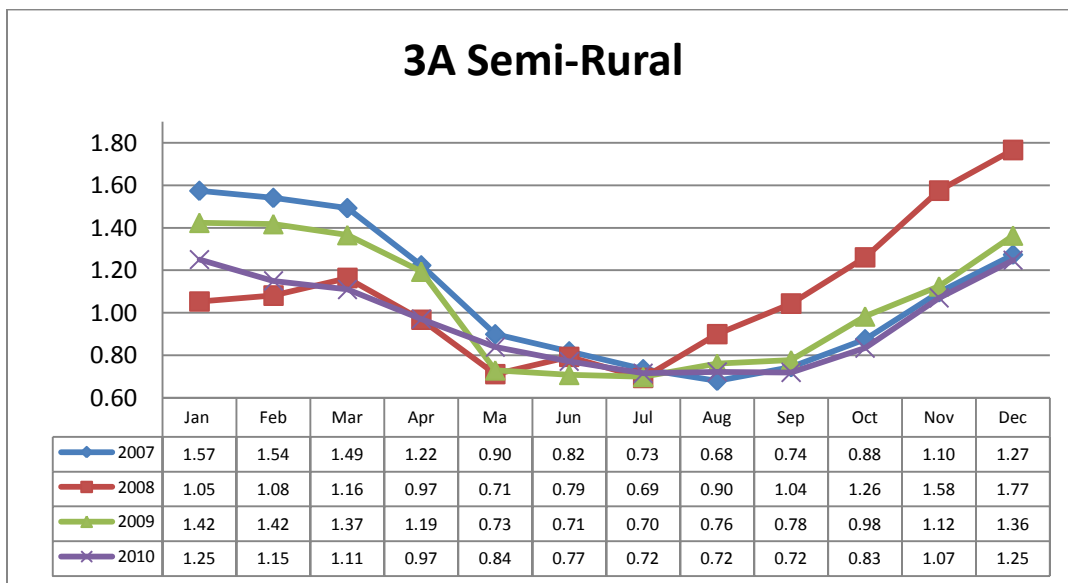
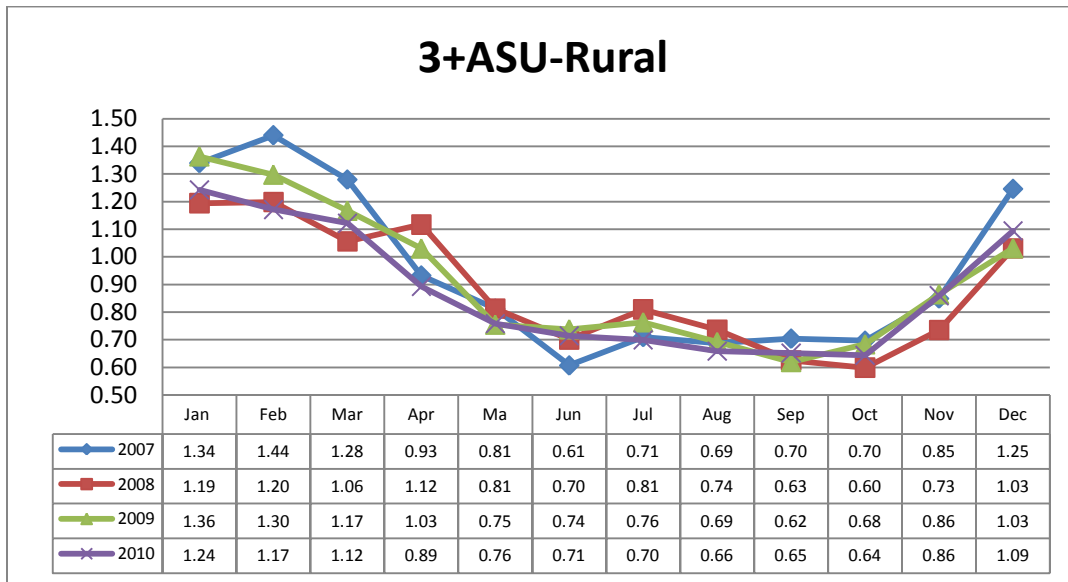
Rural Monthly Seasonal Adjustment Factors Comparison



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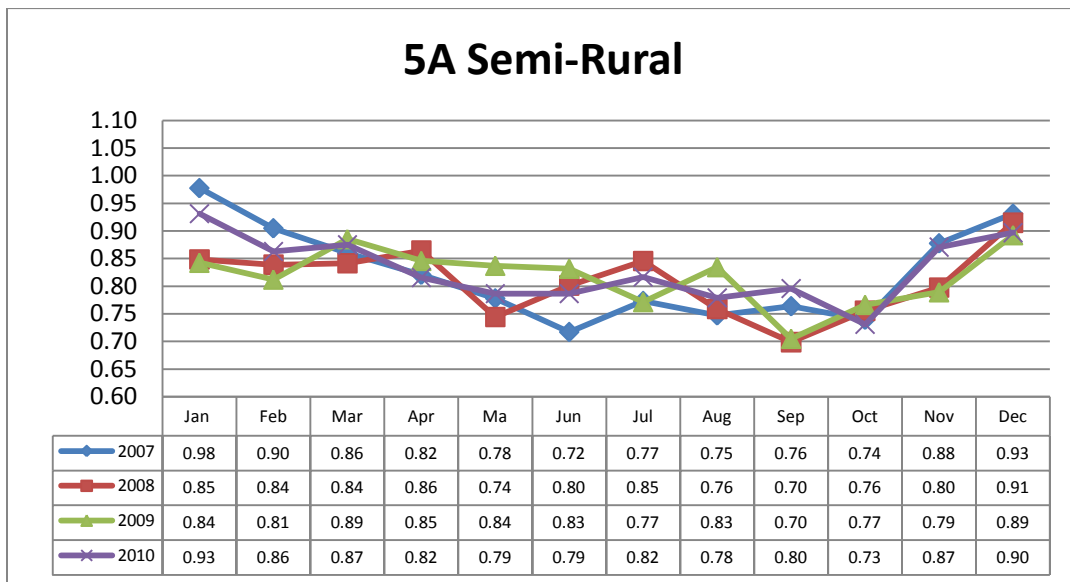
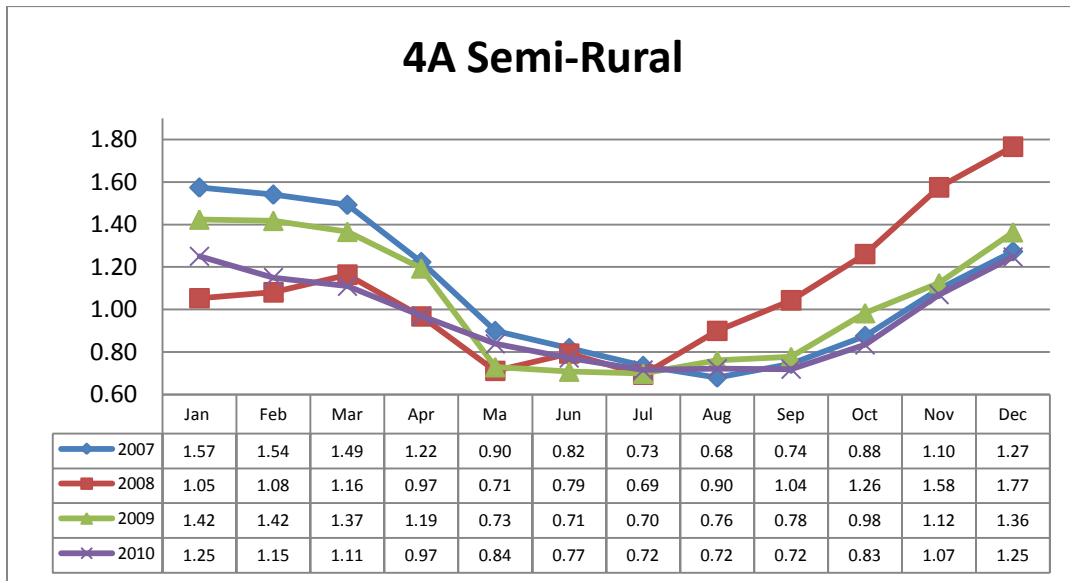
Rural Monthly Seasonal Adjustment Factors Comparison



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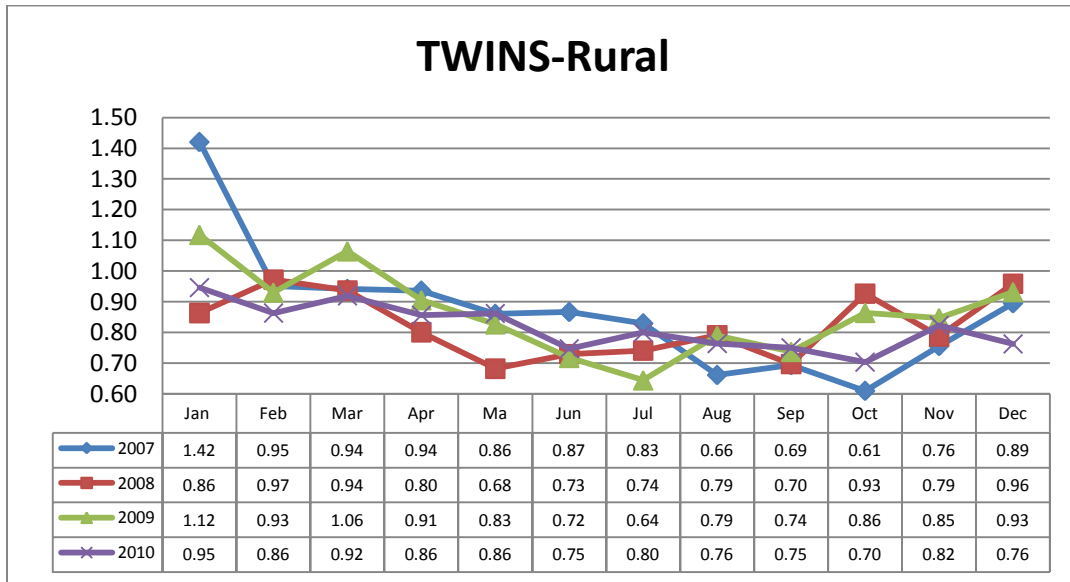
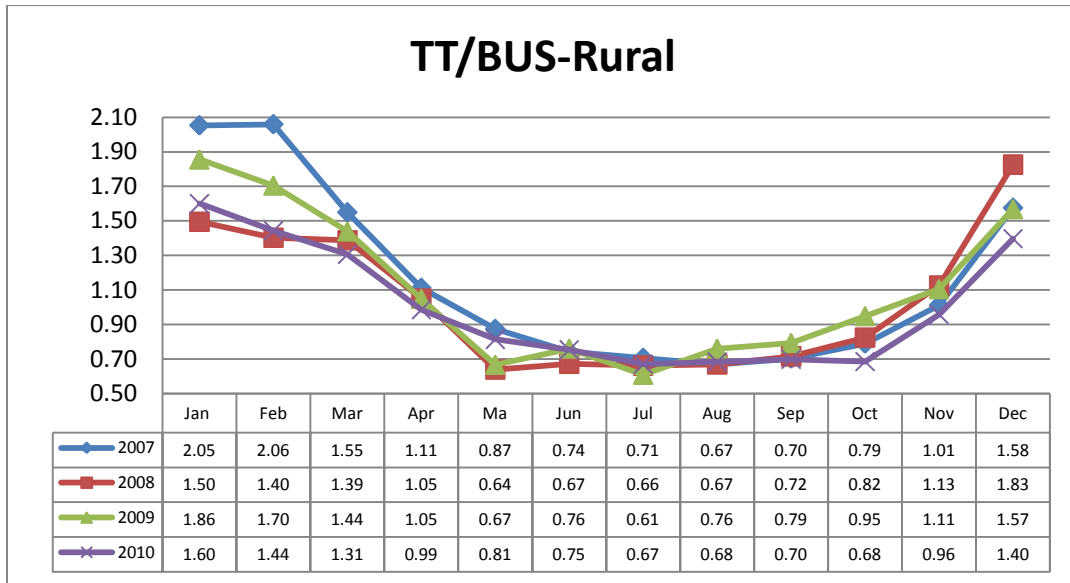
Rural Monthly Seasonal Adjustment Factors Comparison



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