
Appendix 1: Driver Safety Rating Pricing Review

1. Introduction

1 PUB Order 176/19, Order 13.7 states:

2 *With respect to the Driver Safety Rating (DSR) system, the Corporation*
3 *shall:*

4 *(a) File information in the 2021 GRA as to which rating model it intends*
5 *to proceed with;*

6 *(b) File a pricing examination in the 2021 GRA, including the financial*
7 *impact on premium revenue and the cost of modifying the system, of*
8 *the Registered Owner and Primary Driver rating models;*

9 *(c) File information in the 2021 GRA as to whether it has collected data*
10 *to recalibrate the amounts of driver premium to be charged under DSR*
11 *system to be more statistically sound, based on experience; and*

12 *(d) Conduct a review of best practices for rating models in other*
13 *Canadian jurisdictions and file the results of the review in the 2021*
14 *GRA.*

15 The following discusses the pricing examination based on the current DSR model. The
16 main purpose is to evaluate the appropriateness of the current vehicle discounts and
17 driver licence surcharges on a registered owner basis. Section 2 provides an overview
18 of the registered owner basis. Section 3 discusses the methodology and data used to
19 determine the discounts and surcharges on a registered owner basis. Section 4 looks
20 at the results and implications of the pricing examination. Finally, a brief discussion on
21 the primary driver basis is included in section 5.

2. Registered Owner Basis

22 MPI currently provides a discount on the vehicle premium based on the DSR level of
23 the registered owner of the vehicle. Registered owners with DSR levels between 1 to

1 15 are eligible for these discounts, which range from 5% for DSR level 1 to 33% for
2 DSR level 15. Registered owners with DSR level 0 and DSR levels -1 to -20 do not
3 receive a discount. A more detailed discussion of the DSR system is provided in the
4 Driver Classification System Chapter.

5 At the individual vehicle level, the registered owner model does not consider the
6 relative risk of the vehicle based on the actual driver(s) of the vehicle. Instead the
7 model determines the relative risk (and the vehicle discount) simply based on who
8 owns the vehicle.

9 However, at the overall vehicle level, the vehicle discounts provided (at each DSR
10 level) are based on the collective loss experience of the drivers of vehicles registered
11 to owners with the same DSR level. For example, the vehicle discount at DSR level 15
12 reflects the collective loss experience of the drivers of vehicles registered to owners
13 with DSR level 15. The vehicle discount is an adjustment (to the base rate) to reflect
14 the relative risk of all drivers of vehicles registered to owners with DSR level 15 versus
15 all drivers of vehicles registered to owners with DSR level 0 (i.e. the base DSR level).

3. Data and Methodology

3.1 Data

16 For the pricing examination, MPI used historical reported losses and earned units for
17 merit eligible passenger vehicles and light trucks. Certain insurance uses were
18 excluded, which is discussed further in section 3.2 below. Notwithstanding, the pricing
19 examination is still based on more than 96% of total merit eligible vehicles¹.

20 For Collision, Comprehensive, Property Damage and Bodily Injury coverages, MPI used
21 the reported losses and earned units as of February 29, 2020 for insurance years 2015
22 to 2019.

¹ Per the Rate Model, there are 833,462 merit eligible vehicles. The included insurance uses account for 801,088 of those vehicles.

1 For PIPP coverages (i.e. Accident Benefits - Other and Income Replacement
2 Indemnity), MPI used reported losses and earned units as of February 29, 2020 for
3 insurance years 2013 to 2017. The reported losses are based on the claims costs
4 allocation for PIPP coverages pursuant to PUB Order 97/05.

5 Reported losses for PIPP coverages for the two most recent accident years (2018 and
6 2019) were not used. As a result of Centralized Reserving implemented in 2018,
7 lifetime reserves (as applicable) are added if the claimant is still receiving benefits 2
8 years after the accident date. As such, for accident years 2018 and 2019, some claims
9 may not be fully reserved given that they have not passed the 2 year mark.

10 Similar to the process for determining rate line relativities (see *Ratemaking RM.3.2.1*)
11 the reported losses and earned units were organized by territory, insurance use, rate
12 group and registered owner DSR level to facilitate running the minimum bias
13 procedure² to determine DSR level relativities. MPI ran DSR level relativities for the
14 following:

- 15 • Combined Collision, Comprehensive, Property Damage and Bodily Injury loss
16 costs – the combination of these four coverages will be referred to as 'Other
17 than PIPP' for the remainder of this document
- 18 • PIPP loss costs

3.2 Excluded Data

19 Per section 3.1, the pricing examination only used the data for merit eligible
20 passenger vehicles and light trucks.

21 MPI did not use the data for merit eligible motorcycles mainly because the data did
22 not fit within the minimum bias model for passenger vehicles and light trucks given
23 that motorcycles have different rating variables. Further, this data is unlikely to affect

² Refer to <https://www.casact.org/pubs/forum/02fforum/02ff591.pdf> for a detailed discussion of the minimum bias procedure.

1 the DSR level relativities for Other than PIPP given the relatively small proportion of
2 Other than PIPP loss costs for motorcycles compared to the overall.

3 The data for merit eligible motorhomes were excluded for the same reasons. Rate
4 groups for motorhomes, determined based on declared value, are different than rate
5 groups for passenger vehicles and light trucks, determined based on Canadian Loss
6 Experience Automobile Rating (CLEAR) rate groups. Further, the DSR level relativities
7 are unlikely to be affected.

8 For merit eligible passenger vehicles and light trucks, the pricing examination focused
9 on determining the discount/surcharge for the 'typical' insurance uses. To that extent,
10 only the data for insurance uses in the Private Passenger major class were used. The
11 data for merit eligible passenger vehicles and light trucks in the other major classes
12 were excluded. This exclusion includes data for the following insurance uses:

- 13 • Accessible Vehicle-for-Hire
- 14 • Artisan Truck (GVW less than 16,331 kg)
- 15 • Common Carrier Local Passenger Vehicle
- 16 • Common Carrier Passenger Vehicle within 161 km in Manitoba
- 17 • Common Carrier Truck within 161 km in Manitoba
- 18 • Common Carrier Truck within city or municipality
- 19 • Limousine Vehicle-for-Hire
- 20 • Taxicab Vehicle-for-Hire

21 Further, the data for the Passenger Vehicle-for-Hire insurance use (within Major Class
22 1) was also excluded to be consistent with the exclusion of all other vehicle-for-hire
23 insurance uses, as well as recognizing that this is not a 'typical' insurance use.

3.3 Methodology

24 Per section 3.1, MPI used the minimum bias procedure to determine DSR level
25 relativities. This procedure isolates the effect of DSR level on loss costs by adjusting
26 for exposure correlations with other rating variables (i.e. territory, use and rate

1 group). This procedure is used throughout MPI’s ratemaking methodology to
2 determine relativities (see *Ratemaking, RM.3.2.1* and *Ratemaking, RM.4.4*).

3 After the DSR level relativities are determined, curves are fitted using regression
4 analysis to ensure that there is a smooth increasing relativity line as the DSR level
5 decreases from 15 to -20. Curves are fitted to achieve the best possible goodness-of-
6 fit to the observed data, as measured by the R-squared. Curves are fitted separately
7 for the Other than PIPP DSR level relativities and PIPP DSR level relativities. The fitted
8 curves are shown in *Figure 1* and *Figure 2* below.

Figure 1 Other than PIPP DSR Level Relativities

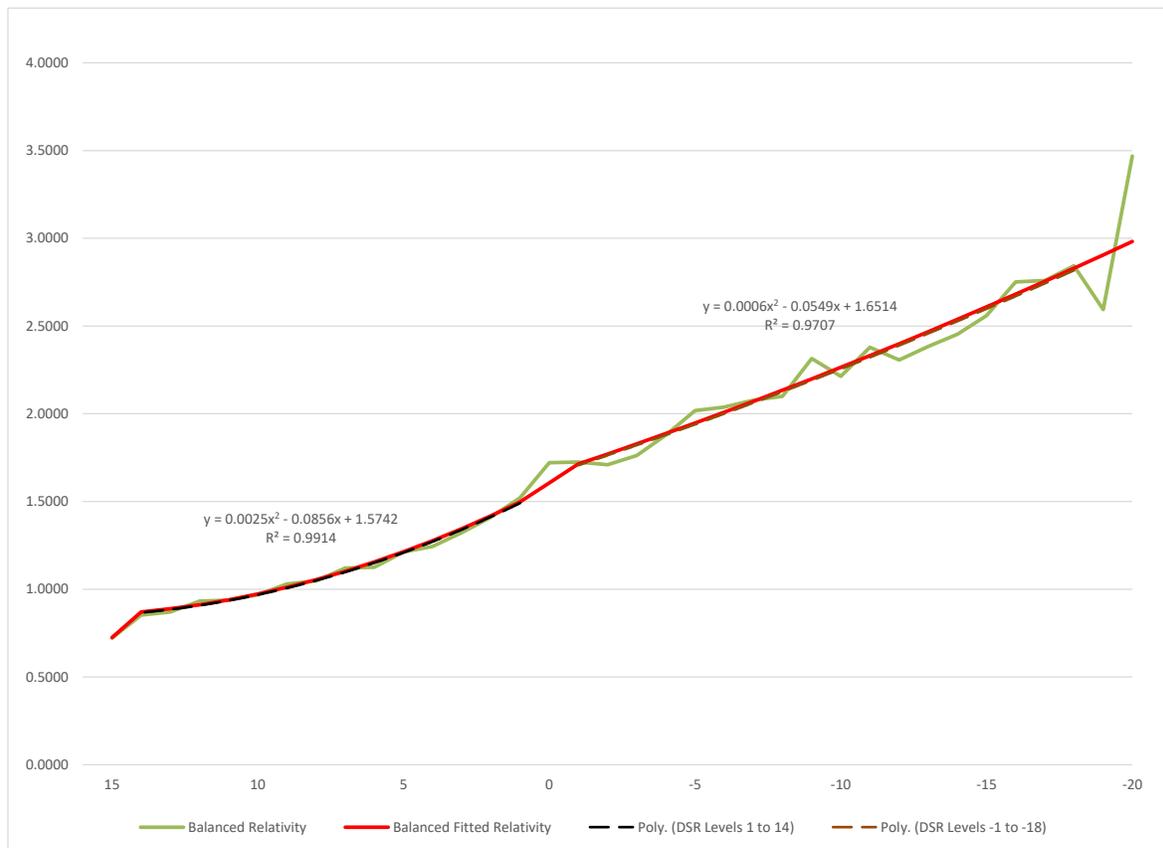
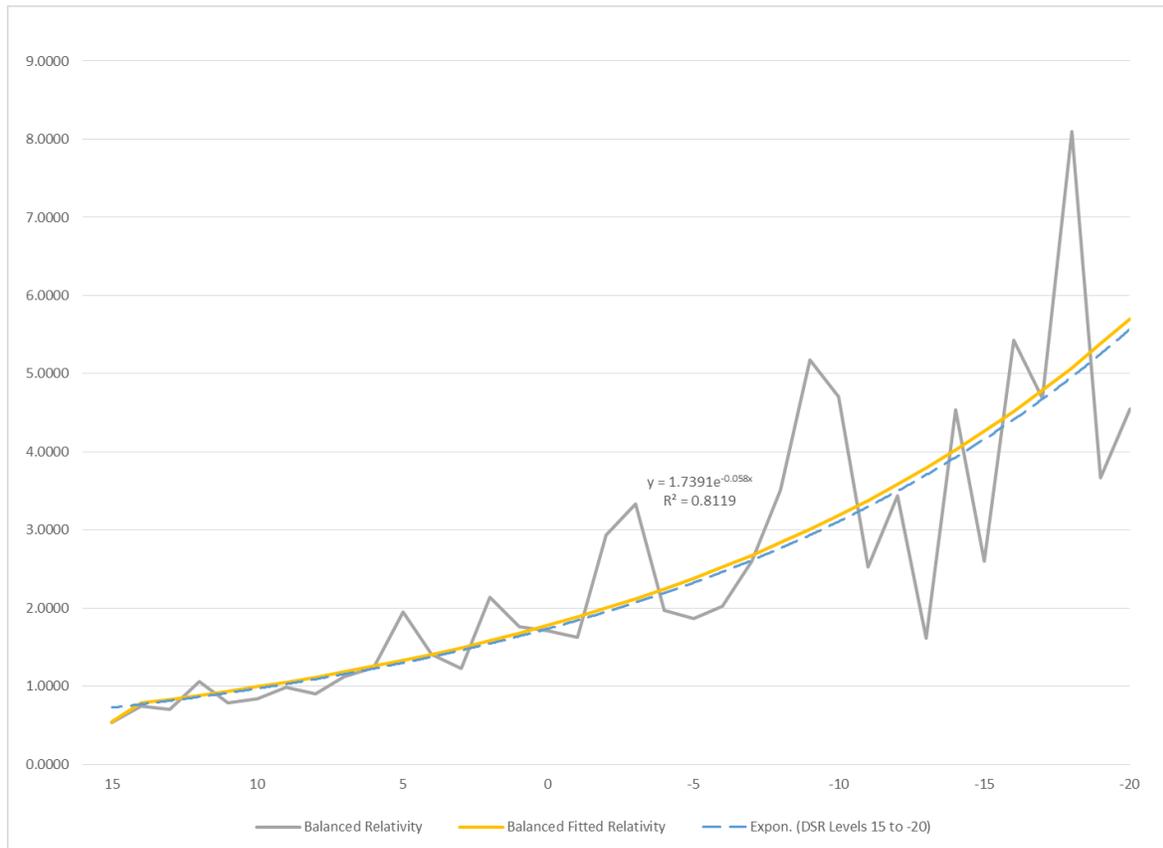


Figure 2 PIPP DSR Level Relativities



- 1 The fitted curves are then used to determine the average loss costs for each DSR
- 2 level. This is done separately for Other than PIPP and PIPP. By coverage:

- 3
$$\text{Average Loss Cost for DSR Level } j = \text{Fitted Relativity at DSR Level } j * \text{Average Loss}$$
- 4
$$\text{Cost for the Coverage}$$

- 5 The total average loss costs are then determined for each DSR level.

- 6
$$\text{Total Average Loss Cost for DSR Level } j = \text{Sum Average Loss Cost for DSR Level } j$$
- 7
$$\text{for All Coverages} + \text{Average Fixed Expenses (i.e. not varying by DSR level)}$$

- 8 Finally, the overall DSR level relativities are determined for each DSR level.

1 *Overall DSR Level Relativity for DSR Level j = Total Average Loss Cost for DSR*
2 *Level j / Total Average Loss Cost for All DSR levels; where*

3 *Total Average Loss Cost for All DSR Levels = Sum Average Loss Cost for All*
4 *Coverages + Average Fixed Expenses (i.e. not varying by DSR level)*

5 The derivation of the overall DSR level relativities for all DSR levels is presented in
6 Figure 3 below.

Figure 3 Overall Relativities by DSR Level

Line No.	DSR	Fitted Relativity		Average Loss Cost			Overall Relativity	
		Colli, Comp, PD & BI	PIPP	Colli, Comp, PD & BI	PIPP	Other Loss Cost & Exp		Total
1	15	0.7244	0.5472	\$576.23	\$155.15	\$40.55	\$771.93	0.6895
2	14	0.8705	0.7888	\$692.42	\$223.62	\$40.55	\$956.59	0.8545
3	13	0.8885	0.8360	\$706.74	\$237.02	\$40.55	\$984.31	0.8792
4	12	0.9115	0.8861	\$725.07	\$251.22	\$40.55	\$1,016.84	0.9083
5	11	0.9396	0.9392	\$747.40	\$266.27	\$40.55	\$1,054.22	0.9417
6	10	0.9727	0.9955	\$773.73	\$282.23	\$40.55	\$1,096.51	0.9795
7	9	1.0108	1.0551	\$804.07	\$299.14	\$40.55	\$1,143.76	1.0217
8	8	1.0540	1.1183	\$838.41	\$317.06	\$40.55	\$1,196.02	1.0683
9	7	1.1022	1.1853	\$876.75	\$336.06	\$40.55	\$1,253.36	1.1196
10	6	1.1555	1.2564	\$919.10	\$356.19	\$40.55	\$1,315.84	1.1754
11	5	1.2137	1.3316	\$965.44	\$377.54	\$40.55	\$1,383.53	1.2358
12	4	1.2770	1.4114	\$1,015.80	\$400.16	\$40.55	\$1,456.50	1.3010
13	3	1.3454	1.4960	\$1,070.15	\$424.13	\$40.55	\$1,534.83	1.3710
14	2	1.4187	1.5856	\$1,128.51	\$449.55	\$40.55	\$1,618.60	1.4458
15	1	1.4971	1.6806	\$1,190.87	\$476.48	\$40.55	\$1,707.90	1.5256
16	0	1.6054	1.7813	\$1,277.00	\$505.03	\$40.55	\$1,822.58	1.6280
17	-1	1.7137	1.8881	\$1,363.13	\$535.29	\$40.55	\$1,938.97	1.7320
18	-2	1.7704	2.0012	\$1,408.28	\$567.36	\$40.55	\$2,016.19	1.8010
19	-3	1.8283	2.1211	\$1,454.30	\$601.36	\$40.55	\$2,096.21	1.8724
20	-4	1.8873	2.2482	\$1,501.20	\$637.39	\$40.55	\$2,179.14	1.9465
21	-5	1.9473	2.3829	\$1,548.98	\$675.58	\$40.55	\$2,265.12	2.0233
22	-6	2.0085	2.5257	\$1,597.65	\$716.06	\$40.55	\$2,354.26	2.1029
23	-7	2.0708	2.6770	\$1,647.19	\$758.97	\$40.55	\$2,446.70	2.1855
24	-8	2.1342	2.8374	\$1,697.60	\$804.44	\$40.55	\$2,542.59	2.2712
25	-9	2.1987	3.0074	\$1,748.90	\$852.64	\$40.55	\$2,642.09	2.3601
26	-10	2.2642	3.1876	\$1,801.08	\$903.73	\$40.55	\$2,745.36	2.4523
27	-11	2.3309	3.3786	\$1,854.14	\$957.88	\$40.55	\$2,852.56	2.5481
28	-12	2.3988	3.5811	\$1,908.07	\$1,015.27	\$40.55	\$2,963.89	2.6475
29	-13	2.4677	3.7956	\$1,962.89	\$1,076.10	\$40.55	\$3,079.54	2.7508
30	-14	2.5377	4.0231	\$2,018.58	\$1,140.58	\$40.55	\$3,199.71	2.8581
31	-15	2.6088	4.2641	\$2,075.15	\$1,208.92	\$40.55	\$3,324.62	2.9697
32	-16	2.6810	4.5196	\$2,132.60	\$1,281.35	\$40.55	\$3,454.51	3.0857
33	-17	2.7544	4.7904	\$2,190.93	\$1,358.13	\$40.55	\$3,589.61	3.2064
34	-18	2.8288	5.0774	\$2,250.14	\$1,439.50	\$40.55	\$3,730.20	3.3320
35	-19	2.9043	5.3816	\$2,310.23	\$1,525.76	\$40.55	\$3,876.54	3.4627
36	-20	2.9810	5.7041	\$2,371.20	\$1,617.17	\$40.55	\$4,028.92	3.5988
37	All DSR Levels*			\$795.44	\$283.51	\$40.55	\$1,119.50	

38 *From Part VI, Ratemaking, Figure RM-11 and Figure RM-12:
 39 Amounts for 'Colli, Comp, PD and BI' and 'PIPP' include claims costs and expenses
 40 Amount for 'Other Loss Cost and Exp' includes the following:
 41 Fixed expenses - operating expenses, regulatory/appeal, road safety, commission flat fees, fleet rebates,
 42 anti-theft discount, reinsurance, and premium taxes and commissions on driver premiums
 43 Fixed other income sources - driver premiums and service fees

4. Results and Implications

- 1 *Figure 4* below shows the DSR discount percentages (for DSR levels 1 to 15) and DSR
- 2 surcharge dollars (for DSR levels -1 to -20) based on the overall DSR level relativities
- 3 presented in *Figure 3*. The discounts and surcharges were calculated by comparing the
- 4 relativity at each DSR level to the relativity at DSR level 0 (i.e. the base DSR level).

Figure 4 Calculated Discounts and Surcharges

Line No.	DSR	Overall Relativity	Calculated Discount (a)	Current Discount	Variance	Calculated Surcharge (b)	Current Surcharge	
1	15	0.6895	57.6%	33.0%	24.6%			
2	14	0.8545	47.5%	30.0%	17.5%			
3	13	0.8792	46.0%	29.0%	17.0%			
4	12	0.9083	44.2%	28.0%	16.2%			
5	11	0.9417	42.2%	27.0%	15.2%			
6	10	0.9795	39.8%	26.0%	13.8%			
7	9	1.0217	37.2%	25.0%	12.2%			
8	8	1.0683	34.4%	25.0%	9.4%			
9	7	1.1196	31.2%	25.0%	6.2%			
10	6	1.1754	27.8%	20.0%	7.8%			
11	5	1.2358	24.1%	15.0%	9.1%			
12	4	1.3010	20.1%	15.0%	5.1%			
13	3	1.3710	15.8%	10.0%	5.8%			
14	2	1.4458	11.2%	10.0%	1.2%			
15	1	1.5256	6.3%	5.0%	1.3%			
16	0	1.6280	0.0%	0.0%	0.0%			
17	-1	1.7320				\$143.89	\$200.00	
18	-2	1.8010				\$209.49	\$200.00	
19	-3	1.8724				\$277.48	\$300.00	
20	-4	1.9465				\$347.94	\$400.00	
21	-5	2.0233				\$420.98	\$450.00	
22	-6	2.1029				\$496.72	\$500.00	
23	-7	2.1855				\$575.26	\$650.00	
24	-8	2.2712				\$656.73	\$800.00	
25	-9	2.3601				\$741.27	\$900.00	
26	-10	2.4523				\$829.00	\$1,000.00	
27	-11	2.5481				\$920.08	\$1,200.00	
28	-12	2.6475				\$1,014.67	\$1,400.00	
29	-13	2.7508				\$1,112.92	\$1,600.00	
30	-14	2.8581				\$1,215.02	\$1,800.00	
31	-15	2.9697				\$1,321.15	\$2,000.00	
32	-16	3.0857				\$1,431.50	\$2,200.00	
33	-17	3.2064				\$1,546.29	\$2,400.00	
34	-18	3.3320				\$1,665.73	\$2,600.00	
35	-19	3.4627				\$1,790.06	\$2,800.00	
36	-20	3.5988				\$1,919.53	\$3,000.00	
37	Average Undiscounted Premium (c)						\$1,548.48	

38 Notes:

39 (a) 1 - Overall Relativity for the respective DSR level / Overall Relativity for DSR level 0

40 (b) [Overall Relativity for the respective DSR level / Overall Relativity for DSR level 0 - 1]

41 * Average Undiscounted Premium + \$45

42 (c) From the Rate Model; reflects the average for merit eligible passenger vehicles and light trucks

43 for 'typical' insurance uses (see RSF.2.2) based on 2020/21 approved rates

1 The discounts and surcharges calculated are applicable to vehicles insured by
2 registered owners with the respective DSR level. For example, a discount of 57.6% is
3 applicable to vehicles insured by registered owners with DSR level 15. As stated in
4 section 1, the discounts and surcharges reflect the collective loss experience of the
5 drivers of vehicles registered to owners with the same DSR level. This implies the
6 following:

- 7 • The discounts and surcharges do not reflect the relative risk of drivers with
8 different DSR levels.
- 9 • The discount for a driver with DSR level 15 would be greater than 57.6% given
10 that the discount was calculated including the loss experience of other drivers
11 with a DSR level lower than 15.
- 12 • The surcharge for a driver with DSR level -20 would be greater than \$1,919.53
13 given that the discount was calculated including the loss experience of other
14 drivers with a DSR level higher than -20.

15 *Figure 4* also compares the calculated discounts to the current discounts. For all DSR
16 levels whereby discounts are applicable (DSR levels 1 to 15), the calculated discounts
17 are higher than the current discounts. If the current discounts were increased to the
18 calculated discounts, MPI estimates that a 23.2% increase in the base rate³ would be
19 required (for merit eligible passenger vehicles and light trucks) to offset the revenue
20 loss from providing higher discounts (i.e. to achieve revenue neutrality). The new
21 overall discounted average vehicle rate would remain the same in the indicated
22 structure. However, average vehicle rates by DSR levels will change per *Figure 5*
23 below.

24 *Figure 4* also shows the current surcharges for DSR levels -1 to -20. However, these
25 surcharges are not directly comparable to the calculated surcharges. As stated earlier,
26 the calculated surcharges are applicable to vehicles insured by registered owners with
27 the respective DSR level. However, the current surcharges are applicable at the driver

³ The base rate reflects the average undiscounted premium per *Figure 4*.

1 level (i.e. based on the driver’s DSR level). The calculated surcharges represents the
 2 minimum surcharges for drivers with the respective DSR levels.

3 *Figure 5* shows the changes in average rate by DSR level based on applying the higher
 4 calculated discounts offset by the 23.2% increase in the base rate required to achieve
 5 revenue neutrality. Registered owners at DSR levels 11 to 15 would see lower average
 6 rates.

Figure 5 Changes in Average Rate

Line No.	DSR	Average Rate			
		Current	Indicated	Variance	% Variance
1	15	\$997	\$777	-\$221	-22.1%
2	14	\$1,081	\$999	-\$82	-7.6%
3	13	\$1,098	\$1,030	-\$69	-6.3%
4	12	\$1,123	\$1,072	-\$51	-4.5%
5	11	\$1,152	\$1,125	-\$27	-2.4%
6	10	\$1,167	\$1,169	\$2	0.2%
7	9	\$1,201	\$1,238	\$37	3.1%
8	8	\$1,204	\$1,298	\$94	7.8%
9	7	\$1,203	\$1,360	\$156	13.0%
10	6	\$1,292	\$1,437	\$145	11.2%
11	5	\$1,378	\$1,516	\$138	10.0%
12	4	\$1,386	\$1,605	\$220	15.8%
13	3	\$1,466	\$1,691	\$224	15.3%
14	2	\$1,466	\$1,782	\$316	21.6%
15	1	\$1,545	\$1,877	\$333	21.5%
16	0	\$1,571	\$1,936	\$365	23.2%
17	-1 to -20	\$1,607	\$1,980	\$373	23.2%

7 *Figure 6* shows the indicated surcharges (based on the overall DSR level relativities)
 8 after adjusting for revenue neutrality.

Figure 6 Calculated Surcharges

Line No.	Surcharge		
	DSR	Indicated	Current
1	-1	\$167	\$200
2	-2	\$248	\$200
3	-3	\$331	\$300
4	-4	\$418	\$400
5	-5	\$508	\$450
6	-6	\$602	\$500
7	-7	\$698	\$650
8	-8	\$799	\$800
9	-9	\$903	\$900
10	-10	\$1,011	\$1,000
11	-11	\$1,123	\$1,200
12	-12	\$1,240	\$1,400
13	-13	\$1,361	\$1,600
14	-14	\$1,487	\$1,800
15	-15	\$1,617	\$2,000
16	-16	\$1,753	\$2,200
17	-17	\$1,895	\$2,400
18	-18	\$2,042	\$2,600
19	-19	\$2,195	\$2,800
20	-20	\$2,355	\$3,000

5. Primary Driver Basis

1 A primary driver model would provide a discount on the vehicle premium based on the
 2 DSR level of the primary driver(s) of the vehicle (rather than the registered owner of
 3 the vehicle). The primary driver(s) of the vehicle would have to be declared when the
 4 insurance policy is written.

5 The primary driver model shares a similar shortcoming to the registered owner model
 6 particularly if only one primary driver is captured per vehicle. At the overall vehicle
 7 level, the vehicle discounts provided (at each DSR level) are based on the collective
 8 loss experience of the drivers of vehicles insured by primary drivers with the same
 9 DSR level. This implies that the discounts and surcharges do not reflect the relative
 10 risk of drivers with different DSR levels.

1 MPI did not conduct a pricing examination using the primary driver model mainly
2 because MPI does not have the information on the primary driver(s) of MPI insured
3 vehicles. While MPI can assume that the registered owner is the primary driver in the
4 case of registered owners with only one registered vehicle, doing so would revert back
5 to the registered owner model. Further, 24% of registered owners have more than
6 one registered vehicle meaning the assumption is less likely to be applicable.

7 One other limitation in conducting a pricing examination relates to how a subset of
8 Collision losses would be handled under a primary driver model. For Collision losses
9 where a driver can be identified⁴, 41% of reported losses⁵ are attributable to claims
10 where the driver is not the registered owner. The handling of these losses under a
11 primary driver model would impact the determination of the appropriate vehicle
12 discounts.

⁴ Collision losses where a driver cannot be identified are commonly a result of hit-and-run accidents.

⁵ For insurance years 2015 to 2019 as of February 29, 2020.