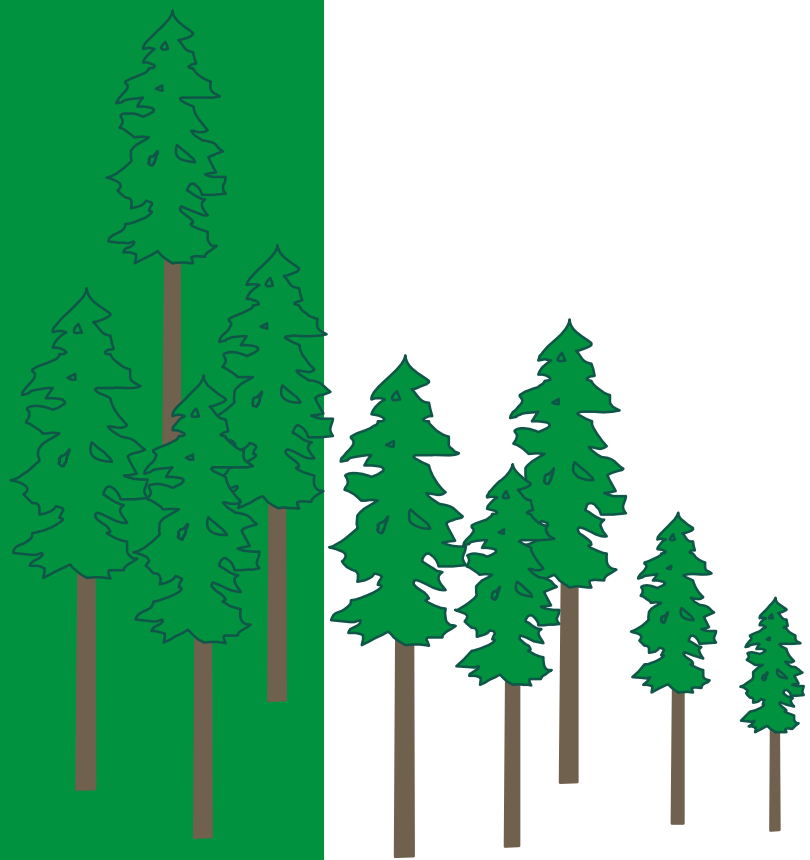
BRITISH COLUMBIA

Ministry of Forests and Range

INTERIOR

MARKET PRICING SYSTEM

Update - 2008



July 10, 2008

Revenue Branch

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1. INTRODUCTION

The purpose of this paper is to provide an overview of the July 1, 2008 update to the Interior Market Pricing System (MPS). [1]

2. AUCTION DATASET

The auction dataset used in the update contains winning bids and data from 1112 sales over the 5 year period January 1, 2003 through December 31, 2007.

3. EQUATIONS

With the initial auction dataset, the 2007 equations were re-estimated. No other changes were made.

The results are the benchmark equations, shown below.

[1] This paper is not intended to provide the basis for calculating stumpage rates nor should it be used as guidance for interpreting the legal policies and procedures for calculating stumpage rates, which are contained in the *Interior Appraisal Manual*. The *Interior Appraisal Manual* contains the policies and procedures referred to in Section 105 of the *Forest Act*.

Estimated Winning Bid Equation

Variable	2007 Equation		Benchmark Equation	
	Co-efficient	t - Statistic	Co-efficient	t - Statistic
Constant	27.50628	9.970842	25.42916	9.169367
Real Stand Selling Price	0.174490	7.737896	0.176569	6.564502
Fir Fraction	6.500597	4.095498	6.021568	2.629507
HemBal Fraction	-12.89714	-7.040192	-16.99553	-10.45084
Cedar Fraction	23.09428	5.408024	31.23939	6.404779
Volume per Hectare/1000	4.825013	1.683968	2.413413	0.805588
LN ((Volume – Deck Volume)/1000)	2.178258	8.310748	2.123400	7.873973
1/Volume per tree *(1-HemBal Fraction)	-1.151656	-2.262554	-1.140946	-1.935495
Grade 3 Fraction	12.18485	6.864476	15.59641	8.544705
Deciduous Fraction	-10.45422	-3.438955	-15.28827	-6.977474
Decay Fraction	-29.49454	-4.620984	-17.33373	-2.628796
Cableyard Fraction	-7.743592	-4.294034	-7.089402	-3.507634
Helicopter Logging Fraction	-33.31608	-8.526350	-49.84570	-6.565967
Horse Logging Fraction	-7.232724	-6.873909	-6.556354	-5.265172
Fire Damaged Fraction	-14.48430	-8.136430	-5.265172	-7.667409
Cycle Time	-1.721603	-11.53573	-1.468105	-9.690312
LN (Number of Bidders)	4.704155	16.28722	4.303525	14.71496
Salvage Logging Indicator	-2.780152	-5.154571	-3.612643	-7.117134
Fort Nelson – Peace Zone	-2.699050	-3.224216	-2.838389	-3.109499
2003 auctions	-1.565476	-1.948649	n/a	n/a
2004 auctions	-3.277362	-5.049053	-2.163179	-2.998854
2005 auctions	2.174661	2.566641	3.048903	3.828505
2006 auctions	-8.879848	-9.982754	-6.615775	-9.222904
2007 auctions	n/a	n/a	-4.978387	-5.369095
Decked Wood Fraction	130.0489	1.988883	77.20196	2.151776
LN (Volume per tree)	4.931008	3.628468	5.115615	3.202992
Number of Observations	1133		1112	
Adjusted R^2	0.710233		0.750153	
***LN means the natural logarithm**				

Number of Bidders Equation

Variable	2007 Equation		Benchmark Equation	
	Co-efficient	t - Statistic	Co-efficient	t - Statistic
Constant	1.262116	3.011341	1.171118	2.677185
Forecast Real Winning Bid	0.039401	21.81794	0.035539	18.81743
District Average Number of Bidders	0.133055	7.894047	0.144130	7.147795
Exchange rate($US/$C)	-3.026744	-4.713646	-2.175238	-3.638978
Partial cut fraction	-0.503874	-3.761580	-0.668524	-3.743705
Slope %	-0.004182	-2.913257	-0.004368	-2.944172
Horse logging fraction	-0.213833	-1.487041	-0.251382	-1.339970
Second Quarter Auctions	0.164435	3.838852	0.112632	2.561376
2003 auctions	0.428716	5.659053	n/a	n/a
2004 auctions	0.308310	2.984956	-0.144920	-2.275288
2005 auctions	0.216573	1.621361	-0.236389	-2.712787
2006 auctions	1.182766	7.083305	0.638989	5.543554
2007 auctions	n/a	n/a	0.463751	3.525266
Number of Observations	1133		1112	
Adjusted R^2	0.412133		0.356338	

New variables were tested to see if they would improve the statistics, compared to the benchmark equations. Likewise, variables that were no longer significant were removed. The final data set contains 1112 auction sales. See Appendix 1 for detailed statistics and definitions.

The final equations, compared to the Benchmark Equations, are shown below.

Estimated Winning Bid

Variable	Benchmark Equation		Final Equation	
	Co-efficient	t – Statistic	Co-efficient	t – Statistic
Constant	25.42916	9.169367	43.55180	7.527415
Exchange Rate ($US/$C)	n/a	n/a	-18.64961	-2.741778
Real Stand Selling Price	0.176569	6.564502	0.161846	6.013594
Fir Fraction	6.021568	2.629507	6.160909	2.697400
HemBal Fraction	-16.99553	-10.45084	-18.24041	-10.96880
Cedar Fraction	31.23939	6.404779	31.23688	6.541557
Volume per Hectare/1000	2.413413	0.805588	n/a	n/a
LN ((Volume – Deck Volume))/1000	2.123400	7.873973	n/a	n/a
LN (Volume/1000)	n/a	n/a	2.303979	9.157420
1/Volume per tree *(1-HemBal Fraction)	-1.140946	-1.935495	-1.145244	-1.975618
Grade 3 Fraction	15.59641	8.544705	14.45331	7.577925
Deciduous Fraction	-15.28827	-6.977474	n/a	n/a
Deciduous Fraction *(1- Competitive Deciduous Indicator)	n/a	n/a	-6.518754	-2.619475
Decay Fraction	-17.33373	-2.628796	-16.29677	-2.499631
Cableyard Fraction	-7.089402	-3.507634	-6.882986	-3.597770
Helicopter Logging Fraction	-49.84570	-6.565967	-51.23053	-6.827542
Horse Logging Fraction	-6.556354	-5.265172	-6.193952	-4.988130
Fire Damaged Fraction	-5.265172	-7.667409	-14.48148	-8.179821
Cycle Time	-1.468105	-9.690312	-1.468274	-9.768212
LN (Number of Bidders)	4.303525	14.71496	4.341040	14.65868
Salvage Logging Indicator	-3.612643	-7.117134	n/a	n/a
Salvage Logging Indicator * Insect Attack Codes Indicator	n/a	n/a	-3.180700	-5.309739
Insect Attack Codes Indicator	n/a	n/a	-3.245697	-3.321124
Fort Nelson – Peace Zone	-2.838389	-3.109499	-3.859350	-4.415586
2004 auctions	-2.163179	-2.998854	-0.913152	-1.155361
2005 auctions	3.048903	3.828505	5.427141	5.111510
2006 auctions	-6.615775	-9.222904	-5.028780	-3.761993
2007 auctions	-4.978387	-5.369095	-3.691669	-2.369795
Decked Volume Fraction	77.20196	2.151776	71.45377	1.954931
LN (Volume per Tree)	5.115615	3.202992	5.522362	3.505561
Competitive Deciduous Indicator	n/a	n/a	-13.90859	-8.099196
Green MPB & Other Pest Attack Fraction	n/a	n/a	-5.694771	-3.447565
Red & Grey MPB Attack Fraction	n/a	n/a	-7.632740	-5.492323
Adjusted R^2	0.750153		0.753765	
***LN means the natural logarithm**				

Number of Bidders Equation

Variable	Benchmark Equation		Final Equation	
	Co-efficient	t - Statistic	Co-efficient	t - Statistic
Constant	1.171118	2.677185	-0.238409	-2.073105
Forecast Real Winning Bid	0.035539	18.81743	0.037132	18.66123
District Average Number of Bidders	0.144130	7.147795	0.131067	6.204260
Exchange rate($US/$CDN)	-2.175238	-3.638978	n/a	n/a
Partial cut fraction	-0.668524	-3.743705	-0.749709	-4.041101
Slope %	-0.004368	-2.944172	-0.004713	-3.061097
Horse logging fraction	-0.251382	-1.339970	-0.353329	-1.773344
Second Quarter Auctions	0.112632	2.561376	0.120251	2.758592
2004 auctions	-0.144920	-2.275288	-0.237125	-4.251207
2005 auctions	-0.236389	-2.712787	-0.456132	-8.498221
2006 auctions	0.638989	5.543554	0.333106	5.610483
2007 auctions	0.463751	3.525266	0.104200	1.681633
Highway Haul	n/a	n/a	0.066370	1.597435
LN (Volume / 1000)	n/a	n/a	-0.074440	-3.325353
Fire Damaged Fraction	n/a	n/a	0.217595	1.605715
Adjusted R^2	0.356338		0.353896	

The new equations result in greater statistical accuracy and reliability.

To implement the new equations in the *Interior Appraisal Manual*, the two equations are reduced to one equation. This is done by substituting the Number of Bidders equation into the Estimated Winning Bid Equation (and thereby eliminating the variable: LN (Number of Bidders). The Insect Attack Codes Indicator is zero for implementation.

4. SPECIFIED OPERATIONS

The auction dataset used to develop MPS is comprised of 1112 auctions. There are some harvesting situations that are not represented in the auction dataset (for example, skyline yarding) and therefore, a specified operation cost estimate is used in the calculation of stumpage rates. See Appendix 2 for definitions of each specified operation.

The specified operations are shown below. Cost estimates from the current Interior Appraisal Manual are used for 1, 2, 3, and 6 below.

Specified Operations	Current Adjustment	Update 2008
1. Rail Haul	Appraisal Manual	Appraisal Manual
2. Barge/Ferry	Appraisal Manual	Appraisal Manual
3. Dump, Boom, Tow, Dewater and Reload	Appraisal Manual	Appraisal Manual
4. Camp Costs	$2.43/$m^3$	$2.69/$m^3$
5. Skyline Yarding	$8.07/$m^3$	$8.42/$m^3$
6. Suitable Secondary Structure Survey	n/a	Appraisal Manual (effective July 25, 2008)

5. TENURE OBLIGATION ADJUSTMENTS

As outlined in the Interior Tenure Obligations Adjustment paper (dated June 5, 2006), the adjustments are based on cost surveys.

The tenure obligation adjustments are shown below.

Tenure Obligation	Current Adjustment	Update 2008
Forest Management Administration Cost*	Appraisal Manual	Appraisal Manual
Road Development Cost	Appraisal Manual	Appraisal Manual
Road Management Cost	Appraisal Manual	Appraisal Manual
Market Logger Road Cost	$1.21/$m^3$	$1.16/$m^3$
Basic Silviculture Cost (Average)	$1165/ha	$1165/ha
Return to Forest Management	1.037	1.034
Low Grade Percent Adjustment	Mark Specific 1/(1-%low grade/100)	Mark Specific 1/(1-%low grade/100)

* Formerly Forest Planning and Administration Cost

6. SUMMARY

The new equations, specified operations and tenure obligation adjustments will be used to calculate the average market price for the Interior, starting July 1, 2008.

APPENDIX 1

FINAL ESTIMATED WINNING BID

Dependent Variable: BID*109.3/CPI
Method: Least Squares
Date: 06/04/08 Time: 13:34
Sample: 1 1900 IF MARK_IN_1112>0
Included observations: 1112
White Heteroskedasticity-Consistent Standard Errors & Covariance

	Coefficient	Std. Error	t-Statistic	Prob.
Constant	43.55180	5.785758	7.527415	0.0000
Exchange Rate	-18.64961	6.802011	-2.741778	0.0062
Real Stand Selling Price	0.161846	0.026913	6.013594	0.0000
Fir Fraction	6.160909	2.284018	2.697400	0.0071
HemBal Fraction	-18.24041	1.662936	-10.96880	0.0000
Cedar Fraction	31.23688	4.775144	6.541557	0.0000
LN (Volume/1000)	2.303979	0.251597	9.157420	0.0000
1/Volume per tree * (1- HemBal Fraction)	-1.145244	0.579689	-1.975618	0.0485
Grade 3 Fraction	14.45331	1.907292	7.577925	0.0000
Deciduous Fraction * (1- Competitive Deciduous Indicator)	-6.518754	2.488573	-2.619475	0.0089
Decay Fraction	-16.29677	6.519671	-2.499631	0.0126
Cableyard Fraction	-6.882986	1.913126	-3.597770	0.0003
Helicopter Logging Fraction	-51.23053	7.503510	-6.827542	0.0000
Horse Logging Fraction	-6.193952	1.241738	-4.988130	0.0000
Fire Damaged Fraction	-14.48148	1.770391	-8.179821	0.0000
Cycle Time	-1.468274	0.150311	-9.768212	0.0000
LN (Number of Bidders)	4.341040	0.296141	14.65868	0.0000
Salvage Logging Indicator * Insect Attack Codes Indicator	-3.180700	0.599031	-5.309739	0.0000
Insect Attack Codes Indicator	-3.245697	0.977289	-3.321124	0.0009
Fort Nelson – Peace Zone	-3.859350	0.874029	-4.415586	0.0000
2004 Auctions	-0.913152	0.790360	-1.155361	0.2482
2005 Auctions	5.427141	1.061749	5.111510	0.0000
2006 Auctions	-5.028780	1.336733	-3.761993	0.0002
2007 Auctions	-3.691669	1.557801	-2.369795	0.0180
Deck Fraction	71.45377	36.55053	1.954931	0.0508
LN (Volume per Tree)	5.522362	1.575315	3.505561	0.0005
Competitive Deciduous Indicator	-13.90859	1.717280	-8.099196	0.0000
Green MPB & Other Pest Attack Indicator	-5.694771	1.651824	-3.447565	0.0006
Red & Grey MPB Attack Fraction	-7.632740	1.389711	-5.492323	0.0000

R-squared	0.759971	Mean dependent var	31.61501
Adjusted R-squared	0.753765	S.D. dependent var	13.17277
S.E. of regression	6.536600	Akaike info criterion	6.618444
Sum squared resid	46273.49	Schwarz criterion	6.749203
Log likelihood	-3650.855	Hannan-Quinn criter.	6.667885
F-statistic	122.4626	Durbin-Watson stat	1.750333
Prob(F-statistic)	0.000000		

FINAL NUMBER OF BIDDERS

Dependent Variable: LOG(NB/MARK_IN_1112)
Method: Least Squares
Date: 06/04/08 Time: 13:33
Sample: 1 1900 IF MARK_IN_1112>0
Included observations: 1112
White Heteroskedasticity-Consistent Standard Errors & Covariance

	Coefficient	Std. Error	t-Statistic
Constant	-0.238409	0.115001	-2.073105
Forecast Real Winning Bid	0.037132	0.001990	18.66123
District Average Number of Bidders	0.131067	0.021125	6.204260
Partial Cut Fraction	-0.749709	0.185521	-4.041101
Slope %	-0.004713	0.001540	-3.061097
Horse Logging Fraction	-0.353329	0.199244	-1.773344
Second Quarter Auctions	0.120251	0.043592	2.758592
2004 Auctions	-0.237125	0.055778	-4.251207
2005 Auctions	-0.456132	0.053674	-8.498221
2006 Auctions	0.333106	0.059372	5.610483
2007 Auctions	0.104200	0.061964	1.681633
Highway Haul	0.066370	0.041548	1.597435
LN (Volume/1000)	-0.074440	0.022386	-3.325353
Fire Damaged Fraction	0.217595	0.135513	1.605715

R-squared	0.361456	Mean dependent var	
Adjusted R-squared	0.353896	S.D. dependent var	
S.E. of regression	0.552732	Akaike info criterion	
Sum squared resid	335.4530	Schwarz criterion	
Log likelihood	-911.5306	Hannan-Quinn criter.	
F-statistic	47.81054	Durbin-Watson stat	
Prob(F-statistic)	0.000000		

VARIABLES AND DEFINITIONS

Variable	Definition
Estimated Winning Bid	The market price for the cutting authority in $/m3
Real Stand Selling Price	Estimated stand lumber value ($/m3) in 1997 dollars. Weighed average of (LRF * Lumber price by coniferous species). See Appraisal Manual section 7.3.
Volume Per Hectare/1000	Total net coniferous cruise volume (cubic metres per hectare) / 1000.
Partial Cut Fraction	Fraction of the harvest method volume that is appraised as partial cut. PC = (100-CAPCUT%)/100. See section 4.9 of Appraisal Manual for definition of CAPCUT%. The 80% limit in section 4.9 does not apply.
Fir Fraction	Fraction of the total net coniferous volume that is Douglas Fir.
Volume	Total net coniferous cruise volume (m3)
Cableyard Fraction	Fraction of total harvest method volume that is appraised as overhead cable yarding.
Helicopter Logging Fraction	Fraction of total harvest method volume that is appraised as helicopter yarding.
Horse Logging Fraction	Fraction of the total harvest method volume that is appraised as horse yarding.
Fire Damage Fraction	Fraction of total net coniferous cruise volume that is fire damaged.
Cycle Time	Hauling round trip cycle time (Primary CT (hrs) + Secondary CT (hrs)). See section 4.5.1 of Appraisal Manual.
HemBal Fraction	Fraction of total net coniferous volume that is Hemlock and Balsam.
Cedar Fraction	Fraction of total net coniferous volume that is Cedar.
Salvage	Where greater than one third of the net coniferous cruise volume is attacked by mountain pine beetle or other pests, salvage = 1, otherwise salvage = 0.
Volume per Tree	Cutting permit average volume per tree from the cruise (m3).
Deciduous Fraction	Total net deciduous cruise volume (m3) / (total net deciduous cruise volume (m3) + total net coniferous cruise volume (m3)).
Slope %	Cutting permit average slope from cruise.
District average number of bidders	Average number of bidders by district from

	the auction dataset.
Decay	Prorated coniferous species decay (%) from the cruise / 100.
Zone 9	Fort Nelson – Peace selling price zone variable. Zone 9 = 1 if cutting authority is appraised with selling price zone 9, otherwise Zone 9 = 0.
2003 Auctions	If auction sold in 2003 then AUC 2003 = 1.
2004 Auctions	If auction sold in 2004 then AUC 2004 = 1.
2005 Auctions	If auction sold in 2005 then AUC 2005 = 1.
2006 Auctions	If auction sold in 2006 then AUC 2006 = 1.
2007 Auctions	If auction sold in 2007 then AUC 2007 = 1.
Deck Fraction	Fraction of timber sale total net coniferous cruise volume that has been felled and decked.
Decked Volume	Total net coniferous volume that has been felled and decked in the timber sale (m^3).
Exchange Rate	Exchange rate ($US/$C). Bank of Canada three month average rate beginning four months prior to the stumpage rate effective date, as published by Revenue Branch.
Grade 3 Fraction	Fraction of coniferous billed volume that was Grade 3. In the modeling dataset this was set to zero for sales December 5, 2005 and later, because after that date Bids applied to Grade 3 as well as green sawlogs. This variable is set to zero for calculation of the average market price because grade 3 is no longer a valid grade.
Second Quarter Auctions	If auction sold in April to June Q2 = 1.
Consumer Price Index	Monthly B.C. Consumer Price Index (CANSIM 326-0020, 2002 = 100) X 1.1787
Consumer Price Index Factor	CPIF = CPI/109.3
Insect Attack Codes Indicator	If volume of pest attack unavailable, Insect Attack Codes Indicator = 1.
Highway Haul	1 if primary haul method is highway.
Green MPB & Other Pest Attack Fraction	Fraction of the total net coniferous volume that is lodgepole pine green attack plus the fraction of the total net cruise volume that is other attack.
Red & Grey MPB Attack Fraction	Fraction of the total net cruise volume that is lodgepole pine red attack plus the fraction of the total net cruise volume that is lodgepole pine grey attack.
Competitive Deciduous Indicator	If upset stumpage rate is determined under section 7.5.1(5) Competitive Deciduous = 1

APPENDIX 2

DEFINITIONS OF SPECIFIED OPERATIONS

If sufficient auction data is not available, the ministry will, for those identified situations, implement specified operations.

The specified operations will be used to adjust the MPS stumpage rate for the estimated incremental cost of the identified situation. The explicit assumption is that if a bidder was faced with a similar situation he or she would lower the bid by the extra cost incurred because of the identified situation.

The situations that may be eligible for specified operations adjustment will be determined according to the following principles:

- The expectation that a bid would be influenced by this situation;
- representation (number of samples, if any, in the auction data set);
- materiality of estimated cost differential (supported by verifiable financial data); and,
- statistical analysis (including the premise that other represented situations and variables in the MPS database and equations may serve as a proxy for the situation in question).

The ministry, after considering the above and any other relevant technical information, may or may not designate the situation as an identified situation eligible for a specified operations and, if eligible, specify the dollars per cubic metre adjustment.

The ultimate objective is to have a representative auction database and hence, few, if any, specified operations adjustments.

The following are identified as specified operations for the Interior MPS. Cost estimates from the current Interior Appraisal Manual are used for 1, 2, 3, and 6 below:

1. Rail Haul
   - Rail haul including truck to rail transfer and rail transport.
2. Barge/Ferry
   - Barge/ferry used to truck haul (private).
   - Barge/ferry not used for truck haul (private).
3. Dump, Boom, Tow, Dewater, Reload
   - Dump, boom
   - Tow
   - Dewater and reload
4. Camp costs
   - Cost estimate is $\$2.69/m^3$
5. Skyline Yarding
   - Cost estimate is $\$8.42/m^3$

6. Suitable Secondary Structure Survey
    - Survey to determine adequate stocking density of suitable secondary structure as per the *Forest Planning and Practices Regulation*