COAST

MARKET PRICING SYSTEM

Update – 2017

December 15, 2017

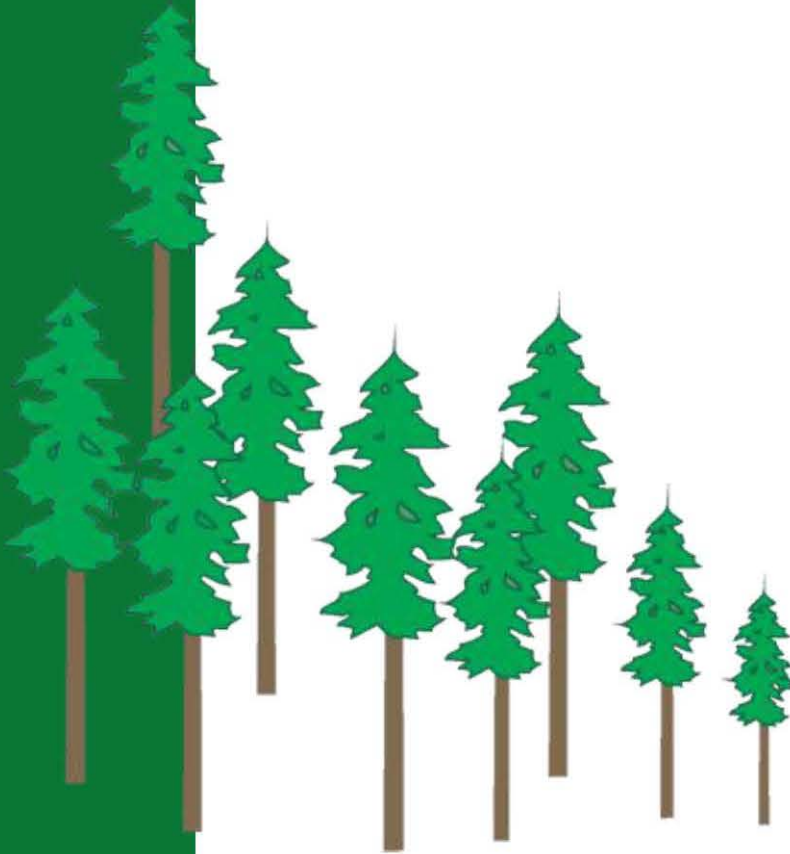Timber Pricing Branch

Coast Market Pricing System – Update 2017

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1. INTRODUCTION

The purpose of this paper is to provide an overview of the December 15, 2017 update to the Coast Market Pricing System (MPS). [1]

2. AUCTION DATASET

The auction dataset used in the update contains winning bids and data from 648 sales over the 11 year period July 1, 2006 through June 30, 2017.

3. BENCHMARK EQUATIONS

With the new auction dataset, the 2016 equations were re-estimated using the new dataset. No other changes were made.

The results are the benchmark equations, on the following pages.

4. FINAL EQUATIONS

There were substantial changes in the 2017 Coast MPS Update.   Besides the usual tweaks aimed at improving the accuracy of the model there were changes aimed at increasing the market sensitivity of the model. These included:

- Expanding the dataset to include a longer time span, particularly to include a full market cycle. This gives the market variables more scope to operate without relying on annual dummy variables.
- New lumber variables, allowing the regression to recognize more nuances of market signals, increasing overall market sensitivity.
- An explicit export share variable in place of the confusing and not very effective export adjusted log AMV's.
- An aggregate market demand for coastal logs variable as represented by total coastal harvest on all lands and tenures. Big swings in Coastal harvest are driven primarily by aggregate market demand factors so total coast harvest can represent macro demand conditions.
- Removal of the annual dummy variables which forces the regression to place more importance on the real market variables.

The overall impact of these changes is a big increase in sensitivity to live market variables as opposed to reliance on annual dummies which operate with long lags. The adjusted r-squared of the final model is only a fraction lower than the benchmark despite the removal of 10 annual dummy variables.   This change will allow stumpage to stay much more current to market conditions WITHOUT requiring an MPS update to get new annual dummies in place.   This is a big improvement to MPS.

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[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 *Coast Appraisal Manual (CAM)*. The *Coast Appraisal Manual* contains the policies and procedures referred to in Section 105 of the *Forest Act*.

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EQUATIONS:

Winning Bid – 2016 and Benchmark

	Final 2016 Equation		11 Year benchmark	
Dependent Variable	**Real Winning Bid**		**Real Winning Bid**	
Explanatory Variable	**Coefficient**	**t-Statistic**	**Coefficient**	**t-Statistic**
Constant	-22.12	-4.51	-24.78	-7.57
3-Mo. Ave. Export Adjusted Log Selling Price	0.624	8.43	0.7259	18.22
Cedar and Cypress	11.13	3.17	13.01	4.79
Gambier Dist 400	-6.16	-3.16	-5.980	--4.15
Cruise Grades	4.45	2.79	4.935	4.46
Conventional Slope	-0.250	-6.55	-0.2143	-7.77
Helicopter Logging	-28.90	-10.59	-31.50	-17.01
Volume per Hectare/1000	12.87	4.84	12.28	6.40
Number of Bidders	1.98	9.25	2.145	14.41
Location	-0.0557	-4.91	-0.05578	-6.40
Second Growth Fir	11.79	5.29	9.419	5.60
Isolated	-5.60	-4.58	-4.847	-5.36
Lumpsum	-4.28	-3.44	-3.692	-3.59
Year Ended June 2008	n/a	n/a	-4.408	-2.797
Year Ended June 2009	n/a	n/a	-8.861	-5.524
Year Ended June 2010	n/a	n/a	-7.657	-4.825
Year Ended June 2011	n/a	n/a	-5.204	-3.211
Year Ended June 2012	0.40	0.29	-4.587	-3.02
Year Ended June 2013	2.49	1.84	-2.638	-1.77
Year Ended June 2014	5.24	3.13	-0.965	-0.619
Year Ended June 2015	0.97	0.59	-4.956	-3.171
Year Ended June 2016	n/a	n/a	5.034	3.286
Year Ended June 2017	n/a	n/a	4.238	2.652
Number of Observations	298		648	
Adjusted R^2	0.735		0.786	

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Number of Bidders – 2016 and Benchmark

	Final 2016 Equation		11 Year benchmark	
Dependent Variable	**Real Winning Bid**		**Real Winning Bid**	
Explanatory Variable	**Coefficient**	**t-Statistic**	**Coefficient**	**t-Statistic**
Constant	-1.86	-2.75	-2.350	-4.46
LN (Volume/1000)	0.495	3.03	0.09147	16.54
Predicted Bid	0.128	12.15	0.5843	7.09
District Average Number of Bidders	0.314	2.77	0.3222	2.73
Year Ended June 2008	n/a	n/a	0.1777	0.93
Year Ended June 2009	n/a	n/a	-0.9458	-2.77
Year Ended June 2010	n/a	n/a	0.7009	1.96
Year Ended June 2011	n/a	n/a	1.612	4.86
Year Ended June 2012	-0.20	-0.68	0.8940	2.57
Year Ended June 2013	-0.73	-2.41	0.6177	1.86
Year Ended June 2014	-1.85	-5.42	0.2587	0.81
Year Ended June 2015	-0.57	-1.82	-0.5957	-1.73
Year Ended June 2016	n/a	n/a	0.4449	1.29
Year Ended June 2017	n/a	n/a	-0.5434	-1.62
Number of Observations	298		648	
Adjusted R^2	0.474		0.433	

Note: LN means natural logarithm

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Winning Bid – Benchmark and 2017 Final

Explanatory Variable	11 Year benchmark		2017 Final	
	Coefficient	t-Statistic	Coefficient	t-Statistic
Constant	-24.78	-7.57	-56.03	-12.14
3-Mo. Ave. Export Adjusted Log Selling Price	0.7259	18.22	n/a	n/a
3-Mo. Ave. Domestic Log Selling Price	n/a	n/a	0.6208	11.79
Cedar Lumber	n/a	n/a	0.04081	7.642
Fir Lumber	n/a	n/a	0.02708	3.246
Hemlock Lumber	n/a	n/a	0.01403	1.942
Cedar and Cypress	13.01	4.79	n/a	n/a
Cypress	n/a	n/a	36.27	4.404
Gambier Dist 400	-5.980	-4.15	-7.239	-3.681
Cruise Grades	4.935	4.46	6.444	4.382
Conventional Slope	-0.2143	-7.77	-0.2664	-7.003
Helicopter Logging	-31.50	-17.01	n/a	n/a
Heli Land Drop	n/a	n/a	-43.11	-14.51
Heli Water Drop	n/a	n/a	-34.50	-8.177
Volume per Hectare/1000	12.28	6.40	20.63	7.499
Number of Bidders	2.145	14.41	2.812	13.95
Location	-0.05578	-6.40	-0.07669	-6.345
Second Growth Fir	9.419	5.60	7.579	2.288
Isolated	-4.847	-5.36	-7.744	-6.247
Lumpsum	-3.692	-3.59	-5.623	-4.165
Export Share * Non-Cedar-Cypress	n/a	n/a	31.31	4.966
Total Coast Harvest	n/a	n/a	0.8928	3.000
Year Ended June 2008	-4.408	-2.797	n/a	n/a
Year Ended June 2009	-8.861	-5.524	n/a	n/a
Year Ended June 2010	-7.657	-4.825	n/a	n/a
Year Ended June 2011	-5.204	-3.211	n/a	n/a
Year Ended June 2012	-4.587	-3.02	n/a	n/a
Year Ended June 2013	-2.638	-1.77	n/a	n/a
Year Ended June 2014	-0.965	-0.619	n/a	n/a
Year Ended June 2015	-4.956	-3.171	n/a	n/a
Year Ended June 2016	5.034	3.286	n/a	n/a
Year Ended June 2017	4.238	2.652	n/a	n/a
Number of Observations	648		648	
Adjusted R^2	0.786		0.785	

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Number of Bidders – Benchmark and 2017 Final

Explanatory Variable	11 Year benchmark		2017 Final	
	Coefficient	t-Statistic	Coefficient	t-Statistic
Constant	-2.350	-4.46	-1.901	-3.861
LN (Volume/1000)	0.09147	16.54	0.2561	2.111
Predicted Bid	0.5843	7.09	0.554	14.83
District Average Number of Bidders	0.3222	2.73	0.7059	0.08456
Year Ended June 2008	0.1777	0.93	n/a	n/a
Year Ended June 2009	-0.9458	-2.77	n/a	n/a
Year Ended June 2010	0.7009	1.96	n/a	n/a
Year Ended June 2011	1.612	4.86	n/a	n/a
Year Ended June 2012	0.8940	2.57	n/a	n/a
Year Ended June 2013	0.6177	1.86	n/a	n/a
Year Ended June 2014	0.2587	0.81	n/a	n/a
Year Ended June 2015	-0.5957	-1.73	n/a	n/a
Year Ended June 2016	0.4449	1.29	n/a	n/a
Year Ended June 2017	-0.5434	-1.62	n/a	n/a
Number of Observations	648		648	
Adjusted R^2	0.433		0.370	

Note: LN means natural logarithm

4. SPECIFIED OPERATIONS

The auction dataset used to develop MPS is comprised of 648 auctions. There are some harvesting situations that are not represented in the auction dataset (for example, helicopter single standing stem selection) 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.

Specified Operations	March 2016 Update	December 2017 Update
Skyline Logging	Appraised as heli	Appraised as heli
Inland Water Log Transportation	$5.62/m3	$6.75/m3
Tree Crown Modification	$35.39/tree (old growth)	$35.05/tree (old growth)
	$16.86/tree (2nd growth)	$15.17/tree (2nd growth)
Clayoquot Sound Operating Costs	$6.95/m3	$7.13/m3
Helicopter Single Standing Stem Selection	$37.78/m3	$37.78/m3
De-stumping for Root Disease Control	$1,114/ha	$1,114/ha
Ecosystem Based Management	$3.72/m3	$4.13/m3
Haul Distance Above 100km	$0.135/m3 per km beyond 100km	$0.135/m3 per km beyond 100km
High Development Cost (only applies to BCTS upset rates)	See Section 4.4.9 of the Coast Appraisal Manual	See Section 4.4.9 of the Coast Appraisal Manual

5. TENURE OBLIGATION ADJUSTMENTS

As outlined in the Coast Tenure Obligations Adjustment paper (dated July 1, 2012), the adjustments are based on cost surveys.

The tenure obligation adjustments are shown below.

Tenure Obligations	March 2016 Update	December 2017 Update
Forest Planning & Administration Cost	$10.54/m3	$13.29/m3
Low Volume Cost	$7.51/m3	$7.51/m3
Road Development Cost	See Section 5.3 of CAM	See Section 5.3 of CAM
Road Management Cost	$1.36/m3	$1.90/m3
Road Use Charges	Approved actuals	Approved actuals
Basic Silviculture Cost	$2.83-$6.83 /m3	$3.01-$10.64 /m3
BCTS Infrastructure	$0.13/m3	$0.18/m3
Low Grade Adjustment	See Section 5.7 of CAM	See Section 5.7 of CAM
Return to Forest Management	1/ (1-% low grade)	1/ (1-% low grade)

6. SUMMARY

The new final equation, specified operations and tenure obligation adjustments will be used to calculate stumpage rates on the Coast, starting December 15, 2017.

APPENDIX 1

FINAL ESTIMATED WINNING BID

Dependent Variable: WB*148/CPI
Method: Least Squares
Date: 10/19/17   Time: 11:56
Sample: 1 914 IF IN_11_YEAR=1
Included observations: 648

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-56.02804	4.615821	-12.13826	0.0000
NB	2.812062	0.201547	13.95238	0.0000
ALP_DOM*148/CPI	0.620820	0.052658	11.78967	0.0000
CEDAR_LUMBER_AMV*CEDAR*148/CPI	0.040808	0.005340	7.642234	0.0000
FIR_LUMBER_AMV*FIR*148/CPI	0.027080	0.008343	3.245966	0.0012
HEMLOCK_LUMBER_AMV*HEMLOCK*148/ CPI	0.014032	0.007226	1.941881	0.0526
CYPRESS	36.26700	8.234571	4.404237	0.0000
SLOPE*(1-HELI)	-0.266355	0.038034	-7.003142	0.0000
HELI_LAND	-43.11316	2.971447	-14.50915	0.0000
HELI_WATER	-34.50390	4.219481	-8.177287	0.0000
VPH/1000	20.62512	2.750299	7.499228	0.0000
LOCATION	-0.076688	0.012086	-6.344979	0.0000
(FIR)*SG	7.578621	3.311934	2.288277	0.0225
GAMB400_DUM	-7.239376	1.966462	-3.681423	0.0003
CRUISE_GRADES	6.444171	1.470747	4.381563	0.0000
ISOLATED	-7.744018	1.239696	-6.246706	0.0000
LUMPSUM	-5.622915	1.350102	-4.164807	0.0000
EXP_EXP_SHARE_12MR*(1-CEDAR- CYPRESS)	31.30552	6.304359	4.965695	0.0000
TOT_COAST_HARV_12MR	0.592793	0.197624	2.999592	0.0028

R-squared	0.790966	Mean dependent var		40.33850
Adjusted R-squared	0.784984	S.D. dependent var		23.51814

FINAL NUMBER OF BIDDERS

Dependent Variable: NB
Method: Least Squares
Date: 10/19/17   Time: 11:58
Sample: 1 914 IF IN_11_YEAR=1
Included observations: 648

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.901167	0.492362	-3.861320	0.0001
WBF*148/CPI	0.055409	0.003736	14.83245	0.0000
DANB_648_11YR	0.705928	0.084562	8.348077	0.0000
LOG(VOL/1000)	0.256098	0.121317	2.110991	0.0352
LUMPSUM	0.325194	0.191560	1.697611	0.0901

R-squared	0.373821	Mean dependent var		4.262346
Adjusted R-squared	0.369925	S.D. dependent var		2.363230

VARIABLES AND DEFINITIONS

PREDICTED BID	Used in the Number of Bidders equation: The estimated winning bid for the cutting authority from the corresponding winning bid equation, expressed in $/m^3.
3 MONTH AVERAGE LOG SELLING PRICE	Average coniferous log selling price estimate expressed in $/m^3. This is based upon a consideration of log grades and species for the cutting authority area, and schedules of log market values collected and published by the Timber Pricing Branch.
3 MONTH AVERAGE EXPORT ADJUSTED LOG SELLING PRICE	As above but the regular, domestic log prices have been adjusted to represent an average including export values.
CEDAR LUMBER	A composite of cedar lumber prices times the fraction of cedar (C$/mfbm, net of duties).
FIR LUMBER	A composite of fir lumber prices times the fraction of fir.
HEMLOCK LUMBER	A composite of hemlock lumber prices times the fraction of hemlock (C$/mfbm, net of duties).
CEDAR AND CYPRESS	The fraction of the coniferous cruise volume that is cedar and cypress (C$/mfbm, net of duties).
CYPRESS	The fraction of the coniferous cruise volume that is cypress.
SECOND GROWTH FIR	The fraction of the coniferous cruise volume that is Douglas fir, if the appraisal is classified as second growth. Zero if the appraisal is classified as old growth.
VOLUME PER HECTARE	Cruised volume of coniferous timber per hectare. Expressed in m^3/ha and is rounded to 2 decimal places.
PIECE SIZE	The net coniferous cruised volume per 10 m log expressed in m^3. PIECESIZE is expressed in m^3 and is rounded to 2 decimal places.
HELICOPTER LOGGING	The fraction of the total net cruise volume, including deciduous volume, of timber in a cutting authority area that must be helicopter yarded or yarded by skyline where logs are fully suspended more than 600 m in a straight line to the centre of the closest possible landing. This is calculated by dividing the total volume of timber that must be helicopter yarded or skyline yarded over 600 m by the total net cruise

volume of the cutting authority area. HELI is in decimal form, rounded to 2 decimal places.

CRUISE GRADES	If cruise is used as a source for log grades for the appraisal for greater than 50 percent of the total net cruise volume, then CRUISE GRADES = 1, otherwise CRUISE GRADES = 0
DISTANCE TO GAMBIER	POA distance is the average straight line distance, weighted by net cruise volume, between the geographic centre of each cutblock in the cutting authority area and Gambier Island.
GAMBDIST400	Where DISTANCE TO GAMBIER is greater than or equal to 400, GAMBDIST400 = 1, otherwise GAMBDIST400 = 0.
DISTRICT AVERAGE NUMBER OF BIDDERS	The average number of bidders for the forest district the cutting authority area is located within is listed in Table 4-2 of the CAM.
VOLUME	That part of the total net cruise volume in the cutting authority area that is coniferous timber except that where the cutting authority is a timber licence or is issued under a licence with an AAC greater than 10 000 m^3, then VOL = 29,900. VOL is expressed in m^3, rounded to the nearest whole number.
CPIF	The BC Consumer Price Index approved by the director for use on the effective date of the appraisal, reappraisal or quarterly adjustment, divided by the base CPI of 109.3.
LOCATION	The net cruise volume weighted average straight line distance measured in kilometres between the geographic centre of each part of a cutting authority area and the nearest support centre that is closest to that part of the cutting authority area.
ISOLATED	Isolated =1, if all parts of the cutting authority area are accessible by air or water only and is not serviced by public ferry service.
LUMPSUM	If the cutting authority is a cruise based competitive timber sale with a stand as a whole rate then LUMPSUM = 1, otherwise LUMPSUM = 0.

Export Share * Non-Cedar-Cypress	Export Share of non- cedar-cypress harvest (as published in monthly appraisal parameters) time the share of non-cedar-cypress.
Total Coast Harvest	Total Coast harvest (all lands and tenure types) in a recent 12 month period (million m3, as published in monthly appraisal parameters)
Year Ended June 2007	If the timber sale was sold in the 12 months ended June 30, 2007 then 1, otherwise zero.
Year Ended June 2008	etc.

APPENDIX 2

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 operation 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 Coast MPS.

Cost estimates from the current *Coast Appraisal Manual* are used for a – f below.

a) Skyline Logging

For those areas within a cutblock that:

- are 600 metres or greater measured in a straight line horizontal distance from the centre of the closest possible landing or place where a landing may be located, and

- are yarded by skyline.

b) Inland Water Transportation

- Where logs must be towed on Great Central, Owikeno or Powell Lake or other authorized inland water location.

c) Clayoquot Sound

- Recognizes the higher level of planning and engineering required by the scientific panel recommendations accepted by the government of British Columbia

- Applies to Hesquiat Peninsula, Esowista Peninsula and the islands, sea and all waters draining into the Pacific Ocean from the height of land between Escalante Point and Quisitis Point.

d) Helicopter Single Standing Stem Selection

- Where single standing trees are marked, limbed, undercut, wedged and then broken from the stump and removed using a helicopter.

- Applies where this method is the only harvest method permitted on an area due to terrain and environmental constraints.

e) Destumping For Root Disease Control

- Where tree stumps must be lifted from the ground for that part of the area where destumping for root disease control is required.

f) Tree Crown Modification

- To protect the standing trees adjacent a harvested area by trimming tree crowns to reduce sail area and decrease the potential for windthrow damage.

g) Ecosystem Based Management

- Applies where Section 93.4 of the *Land Act* requires a higher level of land use planning and/or different harvesting methods as described in the *Coast Appraisal Manual*.

h) Haul Distance Above 100km

- A specified operation cost estimate for permits with haul distances greater than 100km from the cutting authority area to the final log dump.

i) BCTS High Development Cost

- Allows an upset rate reduction for BCTS auction sales with development costs exceeding $11.88/m3.