

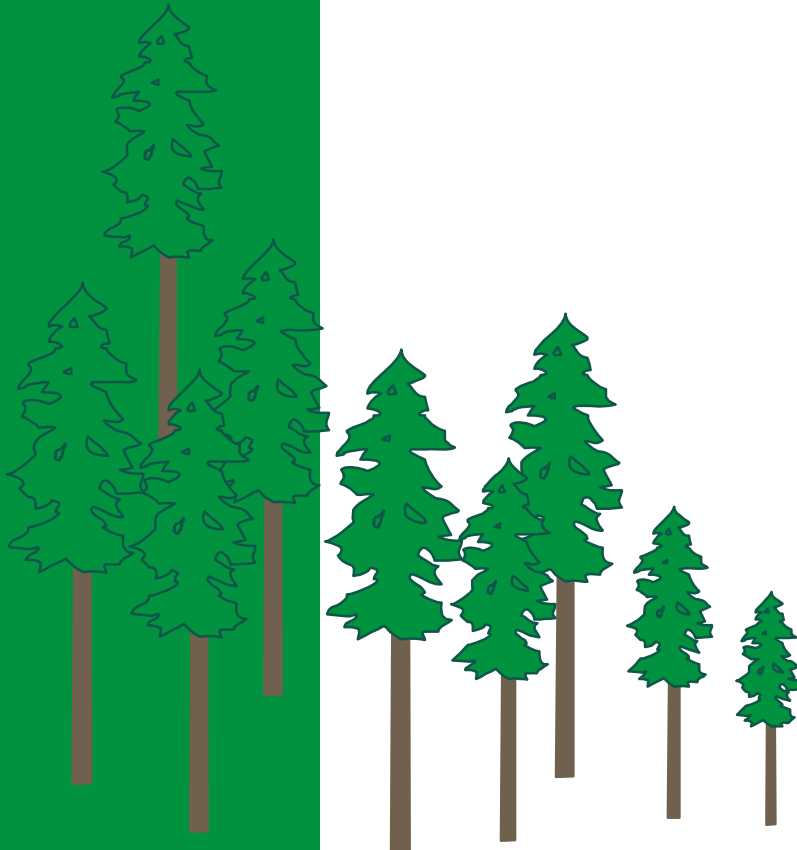


**BRITISH
COLUMBIA**

Ministry of Forests
and Range

INTERIOR MARKET PRICING SYSTEM

Average Market Price



June 5, 2006



Revenue
Branch

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1. Introduction

The purpose of this paper is to explain the calculation of the average market price of timber in the Interior.

This is a technical paper, written for those interested in the detail of stumpage calculations ¹.

The average market price is a key parameter in the Interior MPS; it sets the overall level of stumpage.

2. Calculation of the Average Market Price

On July 1, 2006, and every three months after July 1, 2006, the average market price (AMP) of timber in the Interior will be calculated, as follows.

$$AMP = \frac{\sum_i (SR_i * V_i^{sl} + 0.25 * V_i^{pl})}{\sum_i (V_i^{sl} + V_i^{pl})} \quad (1)$$

Where:

AMP	=	Average Market Price
SR_i	=	MPS stumpage rate for coniferous saw logs, for cutting permit i ; $SR_i \geq \$0.25$ per cubic metre
V_i^{sl}	=	Coniferous saw log (Grades 1 and 2) volume, for cutting permit i
V_i^{pl}	=	Coniferous pulp log and undersized trees (Grades 4 and 6), for cutting permit i

The cutting permits (i) are major licensee permits, fully appraised, with at least 1,000 cubic metres billed in the 12 months beginning 14 months prior to July 1, 2006, and every three months after July 1, 2006. V_i^{sl} and V_i^{pl} for each permit is the volume actually billed during the same 12 month period.

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

In equation (1) above, SR_i is calculated as follows.

$$\begin{aligned} SR_i &= EWB_i - SO_i - TOA_i \\ SR_i &\geq \$0.25/m^3 \end{aligned} \tag{2}$$

Where:

- EWB_i = Estimated winning bid, based on auction sales, for cutting permit i
- SO_i = Specified operations, for cutting permit i
- TOA_i = Tenure obligation adjustments, for cutting permit i

3. Interior Log Grades

On April 1, 2006, the Interior log grades were changed to eliminate Grades 3 and 5 (dead trees) that were priced at \$0.25 per cubic metre.

However, EWB_i in equation (2) is based on auctions sold from January 1, 2001, through December 31, 2005, under the previous log grades.

On July 1, 2006, SR_i applies to a larger percentage of the timber and this will be accounted for as follows.

$$EWB_i = EWB_i^p * (1 - \alpha_i) + 0.25\alpha_i$$

Where:

- EWB_i = Estimated winning bid for saw logs under the new log grades, for cutting permit i
- EWB_i^p = Estimated winning bid for saw logs under the previous log grades, for cutting permit i
- α_i = Fraction of the saw log harvest on cutting permit i that is Grade 3

After April 1, 2006, α_i is not known. The average $\alpha_i(\alpha)$, from the auction sales will be used to estimate α_i . Further, noting that 95 percent of the former Grade 3 are saw logs under the new grades, α is 0.184.

So:

$$EWB_i = EWB_i^p * (1 - 0.184) + 0.25 * 0.184 \quad (3)$$

Where:

$EWB_i^p =$ Estimated winning bid under the previous log grades, for cutting permit i

Which simplifies to ²:

$$EWB_i = EWB_i^p * 0.816 + 0.046 \quad (4)$$

The factor 0.816 is called the log grade correction (LGC) and, therefore:

$$EWB_i = EWB_i^p * LGC + 0.046 \quad (5)$$

Finally, EWB_i^p is calculated as follows:

² For cutting permits with appraisal effective dates prior to April 1, 2006, see Appendix 3.
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Interior Equation

Variables	Co-efficients
Constant	37.65
Real Stand Lumber Price (\$/m ³)	0.20
Exchange Rate (C\$/US\$)	-9.91
Fir Fraction	8.49
HemBal Fraction	-12.37
Cedar Fraction	36.40
Volume per Hectare (m ³ /ha)/1000	10.87
Log of (Volume/1000)	3.36
1/Volume per tree * (1-HemBal fraction)	-2.58
Deciduous Fraction	-14.13
Decay Fraction	-33.81
Slope (%)	-0.03
Partial Cut Fraction	-2.17
Cable Yard Fraction	-10.97
Helicopter Fraction	-35.06
Horse Logging Fraction	-13.85
Fire Damage Fraction	-21.72
Cycle Time (hrs)	-2.46
Tow Distance (km)	-0.03
Salvage (1/0)	-3.40
Fort Nelson – Peace (1/0)	-3.76
2005 Auctions (1/0)	0.39
District Ave. Number of Bidders	0.60

$$EWB_i^p = (\text{the result of the above equation}) * \text{CPI} / 109.3$$

The definitions of the above variables are in Appendix 1.

The Interior equation above is derived from the two econometric equations in Appendix 2. The number of bidders equation is substituted into the winning bid equation and simplified. Some variables are then taken into account by multiplying their co-efficients by their means and adding the result to the constant.

4. Summary

The average market price is calculated every three months, starting on July 1, 2006, and will set the overall level of stumpage in the Interior.

Annually, the auction data set used to estimate the MPS equations will be updated. The equations will be refined and re-estimated. The specified operations and tenure obligation adjustments will also be updated.

Appendix 1

Appendix 1: List of Variables

Real Stand Average Lumber Value Index	Estimated stand lumber value (\$/m ³) in 1997 dollars. Weighted average of (LRF * lumber price by species).
Exchange Rate (\$Cdn/\$US)	Bank of Canada average monthly rate for the month beginning two months prior to the stumpage adjustment date.
Fir Fraction	Fraction of net coniferous cruise volume that is Douglas fir.
HemBal Fraction	Fraction of net coniferous cruise volume that is hemlock and balsam.
Cedar Fraction	Fraction of net coniferous cruise volume that is cedar.
Volume per Hectare/1000	Total net coniferous cruise volume per hectare (cubic metres per hectare)/1000.
LOG (Volume/1000)	Natural logarithm of (net coniferous cruise volume/1000).
1/Volume per Tree * (1-HemBal Fraction)	Volume/Tree = net coniferous cruise volume/number of coniferous stems in the cutting permit.
Deciduous Fraction	Net deciduous cruise volume/(net deciduous cruise volume + net coniferous cruise volume).
Decay Fraction	Weighted average species decay % from cruise/100.
Slope %	Weighted average harvest method side slope from cruise (%).
Partial Cut Fraction	Fraction of net coniferous cruise volume that is appraised as partial cut.
Cable Yard Fraction	Fraction of net coniferous cruise volume that is appraised as overhead cable yarding.
Helicopter Logging Fraction	Fraction of net coniferous cruise volume that is appraised as helicopter yarding.
Horse Logging Fraction	Fraction of net coniferous cruise volume that is appraised as horse yarding.
Fire Damage Fraction	Fraction of net coniferous cruise volume that is fire damaged.
Cycle Time	Hauling round trip cycle time from the landing to the point of appraisal or water dump site and return (hours).
Tow Distance	Lake tow distance (one way km).
Salvage Logging Indicator	1 if greater than one third of net coniferous cruise volume is attacked by mountain pine beetle or other forest pests, 0 otherwise.
Fort Nelson – Peace Zone (AMVZ9)	1 if cutting authority is appraised using Selling Price Zone 9, 0 otherwise.
2005 Auctions	1 for 2006 cutting permits.
District Average Number of Bidders	Average number of bidders by district from the auction dataset.
CPI	Monthly BC consumer price index (Stats Can-P110000).

Appendix 2

Appendix 2: Interior Winning Bid Equation

Dependent Variable: Real Winning Bid

Method: Least Squares

Sample: January 2001 to December 2005

Included observations: 1182

White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	24.40171	2.702258	9.030120	0.0000
Real stand average lumber value index	0.159428	0.021125	7.546786	0.0000
Fir fraction	6.796802	1.385871	4.904354	0.0000
HemBal fraction	-9.908752	1.881195	-5.267265	0.0000
Cedar fraction	29.15937	4.721543	6.175813	0.0000
Volume per hectare/1000	8.706226	2.849444	3.055413	0.0023
LOG(volume/1000)	2.691565	0.259593	10.36842	0.0000
1/Volume per tree * (1-HemBal fraction)	-2.069715	0.256723	-8.062047	0.0000
Grade 3 fraction	11.31771	1.687208	6.707950	0.0000
Deciduous fraction	-11.32074	2.520243	-4.491924	0.0000
Decay fraction	-27.08290	6.550829	-4.134271	0.0000
Cableyard fraction	-8.789590	1.425948	-6.164032	0.0000
Helicopter logging fraction	-28.08467	2.976973	-9.433969	0.0000
Horse logging fraction	-9.391041	1.088346	-8.628725	0.0000
Fire damaged fraction	-17.39914	1.165400	-14.92976	0.0000
Cycle time	-1.971888	0.143949	-13.69849	0.0000
Tow (Distance)	-0.026901	0.021584	-1.246343	0.2129
LOG(Number of Bidders)	5.341422	0.283647	18.83123	0.0000
Salvage logging indicator	-2.160891	0.546376	-3.954949	0.0001
Fort Nelson – Peace Zone	-3.008954	0.763534	-3.940827	0.0001
2002 auctions	-0.465792	0.651657	-0.714781	0.4749
2003 auctions	-2.056223	0.799835	-2.570809	0.0103
2004 auctions	-3.606570	0.689710	-5.229112	0.0000
2005 auctions	1.022189	0.833623	1.226200	0.2204
R-squared	0.689451	Mean dependent var		36.15659
Adjusted R-squared	0.683282	S.D. dependent var		12.74323
S.E. of regression	7.171592	Akaike info criterion		6.798228
Sum squared resid	59557.95	Schwarz criterion		6.901273
Log likelihood	-3993.753	F-statistic		111.7771
Durbin-Watson stat	1.622383	Prob(F-statistic)		0.000000

Appendix 2: Interior Number of Bidders Equation (continued)

Dependent Variable: LOG (Number of Bidders)

Method: Least Squares

Sample: January 2001 to December 2005

Included observations: 1182

White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	0.658527	0.471250	1.397406	0.1626
Forecast real winning bid	0.037255	0.001681	22.16828	0.0000
District average number of bidders	0.090192	0.014414	6.257363	0.0000
Exchange rate (\$Cdn/\$US)	-1.485989	0.736403	-2.017900	0.0438
Partial cut fraction	-0.325923	0.115309	-2.826510	0.0048
Slope %	-0.004579	0.001252	-3.657875	0.0003
Horse logging fraction	-0.318166	0.104049	-3.057847	0.0023
Salvage logging indicator	-0.105875	0.033700	-3.141695	0.0017
Spring auction indicator	0.221511	0.045055	4.916477	0.0000
Winter auction indicator	-0.073479	0.040227	-1.826619	0.0680
2002 auctions	-0.093070	0.052200	-1.782964	0.0749
2003 auctions	0.231395	0.081241	2.848263	0.0045
2004 auctions	0.026096	0.114182	0.228550	0.8193
2005 auctions	-0.132164	0.150419	-0.878641	0.3798
R-squared	0.417061	Mean dependent var		1.184766
Adjusted R-squared	0.410573	S.D. dependent var		0.706209
S.E. of regression	0.542186	Akaike info criterion		1.625360
Sum squared resid	343.3523	Schwarz criterion		1.685469
Log likelihood	-946.5876	F-statistic		64.27996
Durbin-Watson stat	1.806026	Prob(F-statistic)		0.000000

Appendix 3

Appendix 3: Transition Issues

Existing Cutting Permits

There will be a transition period where appraisals have effective dates prior to April 1, 2006, and therefore, do not have the new LRFs. For these appraisals:

$$SR_i = SR_i^p - (\alpha_i - \alpha) * C$$

Where:

- SR_i^p = SR_i calculated using the previous LRFs
- α_i = Alpha, as described in Section 2, for the cutting permit, using historical data (most recent year available, if no data is available use POA average)
- α = Average alpha from the dataset
- C = Value differential between green and dead saw logs (\$10)