Forward Averaging and the Price of Regular Self Serve Gasoline in Nova Scotia

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Abstract

Nova Scotia and New Brunswick regulated the price of gasoline, using formulae which are tailored to their needs, in July 2006. Nova Scotia sets the maximum and minimum regulated price of self serve gasoline while New Brunswick sets only the maximum price and leaves minimum price to be determined by the market forces. Nova Scotia regulator uses "forward averaging" in its pricing formula, the amount of which depends on the judgement of the regulator. New Brunswick does not have forward averaging in the formula. The forward averaging is used to counter the effect of fluctuating international gasoline prices on the regulated wholesale margin in Nova Scotia. The use of discretionary forward averaging amplifies fluctuations in prices. Consumers in Nova Scotia often complain that the regulated gasoline price increases at a higher rate when international price rises and falls at a slower rate when international price of gasoline falls. People in New Brunswick have no such complaint. An attempt is made in this paper, by taking data from New Brunswick and Nova Scotia, to quantify the magnitude of fluctuations in self serve regular price of gasoline and assess whether forward averaging element of the formula is needed.

Key words: Forward averaging, Regulated price, Price fluctuations, Pricing formula

1. Introduction

The purpose of this paper is to point out reasons for gasoline price fluctuations in Nova Scotia, which are higher than those in New Brunswick, despite regulated price of gasoline in both provinces since July 2006. These higher fluctuations are not caused by federal taxes, provincial HST or regulated margins for wholesalers and retailers. Of course, when taxes and margins are higher, price would be higher as well. But the price increase in Nova Scotia is higher than that explained by difference in taxes and margins and similarly price decrease is larger as well. But unfortunately, the increase in price when gasoline prices are rising is larger than the decline in prices when prices are falling. Consumers in Nova Scotia feel the pinch of rising prices when they observe that New Brunswick price of gasoline has not risen as much as in Nova Scotia. The media in Nova Scotia is also active in predicting change in price of gasoline one day prior to the scheduled announcement by the regulator, but more often than not, such predictions are off, some times way off the actual increase. For instance, the media predicted about 2 cents price increase for the regular self service gasoline on July 12th for Nova Scotia. This prediction was based on New Brunswick price increase which was announced on the same day. The maximum price of regular self serve gasoline increased from 120.8 cpl to 122.56 cpl. in New Brunswick. But on 13th July 2012 the Nova Scotia maximum price increased from 123.9 to 129.7 cpl and the minimum price increased from 121.8 cpl to 127.7 cpl. for regular self serve gasoline. The increase in price was about 3 times the increase predicted by the media.

The regulated price in Nova Scotia at present is effective from Friday while that of New Brunswick is effective from Thursday. Both provinces allow 6 cents per litre margin to the wholesalers. The minimum retail margin in Nova Scotia is 4.8 cpl and the maximum 6.6 cpl for regular self serve gasoline while it is 5.9 cpl maximum (with no minimum) in New Brunswick. Nova Scotia sets both minimum and maximum regulated price of gasoline, New Brunswick sets only the maximum prices. Transport cost (0.5 cpl. for Halifax area) is added at the wholesale level in Nova Scotia while it (the actual transport cost to the maximum of 2.5 cpl.) is added to the fixed maximum price. Federal tax is 10 cpl. is same throughout Canada. The provincial tax is 15.5 cpl. in Nova Scotia while it is 13.6 cpl in New Brunswick. Both these taxes are subject to HST which is 15% in Nova Scotia and 13% in New Brunswick.

Regulators in both provinces take 5 day average of highs and lows of gasoline prices in NY mercantile exchange in determining benchmark price and then add margins, taxes and transport costs. In Nova Scotia there are six pricing zones differentiated by transport cost. New Brunswick allows maximum of 2.5 cpl. for transport cost and the price at the pump reflects the actual transport cost, not the maximum. Thus, there is no need for gasoline zones in New Brunswick. Nova Scotia uses forward averaging correction to determine the base wholesale price. No forward averaging adjustment is done in New Brunswick.

2. Scope, data and methodology

The study in the paper is for months of June, July and August of 2012. During these three months gasoline prices both decreased and increased, which is required for our analysis. Data used in our study is culled from internet sources of the regulators of the provinces being studied.

First question encountered in the study was how to compare the to regulated prices as one province determines for Thursday and the other for Friday. Should the average of one province be adjusted by taking account of additional day and then reworking the whole series or take only the retail price changes in relation to the benchmark price changes? The latter approach seemed more appropriate as it does not require adjustment of a day's data in the series.

In order to dispel general feeling of public that prices rise more quickly than they fall, and denied by the Nova Scotia Utility and the Review Board which claims that both price increases and decreases use same formula, increases and decreases in the benchmark prices and its effect on prices at the pump are studied separately.

Since New Brunswick fixes only the maximum price of regular gasoline, the study first takes changes in Benchmark price and maximum regulated pump price in both provinces. A simple formula is used:

$\Delta M = \Delta B(1+t)$

where Δ refers to change, B is Benchmark price, M for maximum regulated price and t is rate of HST. If all other things (federal tax, provincial tax, wholesale and retail margins) are constant then

$\Delta M/\Delta B = (1+t)$

In other words, when the benchmark price rises by one cent per litre, price in New Brunswick should rise by 1.13 cents per litre and by 1.15 cents in Nova Scotia. If the benchmark price rises by one cent, then consumers will have to pay a price which is higher by one cent plus HST on one cent, which in New Brunswick is 13% and in Nova Scotia is 15%.

Table-1 for New Brunswick gives the results of the benchmark price increases and decreases during months of June, July and August 2012. The results are: $\Delta M/\Delta B = 1.13$ for both price increases and price decreases. The fractional difference in table-1 results is caused by rounding of data by New Brunswick regulator.

In Nova Scotia the regulator uses forward averaging, which is a discretionary value, for revenue neutrality of the wholesale business. According to the web site of the N.S. Utilities and Review Board[3, 2012]:

" When the current benchmark price is more than the previous benchmark price of prior
pricing period(s), an adjustment in favour of industry will be considered. Conversely, when the current benchmark price is less than the previous benchmark price of prior pricing period(s), an adjustment in favour of consumers will be considered."

In Nova Scotia the above formula needs to be changed to include forward averaging amount:

$\Delta M = \Delta B(1+t) + \Delta F(1+t)$

and $\Delta M/\Delta B = [\Delta B(1+t) + \Delta F(1+t)]/\Delta B$

where F denotes forward averaging amount.

The results of Nova Scotia are given in Table 2. The average during three months period for increase in the benchmark price was 1.46 (rounded) and for price decreases it was 1.32 (rounded). This result for Nova Scotia is significantly different than that for New Brunswick. It means that in Nova Scotia during the three months period, when the bench mark price increased by one cent per litre the maximum regulated price increased by 1.46 cents instead of 1.15 cents.

For reduction of the benchmark price, during this period, the value of decrease in maximum price was 1.32 cents per litre. In other words when the benchmark price fell by 1 cents per litre, the maximum regulated price fell by 1.32 cents instead of 1.15 cents per litre.

Same result was obtained when we took change in minimum regulated prices as a result of change in the benchmark prices during the three months period in Nova Scotia. The value for the benchmark price increase was 1.46 and for price decrease was 1.33. The fractional difference in price the benchmark price decrease result appears to be caused by rounding done by the N.S. Utilities and Review Board.

The Nova Scotia Utilities and Review Board did not seem to use a formula in using their discretion as to the amount of change in retail price in relation to 1 cent change in the benchmark price. In June 2012, for the first two pricing periods, the decrease in price was 1.07 and 1.09 instead of 1.15 and 1.15. For the remaining pricing periods, however, the price fell by more than 1.15 cents so that average fall for the three months was 1.32 cents per litre instead of 1.15 cents. Similarly when prices started to increase, pricing period July 6, 2012, the Utilities and Review Board raised price by 3 times the increase in the bench mark price. For later pricing periods, the increase was more than 1.15 cents giving an overall average 1.46 for the three months under study.

The consumers' mind recorded these very little initial price reduction when the benchmark prices started falling and big jumps when the benchmark prices started to rise thus making them believe that the board lowers prices by a trickle and raises prices at much faster rate thus believing in "rockets and feathers" hypothesis.

The Department of Natural Resources, Government of Canada, gives actual price, rather than maximum fixed price, data for cities of New Brunswick. A comparison of Halifax regular gasoline prices and cities of New Brunswick show that when prices fall, they fall more steeply, but staying higher, in Halifax than in cities of New Brunswick. When prices start rising, they rasie much faster in Halifax than in cities of New Brunswick. The cities of New Brunswick have different prices becuase there is no minimum regulated price and that gas stations are to charge actual transport cost rather than the maximum allowed by their Board.

Since the results obtained for Nova Scotia were very different than results obtained for New Brunswick, the study took another test to identify the cause of this difference. The formula applied was ΔM/ΔBWP where BWP represents base wholesale price. The results for New Brunswick were not affected but for Nova Scotia results changed. In Nova Scotia when BWP increased by 1 cent, the maximum retail price increased by one cent plus HST (i.e., 1.15 cents, rounded). Similarly when BWP decreased by 1 cent, the decrease in the maximum retail price was 1.15 (rounded). It means that the difference in results between ΔM/ΔB and ΔM/ΔBWP is caused by forward averaging amount.

In order to pinpoint the cause of different results for maximum regulated prices when price increased than when price fell, the study reworked the whole table by eliminating forward averaging from Nova Scotia data. The given benchmark prices are taken but the base wholesale prices, the wholesale selling prices, the minimum retail and maximum retail prices of self serve regular gasoline for Halifax are reworked. The results are presented in table-3. When ΔM/ΔB is taken for reworked table it turns out to be exact 1.15 for both price increases and price decreases. Since no rounding of fraction is done in table 3, the values we get are exact and not rounded.

Table-3 also shows that without forward averaging, the gasoline prices would have been higher than those fixed by the regulator for Nova Scotia when the benchmark prices fell. Also when benchmark prices rose, the Nova Scotia regulator set prices higher than those calculated without forward averaging. On an average for three summer months consumers were given price reduction of 1.32 cents when the benchmark prices fell instead of 1.15 cents. And consumers were charged 1.46 cents for each 1 cent increase in the benchmark price, instead of 1.15 cents, during this period.

Thus it is forward averaging which causes increasing the amplitude of gasoline price fluctuations. Since the amount of forward averaging is purely discretionary, prediction of price to be set by the N.S. regulator is difficult. If we remove forward averaging, we can accurately predict the next regulated price because the benchmark price is known prior to N.S. regulator setting the pump price.

Since we know the total effect of change in benchmark price on change in pump price set by the regulator in Nova Scotia, we can separate the forward averaging and HST effects on pump price change.

$(\Delta M/\Delta B) - (1+t) = \Delta F(1+t)/\Delta B$

For instance if total pump price changes by 2 cents per litre when the benchmark price changes by 1 cents per litre, 1.15 cents is the price with HST and remaining 2 - 1.15 = 0.85 cents per litre is the forward averaging effect. Calculations are shown in table-4.

On the basis of the aforesaid we can conclude that the use of forward averaging in the Nova Scotia Utility and Review Board formula is the cause of larger fluctuations in the regular self serve gasoline minimum and maximum prices than those estimated without forward averaging. Fluctuations are amplified at the turning point when the benchmark prices start rising and giving consumer impression that prices rise like rockets. When the benchmark prices start falling, they fall more than those without forward averaging, but the fall is slower than the rise giving impression to consumers that prices fall like feathers. The discretionary nature of the amount of forward averaging in relation to change in benchmark prices makes it difficult for the Pundits to predict the amount of price change. Is the use of forward averaging necessary for setting prices by the N.S. Utility and Review Board? The following section of the paper deals with this issue.

3. Is Forward Averaging Necessary?

The logic of forward averaging is to give wholesalers regulated margins, which under fluctuating market conditions, would have deviated. According to the Gardner Pinfold two year review [2, 2008] report:

> *In an extended rising market, wholesalers would be buying at steadily higher prices over successive one-week adjustment periods and selling at a price fixed by regulation on the basis of conditions that prevailed over the previous one-week period. In these circumstances, the marketing margin would fall below the regulated margin on each transaction leaving them in a low or potentially negative margin position.*
>
> *In an extended declining market, wholesalers would be buying at steadily lower prices over each successive one-week period and selling at a price fixed by regulation on the basis of conditions that prevailed over the previous week. In these circumstances, their margin would rise above the regulated margin on each transaction leaving them in a relatively high margin position.*

The Nova Scotia Utilities and Review Board adds a discretionary forward averaging amount, which is subject to HST, when the previous week's benchmark price is lower than the current week's benchmark price i.e., when prices are rising. Similarly the Board reduces a discretionary forward averaging amount when current week's benchmark price is lower than previous week's benchmark price i.e., when prices are falling.

There are problems with this line of thinking. The first problem studied in the paper is that it amplifies the magnitude of regulated price fluctuations. Chart-1 shows the maximum prices of regular self serve gasoline in Nova Scotia with and without forward averaging correction. As can be seen from the chart the fluctuations reduce when we remove forward averaging amount. Similarly, chart-2 shows that the gasoline prices in Nova Scotia and New Brunswick move in synch when we remove forward averaging correction from the Nova Scotia data.

Thus forward averaging correction may contradict the sentiments of the Petroleum Products Pricing Act and Regulations the objective of which is to stabilize prices.

The six months' review[1, 2007] report by Gardner Pinfold consulting economists states:

> *"A major complaint from wholesalers is that the forward averaging formula is not fixed and transparent, and nor is its use free from subjective considerations.*
> *There is merit in this complaint.*
>
> *The Regulator should adopt a fixed and transparent formula for forward averaging."*

Although the amount of forward averaging is declared by the Board together with the fixed wholesale and retail prices, the formula on which it uses its discretion is not known or at least does not exist.

The other problem is that the use of forward averaging assumes that the regulator has better judgement about the business than the wholesalers themselves. An ordinary consumers may line up at the gasoline pump on Thursday if they feel that gasoline price is going to go up on Friday. Similarly, the wholesalers may buy gasoline prior to the increase in price. Giving them additional amount by way of forward averaging would simply increase their profit margin.

Further the use of forward averaging is not based on any research study which points out the effect of fluctuating prices on wholesalers' margins. Also, there is no study as yet on the effect of forward averaging on retail margins in Nova Scotia since July 2006. The regulator in New Brunswick does not use forward averaging and the wholesalers have not protested that their margins have fallen when prices rose. Thus, forwarding averaging correction practice in Nova Scotia should be dropped till studies are done and precedents are available to support its use.

4. References

Government of Nova Scotia, Service Nova Scotia and Municipal Relations(2007). *Petroleum Product Price Regulation in Nova Scotia-A Six Month Review*. Prepared by Gardner Pinfold Consulting Economists. (Page 59).

Government of Nova Scotia, Service Nova Scotia and Municipal Relations (2008). *Evaluation of Petroleum Products Pricing Regulation in Nova Scotia-A two year Review*. Prepared by Gardner Pinfold Consulting Economists. (Page 7).

Nova Scotia Utilities and Review Board (2012). *Forward Averaging Correction*. Document: 168069.1 [Online] Available: www.nsuarb.ca (June 9, 2012).

5. Tables and Charts

Abbreviations used in tables:

B Benchmark price of the regular self serve gasoline
F Forward averaging amount
M Maximum regulated price for self serve regular gasoline per litre
ΔB Change in the benchmark price
ΔM Change in the maximum regulated price for self serve regular gasoline per litre
CPL Cents per litre of regular self serve gasoline.

Table-1: Maximum Price of Self-Serve Gasoline in New Brunswick (Cents Per Litre)
June-August 2012

2012	B	F	M	ΔB	ΔM	ΔM/ΔB
31-May	76.48	0	129.4			
07-Jun	73.35	0	125.8	-3.13	-3.6	1.15016
14-Jun	72.95	0	125.4	-0.4	-0.4	1
21-Jun	71.23	0	123.4	-1.72	-2	1.162791
28-Jun	67.9	0	119.7	-3.33	-3.7	1.111111
05-Jul	68.67	0	120.8	0.77	1.1	1.428571
12-Jul	72.96	0	125.4	4.29	4.6	1.072261
19-Jul	75.14	0	127.9	2.18	2.5	1.146789
26-Jul	74.66	0	127.3	-0.48	-0.6	1.25
02-Aug	72.7	0	125.1	-1.96	-2.2	1.122449
09-Aug	77	0	130	4.3	4.9	1.139535
16-Aug	77.95	0	131	0.95	1	1.052632
23-Aug	78.47	0	131.6	0.52	0.6	1.153846
30-Aug	81.23	0	134.7	2.76	3.1	1.123188

Source of New Brunswick data: www.nbeub.ca

∑ΔM/∑ΔB = 1.13 (rounded) when the benchmark price **decreased.**

∑ΔM/∑ΔB = 1.13 (rounded) when the benchmark price **increased**.

Table-2: Maximum Price of Self-Serve Gasoline in Halifax Nova Scotia (Cents Per Litre)
June-August 2012

2012	B	F	M	ΔB	ΔM	ΔM/ΔB
01-Jun	76.2	-1.3	130.5			
08-Jun	73.3	-1.1	127.4	-2.9	-3.1	1.068966
15-Jun	72.2	-1.1	126.2	-1.1	-1.2	1.090909
22-Jun	70.4	-1.9	123.2	-1.8	-3	1.666667
29-Jun	67.9	-2	120.2	-2.5	-3	1.2
06-Jul	69.1	0	123.9	1.2	3.7	3.083333
13-Jul	73.5	0.7	129.7	4.4	5.8	1.318182
20-Jul	75.4	1.1	132.4	1.9	2.7	1.421053
27-Jul	73.4	0	128.8	-2	-3.6	1.8
03-Aug	73.2	0.2	128.8	-0.2	0	0
10-Aug	77.6	1.3	135.1	4.4	6.3	1.431818
17-Aug	78.3	1.5	136.2	0.7	1.1	1.571429
24-Aug	78.8	1	136.2	0.5	0	0
31-Aug	81.8	1.4	140.1	3	3.9	1.3

Source of Nova Scotia data: www.nsuarb.ca

∑ΔM/∑ΔB = 1.32 (rounded) when the benchmark price **decreased.**

∑ΔM/∑ΔB = 1.46 (rounded) when the benchmark price **increased**.

Additional abbreviations used in the table:

Min is minimum regulated price for regular self serve gasoline in Nova Scotia.

BWP is base wholesale price fixed by regulator in Nova Scotia. Base wholesale price equals benchmark price plus forward averaging amount plus wholesaler's margin plus transport cost. For instance, for June 1, 2012 benchmark price 76.2 + forward averaging amount of (-) 1.3 + wholesale margin 6 plus transport cost to Halifax 0.5 = base wholesale price of 81.4 cpl.

Table-3:Minimum and Base Wholesale Price of Self-Serve Gasoline in Nova Scotia (Cpl)
June-August 2012

2012	B	F	Min P	ΔMin P	BWP	ΔBWP	ΔB
01-Jun	76.2	-1.3	128.5		81.4		
08-Jun	73.3	-1.1	125.4	-3.1	78.7	-2.7	-2.9
15-Jun	72.2	-1.1	124.1	-1.3	77.6	-1.1	-1.1
22-Jun	70.4	-1.9	121.1	-3	75	-2.6	-1.8
29-Jun	67.9	-2	118.1	-3	72.4	-2.6	-2.5
06-Jul	69.1	0	121.8	3.7	75.6	3.2	1.2
13-Jul	73.5	0.7	127.7	5.9	80.7	5.1	4.4
20-Jul	75.4	1.1	130.3	2.6	83	2.3	1.9
27-Jul	73.4	0	126.7	-3.6	79.9	-3.1	-2
03-Aug	73.2	0.2	126.7	0	79.9	0	-0.2
10-Aug	77.6	1.3	133.1	6.4	85.4	5.5	4.4
17-Aug	78.3	1.5	134.1	1	86.3	0.9	0.7
24-Aug	78.8	1	134.1	0	86.3	0	0.5
31-Aug	81.8	1.4	138	3.9	89.7	3.4	3

Source of Nova Scotia data: www.nsuarb.ca

∑ΔMin/∑ΔB = 1.33 (rounded) when the benchmark price **decreased.**
∑ΔMin/∑ΔB = 1.46 (rounded) when the benchmark price **increased**.

∑ΔMin/∑ΔBWP or ∑ΔM /∑ΔBWP = 1.15 (rounded) when the benchmark price **decreased.**
∑ΔMin/∑ΔBWP or ∑ΔM /∑ΔBWP = 1.15 (rounded) when the benchmark price **increased**.

In this table B ex-F means the benchmark price excluding forward averaging amount and WSP means wholesale selling price.

Table-4: Minimum and Maximum Prices of Self-Serve Gasoline in Nova Scotia (Cpl)
Excluding Forward Averaging Amounts (ex-F)
**June-August 2012**

2012	B	BWP Ex-F	WSP	Min P ex-F (1)	Min P(2)	Difference (2-1)	M ex-F (3)	M (4)	Difference (4-3)
01-Jun	76.2	82.7	108.2	129.95	128.5	-1.45	132.02	130.5	-1.52
08-Jun	73.3	79.8	105.3	126.615	125.4	-1.215	128.685	127.4	-1.285
15-Jun	72.2	78.7	104.2	125.35	124.1	-1.25	127.42	126.2	-1.22
22-Jun	70.4	76.9	102.4	123.28	121.1	-2.18	125.35	123.2	-2.15
29-Jun	67.9	74.4	99.9	120.405	118.1	-2.305	122.475	120.2	-2.275
06-Jul	69.1	75.7	101.2	121.9	121.8	-0.1	123.97	123.9	-0.07
13-Jul	73.5	80	105.5	126.845	127.7	0.855	128.915	129.7	0.785
20-Jul	75.4	81.9	107.4	129.03	130.3	1.27	131.1	132.4	1.3
27-Jul	73.4	79.9	105.4	126.73	126.7	-0.03	128.8	128.8	0
03-Aug	73.2	79.7	105.2	126.5	126.7	0.2	128.57	128.8	0.23
10-Aug	77.6	84.1	109.6	131.56	133.1	1.54	133.63	135.1	1.47
17-Aug	78.3	84.8	110.3	132.365	134.1	1.735	134.435	136.2	1.765
24-Aug	78.8	85.3	110.8	132.94	134.1	1.16	135.01	136.2	1.19
31-Aug	81.8	88.3	113.8	136.39	138.0	1.61	138.46	140.1	1.64

Source of Nova Scotia data: www.nsuarb.ca

$\sum \Delta M / \sum \Delta B = 1.15$ exact when the benchmark price **decreased.**

$\sum \Delta M / \sum \Delta B = 1.15$ exact when the benchmark price **increased**.
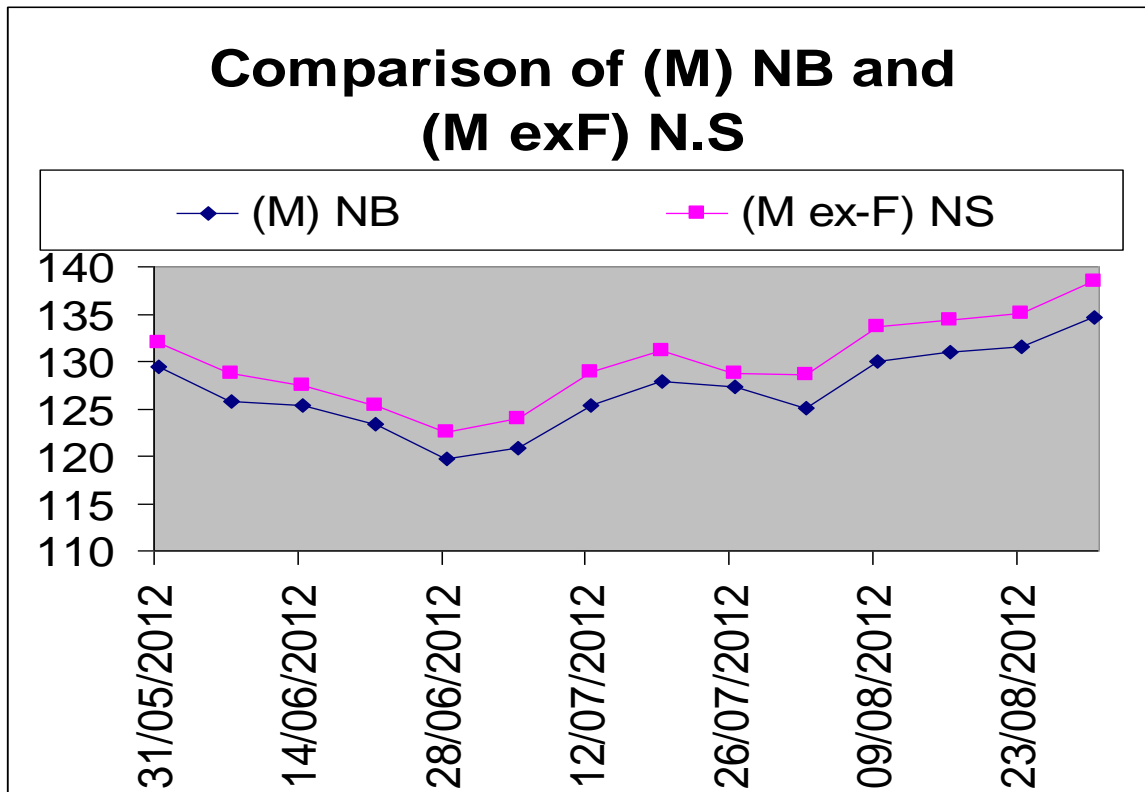
Chart-1
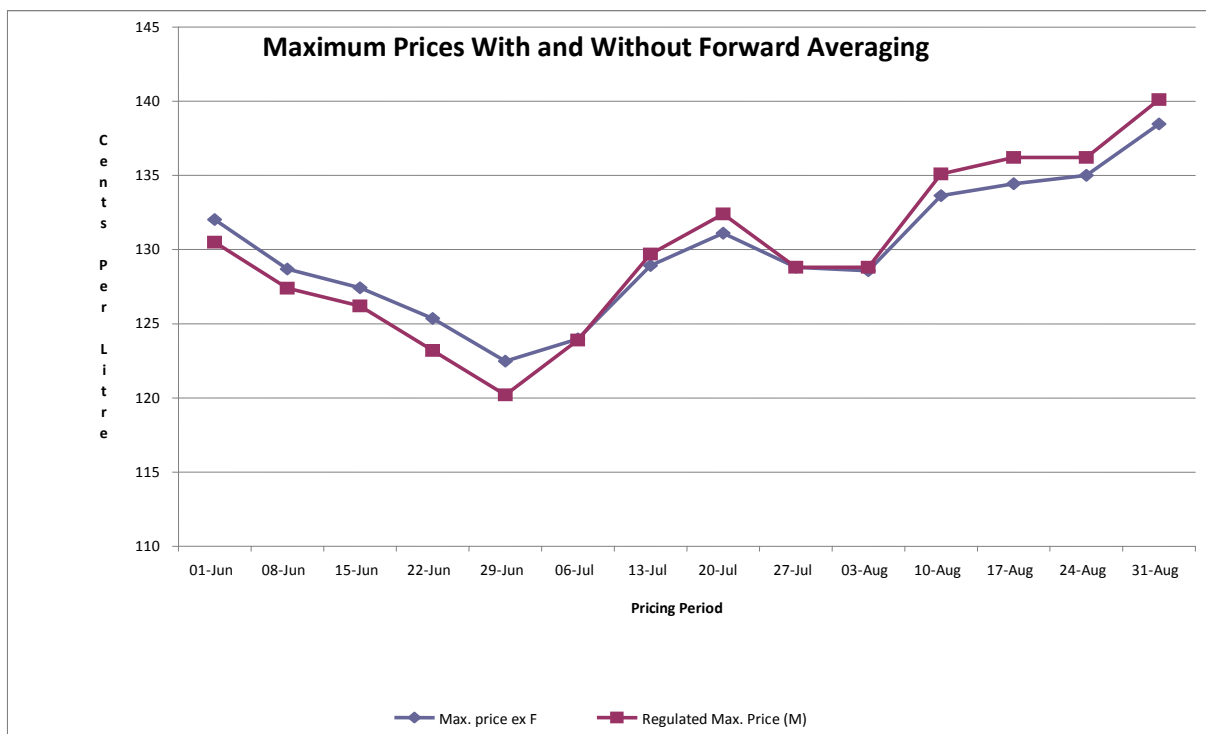
Source of Nova Scotia data: www.nsuarb.ca

Chart-2

Source of New Brunswick data: www.nbeub.ca
Calculated results are shown for Nova Scotia.

Prices for Nova Scotia as on Fridays. Prices for New Brunswick as on Thursdays.