

**A REGIONAL SWING MODEL FOR CONVERTING CANADIAN POPULAR VOTE INTO  
PARLIAMENTARY SEATS:**

**IMPROVING UPON THE CUBE LAW**

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## **A Regional Swing Model for Converting Canadian Popular Vote into Parliamentary Seats: Improving upon the Cube Law**

There has not been a great deal of attention to the relationship between a Canadian political party's popular support level and the number of House of Commons seats it wins since the consideration of the cube law.<sup>i</sup> Although somewhat outdated, the cube law provides a base line by which to compare the appropriateness of a different approach. Simply stated the law suggests that in a single-member plurality electoral system an approximation of a party's complement of constituencies won in a parliamentary election can be derived by cubing (raising to the power of three) the party's proportion of the national popular vote out of the sum of the cubed proportions of all parties, and then multiplying it by the number of seats available. One problem with the cube law's suitability in Canada is its original conceptual base within a two-party system.<sup>ii</sup> Perhaps a more serious flaw in the application of the method to Canada however is the method's dependence on a homogeneous polity where elections are "fought predominantly on national issues to which the different constituencies reacted in a fairly similar way."<sup>iii</sup> This assumption is of course incompatible with the substantial regional variance that frequently characterizes Canadian elections.<sup>iv</sup> However, such an observation provides a clue as to how an alternate model could be developed for the more regionally polarized Canadian environment.<sup>v</sup>

This note seeks to develop and test an empirical model that addresses the "vote-seat" association which sometimes might appear to be idiosyncratic at the national level of analysis. Before proceeding with further discussion of a new model, however, this concern for regional variance suggests a way to adapt the cube law to the Canadian setting by disaggregating it. Instead of calculating the cube law on a uniform national basis, a revised version would divide the procedure into Canada's five regional components. This "regionalized cube law" would divide the nation into the Atlantic, Quebec, Ontario, Prairie (subsequently divided into two) and British Columbia regions, and apply the cubing procedure to the number of seats available in

each area.<sup>vi</sup> The parties' seat totals would then be added from each of the five or six regions in order to attain national figures<sup>vii</sup>. Table 1 provides data from the 1963 through 2006 federal elections which present the actual seat totals and national popular vote, together with hypothetical results that would have occurred from application of the cube law nationally as well as the revised "regional cube law."<sup>viii</sup> Accompanying columns indicate differences from the actual results for each of these theoretically-devised approaches, the means of which show that the original cube law is accurate to within 22.8 seats per party per election while the "regional cube law" is accurate to within 7.6 seats per party per election.<sup>ix</sup> These data demonstrate the importance of regional considerations in developing a model that relates popular vote and parliamentary seats.

Having recognized the importance of regional variation in the association of votes and seats, a new model can be presented which is based on the swing in popular support that parties experience from election to election in different regions. The new regional swing model maintains the five-fold regional delineation.<sup>x</sup> Moreover, it assumes that there is a general association relating how ridings within a given region will vary politically between any given pairing of successive national elections. In fact, it would expect a set of regionally-defined constituencies to approach a normal distribution in their level of change from one election to the next. This expectation of the typical constituency's support for a party covarying by an amount similar to the party's swing in the region overall, is the underlying component of the model.

The overall regional percentage swing to or from a party is then made for each of the parties simultaneously in all of the constituencies within a given region. This, thereby, should provide a cumulative indication of party seat totals in the region. To illustrate, between the 1984 and 1988 federal elections, Conservative support in Atlantic Canada fell 12 percent while Liberal support rose 12 percent. When these percentage swings are applied to each constituency in the region, any Conservative seat won by less than a 24 percent margin in 1984

would be expected to fall to the Liberals. In fact, of course, the swing is not identical in every constituency. In one riding, the Conservatives might decline by 15 percent and in another by 9 percent, but the assumption of a normal distribution would suggest that over a large number of seats in the region, these discrepancies would balance off more or less. In this pursuit, it should be remembered that our goal is to determine overall party seat totals, rather than the outcome in each individual constituency. A formalization of this might be presented as follows:<sup>xi</sup>

Suppose riding  $i$  belongs to region  $R_j$ . In election  $n$ , the predicted percentage vote for party  $p$  in riding  $i$  is  $\hat{V}_n(p, i)$ . The actual percentage vote in the previous election was  $V_{n-1}(p, i)$ . The set of ridings predicted to be won by party  $p$  in election  $n$  is  $\hat{W}_n(p)$ . The regional adjustment for party  $p$ 's vote in riding  $i$  (and in all the other ridings of region  $R_j$ ) is  $\Delta R_n(p, j)$ .

$$V_n(p, i) \cong V_{n-1}(p, i) + \Delta R_n(p, j) = \hat{V}_n(p, i)$$

$$\Delta R_n(p, j) = \sum_{k \in R_j} [V_n(p, k) - V_{n-1}(p, k)]$$

$$\hat{W}_n(p) = \{ i: \hat{V}_n(p, i) > \hat{V}_n(p', i) \text{ for all } p' \neq p \}$$

Also to be considered in the model is the incumbency of a candidate. There has been some disagreement in the literature about the extent to which this variable applies in Canadian elections. The work of Krashinsky and Milne has shown incumbency to have a stronger influence in Ontario provincial elections than those at the federal level, and also to have a cumulative effect over time.<sup>xii</sup> While the specific impact is shown to vary over different elections, they present averages for the period spanning the 1957 and 1980 federal elections indicating a 3 to 4 percent impact by incumbency on the party votes except for Social Credit.<sup>xiii</sup> A study of the U.S. House of Representatives suggests further that the positive electoral impact of

incumbency is maximized early in the legislator's career (particularly after their first term, the so-called "sophomore surge"), and that the additional increment gradually diminishes over time.<sup>xiv</sup> A corollary to this work indicates that upon the incumbent's retirement, there is a corresponding decline in the party's electoral performance in the district (the "retirement slump").

Any attempt to build the effect of incumbency into a model is inevitably arbitrary, however, the above cited literature is suggestive. In applying these considerations to the model, the candidacy of an incumbent in a constituency was deemed to have a potential 3.5 percent positive impact for the party in that seat. In each case the adjustment is to apply to a party in a given district compared to its performance in the same constituency in the previous election. This advantage was to be phased in, such that it represented 2 percent following the incumbent's first term of service, an additional 1 percent following the second term and a further 0.5 percent following the third term. Since the bonus is applied relative to the party's performance in the riding during the previous election (when the incumbent was also a candidate) one can see that this permits a cumulative effect to the advantage of name recognition and personal contact that accompany incumbency. Incumbents with four or more terms of service are not given any additional credit since it is assumed that the advantage of holding office has diminished to a negligible amount by this point in their career. In elections following an incumbent's retirement, their party is penalized the amount corresponding to the bonus accumulated by the previous office holder, to a maximum of 3.5 percent. This penalty applies because the party is now handicapped with the relative disadvantage of a lesser known candidate compared to the previous election. This process can be portrayed as follows:

The incumbency adjustment  $\Delta I_n(p, i)$  applies to party  $p$  in riding  $i$  only if  $i \in W_{n-1}(p)$ , i.e. party  $p$  won riding  $i$  in the previous election.

If party  $p$ 's candidate in riding  $i$  is the incumbent, and if the incumbent has already won  $x$  consecutive elections, then

$$\Delta I_n(p, i) = \begin{cases} .02 & \text{if } x = 1 \\ .01 & \text{if } x = 2 \\ .005 & \text{if } x = 3 \\ 0 & \text{otherwise} \end{cases}$$

If party  $p$ 's candidate in riding  $i$  is not the incumbent, and if the incumbent has won  $y$  consecutive elections, then

$$\Delta I_n(p, i) = \begin{cases} 0 & \text{if } y = 1 \\ -.02 & \text{if } y = 2 \\ -.03 & \text{if } y = 3 \\ -.035 & \text{if } y \geq 4 \end{cases}$$

The revised predicted vote for party  $p$  in riding  $i$  is then

$$\hat{V}_n(p, i) = V_{n-1}(p, i) + \Delta R_n(p, i) + \Delta I_n(p, i).$$

### Empirical Test

The application of the model assumes a stable party system, and its test requires voting data over identical constituencies for each pair of elections to be studied. These constraints suggest that the 1963 election is an appropriate starting point for the study, because it was the first to follow an election where the Social Credit Party had established itself in Quebec.<sup>xv</sup> The model is not structured to anticipate the emergence of new parties in a particular region since there would then be no base vote from the previous election on which to compare. This

condition precludes the ability to apply the model to Quebec in 1993 since the Bloc Quebecois emerged as a new party with no previous electoral track record to use as a reference base. The Reform Party had contested sufficient western seats in 1988 that the model could be applied there. The limitation concerning constituency boundaries means that votes following electoral redistribution can only be tested if the prior results have been applied to the new districts, thereby eliminating the 1968 election.<sup>xvi</sup> The amalgamation of the Progressive Conservative Party and Canadian Alliance prior to 2004, was treated by simply adding the two parties' totals.

Table 2 presents the distribution of seats by party<sup>xvii</sup> determined for the two stages of the model in a step-wise fashion, first the impact of the regional swings for each party, and then the adjustment for incumbency. In the left-hand column are the actual results, and in the right-hand column of the table is a summary measure listing the difference in seats between the overall model and the actual election result for each party.<sup>xviii</sup> The discrepancies between these two figures range from a cumulative low of just five seats in total for the different parties in 2004 to a high of 32 seats in the 1972 election. Included in the 1972 figures is a 14 seat overestimation of the actual Liberal totals, together with the 1965 Liberal figure, the largest variation for any of the parties during the period studied. When these discrepancies were averaged for the different parties over the thirteen elections examined, the mean error figure was 3.8 seats.<sup>xix</sup>

A more detailed consideration of the components of the model indicated that the regional swing element taken alone produced a mean error level of 4.2 seats per party per election. When the incumbency factor was added to the model, the overall accuracy was improved to a mean error of 3.8 seats per party per election.<sup>xx</sup> An attempt to explore more fully the least accurate applications of the model, showed that they related to the Liberals and Social Credit in 1965 and 1972.<sup>xxi</sup> More specifically they occurred in the province of Quebec where Social Credit support was concentrated in certain rural areas rather than being spread province-wide. The effect of this phenomenon for the model was to underestimate the Social Credit seat totals and



reallocate them to other parties, particularly the Liberals. A similar effect explains the model not reflecting NDP strength in certain sub-regions of Atlantic Canada in 1997. When the effect of this Quebec Social Credit distortion is corrected for just 1965 and 1972, the overall mean error of the model during the entire thirteen election-period declines to 3.1 seats.

This case highlights an important limitation of the model, which is the occurrence of a strong deviation in party swing at the sub-regional level. However in a stable party system where partisan swings are relatively homogeneous within any given region, a situation that applied most of the time between 1963 and 2006, this approach does provide a good conversion estimate from popular vote into seats. During the period studied, the mean error of the regional swing model in predicting parliamentary seats was approximately one-quarter that of the old cube law, and almost one-half that of the revised "regional cube law."<sup>xxii</sup> Moreover, its accuracy was greater than either of the other approaches, in every election studied.

Another possible use for the model is to estimate prospective election results from public opinion polling data. Of course, such estimates are only as accurate as the data itself, but this note suggests that in circumstances where the actual popular vote is known the model's level of accuracy represents a marked improvement over the cube law approach.

TABLE 1  
Comparison of Actual and Predicted Number of Seats from Cube Law and  
Regionalized Cube Law, General Elections 1963-1997

		Actual Result	Popular Vote %	National Cube Law	Difference from Result	Regional Cube Law	Difference from Result
1963	LIB	129	41.8	175	+46	152	+23
	PC	95	32.4	81	-14	88	-7
	NDP	17	13.0	5	-12	11	-6
	SOC	24	12.0	4	-20	14	-10
1965	LIB	131	40.2	164	+33	150	+19
	PC	97	32.4	86	-11	87	-10
	NDP	21	17.9	14	-7	21	0
	SOC	16	8.4	1	-15	7	-9
1968	LIB	156**	45.5	191	+35	172	+16
	PC	72	31.4	63	-9	74	+2
	NDP	22	17.0	10	-12	16	-6
	SOC	14	5.2	0	-14	2	-12
1972	LIB	109	38.5	142	+33	125	+16
	PC	107	35.0	107	0	109	+2
	NDP	31	17.7	14	-17	22	-9
	SOC	17	7.6	1	-16	8	-9
1974	LIB	141	43.2	165	+24	155	+14
	PC	95	35.4	91	-4	99	+4
	NDP	16	15.4	8	-8	8	-8
	SOC	12	5.1	0	-12	2	-10
1979	LIB	114	39.8	156	+42	129	+15
	PC	136	35.6	112	-24	133	-3
	NDP	26	17.8	14	-12	19	-7
	SOC	6	4.6	0	-6	1	-5
1980	LIB	147	44.3	190	+43	154	+7
	PC	103	32.5	75	-28	105	+2
	NDP	32	19.8	17	-15	23	-9
1984	LIB	40	28.1	40	0	46	+6
	PC	211	50.2	230	+19	216	+5
	NDP	30	18.9	12	-18	20	-10
1988	LIB	83	31.9	79	-4	86	+3
	PC	169	43.0	195	+26	177	+8
	NDP	43	20.4	21	-22	32	-11
1993	LIB	177	41.3	248	+71	171	-6
	PC	2	16.0	14	+12	10	+8
	NDP	9	6.9	1	-8	2	-7
	REF	52	18.7	23	-29	55	+3
	BQ	54	13.5	9	-45	57	+3
1997	LIB	155	38.4	233	+78	156	+1
	PC	20	19.0	28	+8	27	+7
	NDP	21	11.1	5	-16	8	-13
	REF	60	19.4	30	-30	74	+14
	BQ	44	10.7	5	-39	36	-8
2000	LIB	172	40.8	232	+60	176	+4
	REF	66	25.5	57	-9	81	+15
	PC	12	12.2	6	-6	10	-2
	NDP	13	8.5	2	-11	2	-11
	BQ	38	10.7	4	-34	32	-6
2004	LIB	135	36.7	188	+53	134	-1
	CON	99	29.6	98	-1	98	+1
	NDP	19	15.7	15	-4	20	+1
	BQ	54	12.4	7	-47	56	+2
2006	LIB	103	30.2	104	+1	94	-9
	CON	124	36.3	180	+56	134	+10
	NDP	29	17.5	20	-9	23	-6
	BQ	51	10.5	4	-47	57	+6

\* From 1963 through 1979 the popular vote % for other parties refers specifically to Social Credit, the only other party which would have earned any seats under the cube law formulations.

\*\* Includes former Liberal who became speaker and ran as an independent in seat uncontested by Liberals.

TABLE 2  
Comparison of Actual and Predicted Election Results for Different Stages of conversion model 1963-2004

		Actual Result	Regional Swing	Incumbency Effect	Difference from Actual Result
<b>1963</b>	LIB	129	137	129	0
	PC	95	85	90	-5
	NDP	17	16	16	-1
	SOC	24	27	30	+6
<b>1965</b>	LIB	131	143	145	+14
	PC	97	97	94	-3
	NDP	21	18	18	-3
	SOC	16	7	8	-8
<b>1972</b>	LIB	109	119	123	+14
	PC	107	111	109	+2
	NDP	31	29	27	-4
	SOC	17	5	5	-12
<b>1974</b>	LIB	141	147	144	+3
	PC	95	94	94	-1
	NDP	16	16	17	+1
	SOC	12	7	9	-3
<b>1979</b>	LIB	114	114	115	+1
	PC	136	144	141	+5
	NDP	26	20	21	-5
	SOC	6	4	5	-1
<b>1980</b>	LIB	147	148	142	-5
	PC	103	102	111	+8
	NDP	32	32	29	-3
<b>1984</b>	LIB	40	28	31	-9
	PC	211	224	216	+5
	NDP	30	28	33	+3
<b>1988</b>	LIB	83	78	78	-5
	PC	169	179	174	+5
	NDP	43	38	43	0
<b>1993*</b>	LIB	158	157	157	-1
	PC	1	0	0	-1
	NDP	9	9	9	0
	REF	52	54	54	+2
<b>1997</b>	LIB	155	160	158	+3
	PC	20	22	22	+2
	NDP	21	11	11	-10
	REF	60	62	62	+2
	BQ	44	46	48	+4
<b>2000</b>	LIB	172	170	167	-5
	REF	66	71	71	+5
	PC	12	7	8	-4
	NDP	13	10	10	-3
	BQ	38	42	44	+6
<b>2004</b>	LIB	135	130	133	-2
	CON	99	101	100	+1
	NDP	19	22	21	+2
	PQ	54	55	54	0
<b>2006</b>	LIB	103	103	103	0
	CON	124	128	126	+2
	NDP	29	24	26	-3
	PQ	51	53	53	+2

\* Excludes Quebec because Bloc Quebecois had no prior reference point.

## APPENDIX

Comparison of Actual and Predicted Election Results  
for Different Stages of Conversion Model 1963

		<b>Actual Result</b>	<b>Regional Swing</b>	<b>Incumbency Effect</b>
<b>Canada</b>	Lib	123	137	129
	PC	95	85	90
	NDP	17	16	16
	SOC	25	27	30
<b>Atlantic</b>	Lib	19	22	21
	PC	14	11	12
	NDP	--	--	--
	SOC	--	--	--
<b>Quebec</b>	Lib	47	48	45
	PC	8	2	4
	NDP	0	0	0
	SOC	20	25	26
<b>Ontario</b>	Lib	51	56	53
	PC	27	24	26
	NDP	6	5	6
	SOC	1	0	0
<b>Prairies &amp; NWT</b>	Lib	3	2	2
	PC	42	43	43
	NDP	2	2	2
	SOC	2	2	2
<b>BC &amp; Yukon</b>	Lib	7	9	8
	PC	5	5	5
	NDP	9	9	8
	SOC	2	0	2

Comparison of Actual and Predicted Election Results  
for Different Stages of Conversion Model 1965

		<b>Actual Result</b>	<b>Regional Swing</b>	<b>Incumbency Effect</b>
<b>Canada</b>	Lib	131	143	145
	PC	97	97	94
	NDP	16	18	8
	SOC	16	7	8
<b>Atlantic</b>	Lib	15	16	20
	PC	18	17	13
	NDP	--	--	--
	SOC	--	--	--
<b>Quebec</b>	Lib	56	64	63
	PC	8	9	9
	NDP	--	--	--
	SOC	11	2	3
<b>Ontario</b>	Lib	51	52	52
	PC	25	25	25
	NDP	9	7	7
	SOC	--	1	1
<b>Prairies &amp; NWT</b>	Lib	2	3	3
	PC	42	42	42
	NDP	3	2	2
	SOC	2	2	2
<b>BC &amp; Yukon</b>	Lib	7	8	7
	PC	4	4	5
	NDP	9	9	9
	SOC	3	2	2

Comparison of Actual and Predicted Election Results for Different Stages of Conversion Model  
1972

		<b>Actual Result</b>	<b>Regional Swing</b>	<b>Incumbency Effect</b>
<b>Canada</b>	Lib	109	119	123
	PC	107	111	109
	NDP	31	29	27
	SOC	17	5	5
<b>Atlantic</b>	Lib	11	8	8
	PC	21	24	24
	NDP	--	--	--
	SOC	--	--	--
<b>Quebec</b>	Lib	56	67	68
	PC	2	4	3
	NDP	--	--	--
	SOC	16	3	3
<b>Ontario</b>	Lib	36	36	39
	PC	40	41	40
	NDP	11	9	7
	SOC	1	2	2
<b>Prairies &amp; NWT</b>	Lib	4	3	4
	PC	34	37	35
	NDP	8	6	7
	SOC	--	--	--
<b>BC &amp; Yukon</b>	Lib	4	5	4
	PC	9	6	7
	NDP	11	13	13
	SOC	--	--	--

Comparison of Actual and Predicted Election Results  
for Different Stages of Conversion Model 1974

		<b>Actual Result</b>	<b>Regional Swing</b>	<b>Incumbency Effect</b>
<b>Canada</b>	Lib	141	147	144
	PC	95	94	94
	NDP	16	16	17
	SOC	12	7	9
<b>Atlantic</b>	Lib	13	15	14
	PC	17	17	18
	NDP	1	0	0
	SOC	1	0	0
<b>Quebec</b>	Lib	60	66	64
	PC	3	2	2
	NDP	0	0	0
	SOC	11	6	8
<b>Ontario</b>	Lib	58	58	57
	PC	22	23	24
	NDP	8	6	6
	SOC	0	1	1
<b>Prairies &amp; NWT</b>	Lib	6	4	4
	PC	36	37	37
	NDP	4	5	5
	SOC	0	0	0
<b>BC &amp; Yukon</b>	Lib	8	4	5
	PC	14	15	13
	NDP	2	5	6
	SOC	0	0	0

Comparison of Actual and Predicted Election Results  
for Different Stages of Conversion Model 1979

		<b>Actual Result</b>	<b>Regional Swing</b>	<b>Incumbency Effect</b>
<b>Canada</b>	Lib	114	114	115
	PC	136	144	141
	NDP	26	20	21
	SOC	6	4	5
<b>Atlantic</b>	Lib	12	13	13
	PC	18	17	17
	NDP	2	1	1
	SOC	0	1	1
<b>Quebec</b>	Lib	67	70	69
	PC	2	2	2
	NDP	0	0	0
	SOC	6	3	4
<b>Ontario</b>	Lib	32	29	31
	PC	57	60	57
	NDP	6	6	7
	SOC	0	0	0
<b>Prairies &amp; NWT</b>	Lib	2	2	2
	PC	39	43	43
	NDP	10	6	6
	SOC	0	0	0
<b>BC &amp; Yukon</b>	Lib	1	0	0
	PC	20	22	22
	NDP	8	7	7
	SOC	0	0	0



Comparison of Actual and Predicted Election Results  
for Different Stages of Conversion Model 1980

		<b>Actual Result</b>	<b>Regional Swing</b>	<b>Incumbency Effect</b>
<b>Canada</b>	Lib	147	148	142
	PC	103	102	111
	NDP	32	32	29
<b>Atlantic</b>	Lib	19	16	16
	PC	13	13	14
	NDP	0	3	2
<b>Quebec</b>	Lib	74	73	74
	PC	1	1	0
	NDP	0	1	1
<b>Ontario</b>	Lib	52	54	49
	PC	38	37	40
	NDP	5	4	6
<b>Prairies &amp; NWT</b>	Lib	2	4	2
	PC	34	33	38
	NDP	15	14	11
<b>BC &amp; Yukon</b>	Lib	0	1	1
	PC	17	18	19
	NDP	12	10	9

Comparison of Actual and Predicted Election Results  
for Different Stages of Conversion Model 1984

		<b>Actual Result</b>	<b>Regional Swing</b>	<b>Incumbency Effect</b>
<b>Canada</b>	Lib	40	28	31
	PC	211	224	216
	NDP	30	28	33
<b>Atlantic</b>	Lib	7	7	7
	PC	25	25	25
	NDP	0	0	0
<b>Quebec</b>	Lib	17	6	10
	PC	58	67	63
	NDP	0	0	0
<b>Ontario</b>	Lib	14	13	12
	PC	67	73	73
	NDP	13	9	10
<b>Prairies &amp; NWT</b>	Lib	1	2	2
	PC	41	39	37
	NDP	9	10	12
<b>BC &amp; Yukon</b>	Lib	1	0	0
	PC	20	20	18
	NDP	8	9	11

Comparison of Actual and Predicted Election Results  
for Different Stages of Conversion Model 1988

		<b>Actual Result</b>	<b>Regional Swing</b>	<b>Incumbency Effect</b>
<b>Canada</b>	Lib	83	78	78
	PC	169	179	174
	NDP	43	38	43
<b>Atlantic</b>	Lib	20	19	21
	PC	12	13	11
	NDP	0	0	0
<b>Quebec</b>	Lib	12	9	10
	PC	63	66	65
	NDP	0	0	0
<b>Ontario</b>	Lib	43	45	42
	PC	46	48	47
	NDP	10	6	10
<b>Prairies &amp; NWT</b>	Lib	7	4	4
	PC	36	37	37
	NDP	13	15	15
<b>BC &amp; Yukon</b>	Lib	1	1	1
	PC	12	15	14
	NDP	20	17	18

Comparison of Actual and Predicted Election Results  
for Different Stages of Conversion Model 1993 excluding Quebec

		<b>Actual Result</b>	<b>Regional Swing</b>	<b>Incumbency Effect</b>
<b>Canada</b>	Lib	158	157	157
	PC	1	0	0
	NDP	9	9	9
	Ref	52	54	54
<b>Atlantic</b>	Lib	31	32	32
	PC	1	0	0
	NDP	0	0	0
	Ref	0	0	0
<b>Ontario</b>	Lib	98	99	99
	PC	0	0	0
	NDP	0	0	0
	Ref	1	0	0
<b>Prairies &amp; NWT</b>	Lib	23	21	21
	PC	0	0	0
	NDP	6	9	9
	Ref	27	26	26
<b>BC &amp; Yukon</b>	Lib	6	5	5
	PC	0	0	0
	NDP	3	0	0
	Ref	24	28	28

Comparison of Actual and Predicted Election Results  
for Different Stages of Conversion Model 1997

		<b>Actual Result</b>	<b>Regional Swing</b>	<b>Incumbency Effect</b>
<b>Canada</b>	Lib	155	160	158
	PC	20	22	22
	NDP	21	11	11
	Ref	60	62	62
	BQ	44	46	48
<b>Atlantic</b>	Lib	11	13	13
	PC	13	18	18
	NDP	8	1	1
	Ref	0	0	0
<b>Quebec</b>	Lib	26	25	23
	PC	5	4	4
	NDP	0	0	0
	BQ	44	46	48
<b>Ontario</b>	Lib	101	103	103
	PC	1	0	0
	NDP	0	0	0
<b>Prairies &amp; NWT</b>	Lib	11	12	12
	PC	1	0	0
	NDP	9	7	7
	Ref	35	37	37
<b>BC &amp; Yukon</b>	Lib	6	7	7
	PC	0	0	0
	NDP	4	3	3
	Ref	25	25	25

Comparison of Actual and Predicted Election Results  
for Different Stages of Conversion Model 2000

		<b>Actual Result</b>	<b>Regional Swing</b>	<b>Incumbency Effect</b>
<b>Canada</b>	Lib	172	170	167
	Alliance	66	71	71
	PC	12	7	8
	NDP	13	10	10
	BQ	38	42	44
	OTH		1	1
<b>Atlantic</b>	Lib	19	23	22
	PC	9	7	8
	NDP	4	2	2
<b>Quebec</b>	Lib	36	33	31
	PC	1	0	0
	BQ	38	42	44
<b>Ontario</b>	Lib	100	101	101
	Alliance	2	1	1
	PC	0	0	0
	NDP	1	0	0
	OTH	0	1	1
<b>Prairies &amp; NWT</b>	Lib	12	9	9
	PC	2	0	0
	NDP	6	6	6
	Alliance	37	42	42
<b>BC &amp; Yukon</b>	Lib	5	4	4
	NDP	2	2	2
	Alliance	27	28	28

Comparison of Actual and Predicted Election Results  
for Different Stages of Conversion Model 2004

		<b>Actual Result</b>	<b>Regional Swing</b>	<b>Incumbency Effect</b>	
<b>Canada</b>	LIB	135	130	133	
	CON	99	101	100	
	BQ	54	55	54	
	NDP	19	22	21	
	OTH	1	0		
<b>Atlantic</b>	LIB	22	17	17	
	CON	7	11	11	
	NDP	3	4	4	
<b>Quebec</b>	LIB	21	20	21	
	BQ	54	55	54	
<b>Ontario</b>	LIB	75	74	75	
	CON	24	27	26	
	NDP	7	5	5	
<b>Man/Sask/ Terr.</b>	LIB	7	9	9	
	CON	4	20	14	14
	NDP	4	8	8	
<b>Alberta</b>	LIB	2	2	1	
	CON	26	26	27	
<b>BC</b>	LIB	8	8	10	
	CON	22	23	22	
	NDP	5	5	4	
	OTH	1			

Comparison of Actual and Predicted Election Results  
for Different Stages of Conversion Model 2006

		<b>Actual Result</b>	<b>Regional Swing</b>	<b>Incumbency Effect</b>	
<b>Canada</b>	LIB	103	103	103	
	CON	124	128	126	
	BQ	51	53	51	
	NDP	29	24	26	
	OTH	1			
<b>Atlantic</b>	LIB	20	20	21	
	CON	9	9	8	
	NDP	3	3	3	
<b>Quebec</b>	LIB	13	12	12	
	CON	10	10	10	
	BQ	51	53	53	
	OTH	1			
<b>Ontario</b>	LIB	54	56	57	
	CON	40	39	39	
	NDP	12	11	10	
<b>Man/Sask/ Terr.</b>	LIB	7	7	6	
	CON	20	20	20	20
	NDP	4	4	5	
<b>Alberta</b>	LIB				
	CON	28	28	28	
<b>BC</b>	LIB	9	8	7	
	CON	17	22	21	
	NDP	10	6	8	

In Quebec, the Conservative Party estimate utilizes the provincial ADQ vote as a template



## NOTES

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- i. M.G. Kendall and A. Stuart, "The Law of the Cubic Proportion in Election Results," *British Journal of Sociology* 1, (1950); D.E. Butler, *The Electoral System in Britain since 1918*, (London, 1967); Terence Qualter, "Seats and Votes: An Application of the Cube Law to the Canadian Electoral System," *Canadian Journal of Political Science* 1, (1968), 336-344; Duff Spafford, "The Electoral System of Canada," *American Political Science Review* 64, (1970), 168-176.
  - ii. More recent British research by Curtice & Steed, "Electoral Choice," *British Journal of Political Science* 12, (1982), 249-298, raises serious doubts if the cube law is still appropriate in the United Kingdom given the electoral fate of SDP-Liberal alliance. Still R. Taagepera & M. Shugart, *Seats and Votes* (New Haven, 1989) p. 166 provide data that argue for the general appropriateness of the cube rule in various electoral systems.
  - iii. Butler, *The Electoral System in Britain*, 197.
  - iv. Qualter, "Seats and Votes," 338.
  - v. A representative review of literature addressing the impact of region upon Canadian electoral behavior includes Alan C. Cairns "The Electoral System and the Party System in Canada, 1921-1965," *Canadian Journal of Political Science* 1, (1967), pp. 55-80; W.P. Irvine, "Assessing Regional Effects in Data Analysis," *CJPS* 4, (1971) pp. 2-24; D. Blake, "The Measurement of Regionalism in Canadian Voting Patterns," *CJPS* 5 (1972) pp. 54-81; Mildred Schwartz, *Politics and Territory*, Montreal: McGill-Queen's U. Press (1974); R. Johanston and J. Ballantyne, "Geography and the Electoral System," *CJPS* 10, (1977) pp. 857-866; D. Blake "Constituency Contexts and Canadian Elections: An Exploratory Study" *CJPS* 11, (1978) pp. 281-305; Lisa Young and K. Archer, *Regionalism and Party Politics in Canada*, Toronto: Oxford U. Press. (2002).
  - vi. The reason for a regional rather than provincial disaggregation is necessitated by the fact that the smaller provinces have so few seats that the rounding process would be more likely to distort the seat allocation than when larger blocks of seats are divided. The regional classification scheme adopted was chosen because it is in common use. The Northwest Territories and Yukon seats are considered together with the Prairie region.
  - vii. Alberta was separated from the other Prairie provinces following the 2001 census-based redistribution, because of its size, but this seemed to have a minimal impact upon the results of the model.
  - viii. There are no data from the 1968 election because of an inability to obtain results from the 1965 election transposed to the redistributed constituency boundaries. This was not a problem for subsequent redistributions.
  - ix. Another approach suggested by Edward Tufte, "The Relationship Between Seats and Votes in Two-Party Systems", *American Political Science Review* 67, (1973), 540-546, and Markku Laakso in "Should a Two-and-a-Half Law Replace the Cube Law in British Elections?," *British Journal of Political Science* 9, (1979), 355-362 was also considered. This method makes use of the exponent 2.5, and while the results represent a slight improvement over the cube principle with our data, they are not nearly as accurate as the "regional cube law."
  - x. The regional categorization is preferable to a provincial scheme because the paucity of

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seats in the similar provinces would provide little independence between the provincial and individual constituency vote swing. In the extreme case, each P.E.I. seat comprises one-quarter of the provincial vote swing but is less than one thirtieth of the Atlantic regional swing.

- xi. Formalizations within the paper were provided by Marc Kilgour of the Mathematics Department at Wilfrid Laurier University, for which the author is indebted.
- xii. Michael Krashinsky and William Milne, "Some Evidence on the Effect of Incumbency in Ontario Provincial Elections," *Canadian Journal of Political Science* 16, (1983), 489-500; M. Krashinsky and W. Milne, "Additional Evidence on the Effect of Incumbency in Canadian Elections," *Canadian Journal of Political Science* 18, (1985), 155-165; M. Krashinsky, "The Effect of Incumbency in the 1984 Federal and 1985 Ontario Elections," *Canadian Journal of Political Science* 19, (1986), 337-343.
- xiii. Krashinsky and Milne, "Additional Evidence," 158.
- xiv. Albert D. Corey and David R. Mayhew, "Congressional Dynamics and the Decline of Competitive Congressional Elections," in Laurence C. Dodd and Bruce I. Oppenheimer (eds.), *Congress Reconsidered* (New York: Praeger, 1977), p. 60.
- xv. An additional reason for using 1962-1963 pair of elections as the initiation point is that from this time on, the Liberals, Conservatives and New Democrats contested virtually all constituencies in the country.
- xvi. Data from the 1979, 1988 and 1997 elections can be used because Elections Canada made available the 1974, 1984 and 1993 voting results reformulated into the newly redistributed boundaries.
  - xvii. The more specific figures for each election contained in this table are presented in the appendix.
  - xviii. The Social Credit and Reform figures are combined with others (a scattering of independents) in order to save space, but the application of the model to Social Credit and Reform is done independently of any other party.
  - xix. The accuracy levels by party broke down as Liberals - 4.8 seats; Conservatives - 3.4 seats; NDP - 2.9 seats; BQ - 3.0 seats; Social Credit - 6.0 seats, Reform and Canadian Alliance - 3.0 seats.
  - xx. It should be noted however, that the consideration of incumbency did not have a uniformly positive effect upon the model. In certain cases, particularly the 1980 election, it had a negative impact.
  - xxi. For the purpose of this study, the Social Credit Party and Ralliement des Creditistes are treated as one movement, and their vote totals are combined.
  - xxii. The accuracy level for the cube law over the eight elections excluding 1968 is 16.6 seats per party per election, and for the "regionalized cube law" over the same period is 7.8 seats per party per election.