A Model for Interpreting Voting Patterns with Application to Florida

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by: Oliver Terence Dawshed (OliverDawshed@aol.com)

Abstract. This work presents a model developed to interpret the electoral voting patterns of Florida seen in the presidential race in the election of 2000 and applies that model to Florida 2004. The model is a two-factor regression analysis, developed from county-level data and applied to precinct level data in selected counties. The model accounted for about two-thirds of the variance in eleven northern counties with a probability of 1E-47 that the result was by chance. In two counties, the model accounted for 90% of the variance. The two parameters used were spoilage and the ratio of Gore votes to the votes for the Democratic senatorial candidate, Bill Nelson (i.e., Gore/Nelson, called here the *pseudocrossover* ratio). These variables can be logically connected to specific ballot tampering strategies.

In 2004, the replacement of punchcard and centrally-tabulated optical scan ballots with touchscreen and precinct-tabulated Marksense ballots all but eliminated spoilage. The analytical model, however, continued to identify as aberrant the voting patterns of certain counties, albeit at a lower level of significance. Alternative explanations for the pseudocrossover ratio were examined and discarded. The preponderance of evidence suggests that there was electoral fraud in Florida that advantaged George Bush especially in 2000, but probably also in 2004.

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For the nonspecialist: There are two measures of interest, the correlation coefficient r^2 and the probability P that an observation is by random chance. The closer that r^2 is to 1.0, the more of the variation in data we have succeeded in explaining. The closer it is to zero, the less we have succeeded in explaining. P varies between 0 and 1. Values of P less than 0.05 are generally regarded as significant. To avoid typesetting problems, superscripts have been avoided. 1E-3 refers to 0.001 (one chance in 1000) 1E-4 refers to 0.0001 (one chance in ten thousand) and so on.

Finally, there are three (and only three) variables that this paper studies in detail. *Spoilage* is defined as the number of ballots that were not counted divided by the total number of ballots in a race. The *crossover ratio* is the number of votes received by a presidential candidate divided by the number of votes received by the senatorial candidate of the same party. The *crossover fraction* is the fraction of voters who voted for a senatorial candidate of one party and crossed over to vote for the presidential candidate of the other.

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1.0 Introduction. To paraphrase George Santayana, those who fail to understand history are likely to repeat errors they might have prevented. With that in mind, consider that in 2000, we spent months developing and testing methodology to understand the Florida election and identify statistically-unusual counties and precincts. Granting that the advent of electronic voting has introduced ever-more sophisticated means to cheat, many basic principles still apply to statistical analysis. A few are obvious. For example, the number of votes should not exceed the number of voters. But many principles are not so obvious.

The goal of an electoral statistical study is to construct an interpretation of voting patterns that is both internally-consistent *and* consistent with all known external facts. Statistical aberrations are *not* irrefutable proof of fraud. The only irrefutable proof of fraud comes from individuals who witnessed or participated in that crime, and/or documentary or physical evidence. That said, circumstantial evidence may at some point accumulate to the point that a reasonable person will conclude that fraud was likely committed.

In general, within reasonable limitations:

- the parameters of any analytical model should be *explicitly* connected to specific strategies of vote manipulation
- as many parameters as possible should be considered for construction of the model
- the criteria for the inclusion or rejection of a parameter should be consistent and as transparent as possible
- the parameters selected for an analytical model should be as *few* as possible
- the parameters must be proven to be reasonably statistically-independent of one another
- any analytical model should be applicable statewide and indeed nationwide
- any analytical model should be applicable for past elections
- longitudinal studies (studies comparing present to past) are limited by changing demographics and should be used with caution
- analytical models should be explanatory at both the county *and* at the precinct level
- because the suggestion of electoral fraud is tantamount to an allegation of the commission of a crime, a very high level of certainty is desirable
- the implications of any analytical model should be plausible and consistent with other electoral observations and with known facts
- data and methodology should be made widely available
- a genuine attempt to engage opposing opinion should be made

2.0 How we arrived at our analytical model. In brief, we thoroughly analyzed how different kinds of electoral fraud would affect voting statistics. We examined many possible parameters at the county level, eliminated those which were not found to be predictive, and further winnowed out those parameters which might be correlated to one another to avoid multicollinearity. Parameters whose values were not available were eliminated, leaving two parameters: the percentage of ballots spoiled, i.e., not containing a legal vote for president and the *ratio* of votes for Gore divided by the number of votes for Democratic senatorial candidate Bill Nelson. The latter was ultimately designated the *pseudocrossover* ratio.

2.1 How different strategies of cheating affect results: turnout, spoilage, crossover. We first examined exactly how specific strategies of cheating would affect results, for simplicity considering old-fashioned paper ballots. A simple example of cheating is stuffing the ballot box by adding illegal ballots marked for one candidate. In that case, unless the poll registry is falsified by an election official, the number of ballots will exceed reported *voter turnout*.

Other parameters may also be affected by stuffing the ballot box. Suppose that the least sophisticated strategy is used. The ballot box is stuffed with ballots marked for only one race and the rest of the races are left blank. In that case, the *spoilag*e (ballots without a legal vote) for the other races will be elevated. In this case, the spoiled ballots will be *undervotes*. *Overvotes* would be seen if, instead of adding ballots marked for one candidate, one made ballots marked for the other candidate uncountable by making a second mark that rendered it impossible to determine voter intent. Since

$$\text{turnout} = \text{valid ballots} + \text{spoiled ballots}$$

spoilage and turnout are equivalent as parameters. However, note that spoilage may differ between different races while turnout cannot.

To explore how electoral statistics are affected, however, one has to make some assumptions about the extent of *crossover* voting. One can consider two extreme cases. In the first, voters from each party vote a straight ticket. Therefore, the Democratic votes in one race match the Democratic votes in all other races, and similarly for Republican votes.

In the second extreme case, 100% of voters cross over party lines to vote for the candidate of the opposite party in just one race. This might occur in reality when, say, a very liberal Republican runs against a very conservative Democrat in a very polarized electorate. In that case, the votes of the candidate will match the votes of the opposing party in other races.

In reality, of course, voters are not as polarized by party as the above two cases. An ethnically Greek Republican might be swayed to cross over for an ethnically Greek Democrat. A Democratic Catholic might decide to vote for a moderate Republican Catholic. A priori, of course, we do not know what the crossover rate will be for a given

race. There must be some degree of crossover or the vote totals would be the same for all the candidates.

What we can say is that there are reasons to believe that the effects of crossover are usually relatively small. While these reasons will be examined in more depth later, one point can be made here. To affect vote totals, the crossover must be greater in one direction than another. Otherwise, it cancels out.

The simplest way to provide a measure this crossover is to take a ratio of the vote total for one candidate of interest relative to some other candidate on the ballot. So, for example, the *ratio* of the votes of a presidential candidate to a senatorial candidate of the same party provides a measure of the degree of crossover. If there's no crossover, that ratio is approximately 1.0. If there is complete crossover away from the presidential candidate by members of his party and no reverse crossover, that ratio is 0.0. If the ballot box has been stuffed for one candidate, unless the ballot box stuffer is extraordinarily careful to match the ratio of votes in all other races, the fraud may be detectable as a surprising crossover value in the affected precinct.

Other statistics may be useful, but these three— turnout, spoilage, and crossover—are particularly useful because they connect voting results to methods of cheating.

2.2 Selection of parameters. In studying Election 2000, a number of other parameters were mentioned as possibly being important. We examined for each county Level 1 literacy, % minority, median income, % African American, total population, location by latitude and longitude, voters per precinct, type of voting machine (Marksense precinct-tabulated, Marksense centrally-tabulated and punchcard), turnout, vote increase 1996-2000, spoilage in the presidential race, the partisan ratio of the county measured as the average of votes in three Democratic races vs. three Republican races and 8 candidate ratios (e.g., Gore/Bush), including the ratio of total presidential votes to total senatorial and of total senatorial to total treasurer. The latter two are indicative of spoilage, deliberate or not.

As a first step, we constructed a correlation table of all of these factors to see which seemed to be related. Using multiple factors that are strongly correlated to one another is an analytical defect called *multicollinearity*, which can lead to erroneous conclusions. As an obvious example, one should choose between % minority and % African American and not use both since, at least in Florida at the county level, the numbers are closely connected.

As a second step, we looked at which of the parameters seemed to best predict the Gore performance at the county level. Median income, % African American, total population, latitude, longitude, voters per precinct, type of voting machine, turnout, vote increase, Gore/Nelson, presidential/senatorial, and %spoiled (in the presidential race) were regressed against %Gore. Level 1 literacy was dropped because figures were available for only 65 counties. This model had an adjusted r^2 of 0.60 and a significance of 1.6E-8.

Latitude and longitude, machine type and vote increase were found to be far from significant, so these were dropped from the analysis.

The remaining eight variables were regressed against %Gore, resulting in an r^2 of 0.58 and a significance of 2.4E-10. A disproportionate fraction of the significance derived from the parameter Gore/Nelson. Since %spoiled correlated to %African American (a relationship proven by the US Commission on Civil Rights) and to presidential/senatorial, one of the three needed to be chosen and the other two discarded to avoid multicollinearity. By trial and error, the best two-parameter model that could be found regressed Gore/Nelson against %spoiled against %Gore to yield a model with an adjusted r^2 of 0.31 and a significance of 2.4E-6.

Realistically, the simplified analysis had lost little of value. Median income figures are not available on a precinct by precinct basis and voters/precinct and county population data are not meaningful parameters below the county level. At the time the analysis was done, we did not have turnout figures by precinct. So, of the eight factors that might have been of merit in describing the Florida results, the two that were useful on the precinct level also had a high level of significance and described almost one-third of the variance in county-level results.

2.3 Applying the model in Election 2000. Having selected of parameters by looking at the *county* level, we then applied the model on the *precinct* level. This procedure accomplished several goals. The most important of these was separating the process of experimental design from the process of measurement. However, choosing parameters at the county level also increases the likelihood that the model will be valid statewide.

At this point, since resources were limited, a decision needed to be made as to which counties would be studied. We rank-ordered counties by individual parameters to understand which counties might be statistically unusual. The same counties showed up again and again in this analysis. For example, Hardee county was 1 standard deviation greater than the mean in punch card spoilage, two standard deviations low in turnout, almost 2 standard deviations low in Gore/Nelson and yet very average in its partisan ratio, defined as the total Democratic vote in the top 3 races vs. total Republican vote in those races.

We found north Florida had a cluster of unusual candidate ratios and high spoilage. There were also unusual counties in south Florida, especially Miami-Dade, Palm Beach and Broward. So, since data were not available from the state, we solicited data from a number of counties. Of these, only Bay, Bradford, Calhoun, Columbia, Dixie, Escambia, Gulf. Hamilton. Jackson, Miami-Dade, Suwanee, Washington, and Union were received in a reasonably timely and complete fashion. For Miami, we did not have %spoilage figures. We later obtained data for Charlotte, Duval, Gilchrist, Lee, and Liberty counties and analyzed them.

Individually, each county we studied fit the two-parameter (%spoiled and Gore/Nelson) model extremely well. We also combined data for a number of Panhandle counties into a

single analysis and found that improved the predictive capacity of the model. We also tried putting back in countywide parameters such as voters/precinct, turnout, and total presidential/total senatorial but found that adding those back in barely raised the predictive capacity

The results of these labors, most of which are reproduced from our earlier work, are presented in the table below.

Several notes are in order. First, if provisional, absentee, or early voting were tabulated separately, these were treated as separate precincts. This is procedurally necessary, since if they are ignored, a large fraction of the vote may not be incorporated into the analysis. However, this tends to underweight absentee and early votes.

Second, certain small precincts had to be excluded because no votes were recorded for Nelson (or, in 2004, for Castor). In this case, the ratio Gore/Nelson diverges. The number of such precincts was small, and the number of votes so ignored very small.

Third, in a few cases, minor candidate totals were not available when analysis was done in 2000.

Fourth, we met resistance for the release of data from some county supervisors. Discrepancies of up to 4% in the spoilage data they released to us and the data reported by the Governor's Select Task Force were noted.

TABLE 2.3.1. TWO PARAMETER PRECINCT-LEVEL REGRESSION OF %GORE

	r^2	Probability	Gore/Nelson	%spoiled	Type
Bay	0.66	one in 7.6E-12	one in 6.7E-12	5.0E-2	1
Bradford	0.83	2.1E-8	3.5E-5	4.8E-8	1
Calhoun	0.88	1.4E-6	3.3E-12	0.12	1a
Charlotte (*)	0.55	8.2E-12	1.2E-5	2.6E-8	1
Columbia	0.89	2.9E-15	7.8E-11	3.0E-9	1
Dixie	0.82	1.9E-4	4.4E-4	0.11	1a
Duval	0.90	1.5E-135	8.9E-50	2.1E-119	1
Escambia	0.91	2.4E-56	1.3E-21	8.0E-44	1
Gilchrist	0.83	3.1E-4	5.1E-3	8.1E-3	1
Gulf	0.80	2.4E-5	0.12	7.1E-5	3
Hamilton	0.64	1.8E-2	7.8E-2	5.5E-2	6
Hardee	0.82	7.0E-5	1.8E-5	8.4E-2	1a
Jackson	0.67	3.6E-7	4.1E-7	6.1E-2	1a
Lee	0.66	1.9E-36	4.4E-20	1.3E-15	1
Liberty	0.61	2.9E-3	0.15	1.0E-3	3
Miami-Dade (**)			0.50		4
Suwanee	0.72	4.9E-5	0.12	9.3E-5	3
Washington	0.78	4.8E-5	1.5E-5	0.44	2
Union	0.74	8.7E-3	6.5E-3	6.0E-3	1
11 northern combined (***)	0.62	1.1E-47	9.6E-41	4.3E-14	1

(*) Charlotte, Duval, Gilchrist, Hardee, Lee, and Liberty have not previously been published.

(**) Single factor analysis. The US Civil Rights Commission proved at the precinct level that there was a highly significant association between spoilage and %African American in Duval, Miami-Dade, and Palm Beach counties. Therefore, it is likely that a regression with %Gore would also be statistically significant. In Miami, r^2 was 0.53 for spoilage vs % African American, and in Palm Beach, r^2 was 0.25. Both values are highly statistically significant.

(***) Bay, Bradford, Calhoun, Columbia, Dixie, Gulf, Hamilton, Jackson, Suwanee, Washington, and Union combined.

Types: 1: both Gore/Nelson and %spoilage statistically abnormal, 1a: Gore/Nelson abnormal and %spoilage near abnormal, 2: Gore/Nelson abnormal and %spoilage normal, 3: spoilage abnormal and Gore/Nelson nearly abnormal, 4: %spoilage abnormal and Gore/Nelson normal, 5: %spoilage normal and Gore/Nelson normal, 6: both values nearly abnormal

3.0 Psst! A word about conspiracies. An old joke has it that an economist and her graduate student were walking across the campus. Spying a $20 bill on the sidewalk, the student stooped to pick it up. "Don't bother," said the professor. "The theory of efficient markets proves that it's already been picked up." Similarly, it is often argued that conspiracies necessarily come to light and that therefore none can exist. It's true that many more conspiracies are imagined than exist in reality; the persistence of the "Protocols of the Elders of Zion" after repeated debunking shows the power of myth to overwhelm fact. It's also true that the existence of conspiracies generally does emerge eventually.

However, those who disparage "conspiracy theorists" cannot answer the fact that some conspiracies, even large ones, come to light only after many years. Iran-Contra, a tightly-coordinated conspiracy involving millions of dollars and hundreds or perhaps thousands of direct participants, began to emerge only after roughly five years of incubation. Even so, the allegations that there was a connection between the outflow of guns to Central America and the inflow of cocaine into the United States were savagely ridiculed for almost a decade. At least one reporter, Gary Webb, lost his job. Thousands of Central American noncombatants died, assassinated by death squads and US-equipped troops. Years later, CIA Inspector General Frederick Hitz confirmed that gun-running contractors of the CIA were indeed implicated in drug running.

Conspiracies need not be centrally coordinated or even particularly secret. All that a conspiracy requires is that the goal of joint action not be widely acknowledged. In 2000, despite the painstaking efforts of the US Commission on Civil Rights to demonstrate that ballot spoilage in Florida was disproportionate in African American districts and that illegitimate purges of voter lists targeted African Americans, the media, the Justice Department, the president, and Congress continue to deny that a conspiracy existed in Florida.

Individual citizens do not have the resources available to either the federal government or the media to investigate and cannot be expected to provide full-bore proof of what are, after all, crimes. Citizens can and should, however,

- verify and document the source of each fact they use
- base their conclusions on sound interpretative methods, especially if statistical
- seek out contrary opinion
- honestly consider contrary facts and alternative interpretations
- test the implications of their conclusions against reality
- be slow to make accusations of wrongdoing

4.0 Interpretation of the model. The model developed in our earlier work shows that in almost all of the counties we have studied, Al Gore's performance at a precinct level can be predicted to a very high degree of accuracy from just two variables: the spoilage of ballots and how he did relative to his ballotmate, Bill Nelson. But what do these findings mean?

4.1 Spoilage. The interpretation of spoilage is straightforward. The US Commission on Civil Rights believed that the evidence indicated a violation of the Voting Rights Act in 2000, and referred the evidence to the Justice Department. The Justice Department, by then under Republican control, declined to further investigate. But statisticians should have little doubt that spoilage was racially-targeted, either consciously or not.

Statistical analysis can't exclude the possibility that the same patterns of spoilage *could* have been unconscious and caused, for example, by providing poorly-maintained and error-prone voting machines to African American precincts. E*vidence refutes* the possibility that excess spoilage might have been primarily the indirect result poorer education in African American precincts. An extraordinary fraction of the spoilage was from overvotes.

4.2 Crossover ratio? Or pseudocrossover ratio? The interpretation of the Gore/Nelson crossover ratio is less obvious. In principle, the crossover ratio is completely independent of the partisan composition of a precinct, depending only on the persuadability of voters. In a highly polarized electorate, a precinct that is 99% Republican will still deliver 1 vote for each Democrat on the ballot, making the crossover ratio for every pair of candidates 1.0.

In practice, however, the situation is far more complex. Even neglecting third party candidates, there will be people who lean toward one party or the other but can be persuaded to swing to the other party if the candidate is attractive. So, to oversimplify, each county will have its strong Democrats, Democratic leaners, Republican leaners and strong Republicans. Some fraction of voters crosses over depending on the race. Not only that, the proportion that crosses over may vary depending on the issue. We simply don't know the answer to the question of how many cross over.

For any given race, we might assume that some fraction of Democrats p crosses over to vote Republican and some fraction of Republicans q crosses over to vote Democrat. In a reasonably homogenous population, and to a first approximation, p and q can be supposed to be constant in different precincts of a given county. To complicate matters, in the real world, there is spoilage (not to mention third party candidates) to deal with as well.

An important note: Values for crossover are not necessarily connected to other measures of crossover, such as exit poll reports of people of one party voting for another or people who voted for one candidate in the previous election now voting for his opponent.

If spoilage is negligible or if it is distributed randomly, a simple linear relationship will be observed:

$$D = (\text{slope1})(d) + (\text{slope2})(r) + \text{intercept} \qquad \text{Eq. 4.2.1}$$

where D is the number of Democratic presidential votes, d is the number of democratic senatorial votes, r is the number of Republican senatorial votes, slope1 and slope2 are

constants related to the crossover fractions p and q respectively, and the intercept should be zero. As is described in the Appendix in much more detail, slope2 cannot be negative, since that will imply that the crossover fraction from Republican to Democratic, q, is also negative. There are similar restrictions on slope1.

If spoilage is not randomly distributed, the analysis gets more complicated. And, unfortunately, we know that in the 2000 election in Florida, spoilage was much heavier in Democratic precincts, so it was not random. However, a number of variants on assumptions about spoilage of the crossover model were tried on the combined 11 northern counties and all gave significant negative values of q of about -0.1. (The results are sensitive to the assumptions about distributions of spoilage, so that physically possible results can be obtained in some circumstances, but no coherent picture of the Panhandle emerges.)

The smallest non-negative value possible for q is zero, corresponding to zero Republican to Democratic crossover. If this assumption is made, positive values of Democratic to Republican crossover are necessarily obtained, since Nelson outpolled Gore throughout north Florida. In this model, 10 - 25% of Nelson voters cross over to vote for Bush, in precinct after precinct, county after county. This is just what the "Dixiecrat hypothesis", which supposes that rural north Florida is comprised of people who register as Democrats and vote Democratic for local candidates, while voting Republican on the national ticket. The fit is very, very, very good, not only on a precinct by precinct and county by county basis, but also region wide.

There's just one problem.

This is simply *not* consistent with what the Gore/Nelson v. %Gore plots show.

Table 4.2.1. Apparent crossover values by county

	Two-parameter crossover model (*)			One parameter
County	**r^2**	**p (%)**	**q (%)**	**p(%) if q=0**
Bay	0.994	-2.1 +/- 3.9	-12.0 +/- 2.0	20.5 +/- 1.0
Bradford	0.980	18.4 +/- 3.8	- 0.8 +/- 3.5	9.9 +/- 3.2
Calhoun	0.977	-13.3 +/- 5.2	-49.2 +/- 7.5	13.2 +/- 6.4
Columbia	0.989	-1.5 +/- 4.2	-17.8 +/- 3.6	14.9 +/- 2.0
Dixie	0.988	0.5 +/- 9.6	-27.6 +/- 14.1	12.0 +/- 2.1
Gulf	0.972	18.5 +/- 5.5	-11.2 +/- 7.0	19.0 +/- 4.5
Hamilton	0.990	12.7 +/- 4.3	-11.2 +/- 5.2	20.1 +/- 8.0
Jackson	0.983	6.6 +/- 3.6	-12.4 +/- 3.5	11.2 +/- 2.1
Suwanee	0.974	14.8 +/- 4.9	- 9.0 +/- 4.6	12.3 +/- 6.1
Washington	0.922	11.0 +/- 10.4	-29.0 +/- 10.6	23.4 +/- 5.2
Union	0.941	17.5 +/- 14.6	- 9.5 +/- 15.9	19.1 +/- 5.8
Hardee	0.884	4.8 +/- 5.8	- 21.6 +/- 4.3	23.8 +/- 4.4
Miami	0.991	- 6.0 +/- 0.4	- 0.4 +/- 0.3	-7.0 +/- 0.4 (**)
Escambia	0.997	- 0.5 +/- 1.4	- 3.3 +/- 6.0	6.8 +/- 0.5

(*) The two-factor regression was run without correction for spoilage. The one factor regression was run with correction for spoilage. Similar results are obtained if the reverse is done.
(**) Spoilage data were not available for Miami when data were compiled, so 1-factor model has *not* been corrected. The negative p value here may be due to spoilage.

If there were no Republican crossover, and Democratic crossover were more or less constant throughout a county as the one-parameter model would suggest, then the Gore-Nelson ratio should be constant, independent of the electoral composition of a precinct. But the Gore-Nelson plots do not show this. As is mentioned briefly in Appendix A, the crossover ratios seen in the most Republican precincts are more consistent with a crossover fraction p of 20%, while the crossover fraction p in the most Democratic precincts are essentially 0.

As seems to be ever the case in modeling, one can never entirely exclude a hypothesis. For example, one might argue that there are *two* characteristic crossover ratios for a county, one for whites and one for blacks. Such a model might be fit, with considerable additional labor, to a three-parameter model. But what can be said with certainly, even at this stage, is that any crossover model would require substantiation.

If one assumes that the difference between Gore's performance and Nelson's is due to crossover voting, even the murky results for crossover fraction produced so far suggest that north Florida is an extraordinarily heterogeneous region. The crossover ratios are also Indeed, the definition of which Florida counties are dominated by Dixiecrat voting or the extent of the claimed effect is unclear.

In fact, there are a number of reasons to suspect that the "Dixiecrat hypothesis" does not explain Florida voting patterns in the 2000 election. The first is that, nationally, the transition in party identification began 20 years ago and has essentially run its course. There are no more than a handful of Democratic state senators and representatives from Republican north Florida. Perhaps voters have retained registrations to a party for which they do not vote at either the local or the national level, but in terms of voting behavior, there's little reason to believe that there is unusual crossover.

The second reason to doubt the Dixiecrat hypothesis is that senatorial seats are contended for by the right almost as ferociously as the presidential race. Betty Castor was demonized by James Dobson in 2004 as supposedly having "consistently sought to advance the cause of the abortion industry" and being in favor of gay marriage (www.floridabaptistwitness.com/3400.article). We did examine briefly the statistics of a non-controversial race, i.e. that for State Treasurer, but found no greater enlightenment.

Third, no evidence of crossover is seen in Miami-Dade, representative of Democratic counties (crossover ratio 1.08 +/- 0.12), consistent with the notion that the general electorate is highly polarized. In addition, as the present work has begun to show, the electoral statistics of the rural northern counties more closely resemble other Republican counties than they resemble one another.

Several kinds of ballot tampering might be consistent with unusual pseudocrossover ratios. One method is by erasing the Gore mark from a double (Bush-Gore) overvote. Notice that this method of ballot tampering also lowers spoilage. Another method is to deliberately miscount Gore votes as Bush votes. Therefore, ballot tampering has to be considered as an alternative explanation for the peculiar crossover ratios of north Florida, and the crossover ratio will subsequently be referred to as *pseudocrossover* ratio to emphasize that question.

4.3 Did ballot tampering take place in 2000? The all-but-inevitable conclusion of reading the report of the US Commission on Civil Rights is that, yes, ballots of many African Americans were deliberately spoiled. In Duval County, for example, tens of thousands of ballots were spoiled, supposedly because voters overvoted on a ballot with a confusing design and incorrect instructions. Yet no evidence has been produced to suggest that this is actually what happened. Many residents of Duval County remain convinced their votes were destroyed. To add to suspicions, the supervisor of Duval County, John Stafford, had to be taken to court to permit *inspection* of the spoiled ballots, even though they are a public record.

The present work adds observations from many counties to that work to show that ballot spoilage was extremely widespread and in many cases not explainable at all. Escambia County, Scarborough country, supposedly had overvote protection on its machines. Yet half a dozen very Democratic precincts had spoilage rates of over 12%.

One may also suspect that ballot tampering may have taken place because two variables that can be directly related to ballot tampering, spoilage and pseudocrossover, show statistically very unusual values. This is seen in an extraordinary number of counties of north Florida. The model presented in *Bush's Fifth Ace* began as a modest predictor of a small fraction of the variation on a county-by-county basis. On a precinct-by-precinct basis, it is virtually quantitative, explaining two-thirds to 90% of the variability either within individual counties or by lumping counties together.

Also, even though spoilage and the crossover ratio appear to be statistically independent, statistically-significant correlations of both are found with great frequency in the same counties. The high spoilage occurred in very Democratic precincts, while the unusual pseudocrossover occurred in very Republican precincts, preserving the statistical independence of the variables. Nine of 18 counties examined show both effects at statistically-significant levels. Another 7 show one effect at a statistically significant level and the other at a near-statistically significant level. In one additional county, both parameters were at near-statistically significant levels. In only one county was a single parameter significant and the other clearly absent.

It's also notable that the pseudocrossover ratio in Miami, which has many very Republican precincts shows no relationship between %Gore and the crossover ratio. Indeed, the evidence is that there is virtually no crossover at all in Miami, corresponding to an intensely polarized electorate.

A further reason to suspect that ballot tampering may have taken place is that, according to work by Paul Lukasiak, certain counties in the western Panhandle which reported overvotes did not have double overvotes, although some overvotes with many more than one mark were noted. It is simply incredible that no double overvotes could have been observed. The conversion of double overvotes into votes is, by the way, one of the means by which the pseudocrossover ratio can be altered.

Nor is ballot tampering inconsistent with any of the known facts. As mentioned, the pseudocrossover ratio and spoilage were chosen as variables in large measure because they serve as measures of different sorts of ballot tampering.

Therefore, while there was no *direct* evidence of ballot tampering, there was clear evidence of widespread contempt for the integrity of the vote evidenced in spoilage. There was unambiguous evidence of ballot tampering in Escambia and several other counties in the western Panhandle. There was evidence that unusual statistics are clustered in certain counties, consistent with what would be seen if there were tampering. While there is no direct evidence, the preponderance of evidence points to election theft.

And there is more to come.

5.0 Election 2004

5.1 What's different in 2004?

A number of facts have changed between 2000 and 2004. First, punchcards and centrally-tabulated ballots, not to mention lever machines and paper ballots, have been eliminated. The consequence has been a drastic drop in vote spoilage. On the other hand, touchscreen machines and central tabulators with poor security have been introduced, opening new opportunities for tampering.

5.2 Application of the model to 2004

Temporarily ignoring the fact that spoilage had probably ceased to be a significant factor by 2004, we applied the model precisely as it had been applied before. One a county wide basis, an r^2 of 0.285 was observed. This is very little reduced from the value of 0.312 seen in 2000. The results we have obtained for individual counties are given below. At this stage, figures for spoilage are not available for many counties.

Counties with unusual (greater than one standard deviation from the mean) values of the Kerry/Castor crossover ratio were, in ascending order of numerical value: Lafayette, Holmes, Dixie, Liberty, Suwanee, Baker, Hardee, Union, Taylor, Gilchrist, and Wakulla on the low side and St. Lucie, Broward, Orange, Palm Beach, Monroe, Charlotte, Lee, Osceola, Collier, and Miami-Dade on the high side. So, Lafayette was the furthest from the mean on the low side and Miami-Dade on the high side.

Counties that showed a notable (greater than one standard deviation) *shift* in crossover ratio from 2000 to 2004 were in order of increasing numerical value Bradford, Jackson, Osceola, Walton, Escambia, Hendry, Brevard, Bay, Gulf, Washington on the high side and Martin, Sarasota, Hernando, Wakulla, Highlands, Sumter, Dixie, and Hardee on the low side. The former group represents an *increase* in the ratio Kerry/Castor relative to Gore/Nelson and the latter represents a decrease in the ratio Kerry/Castor relative to Gore/Nelson. To take an illustrative example, Washington County showed a large increase in Kerry/Castor relative to Gore/Nelson (from 0.69 in 2000 to 0.84 in 2004), so either Kerry was much more popular than Gore or Castor was much less popular than Nelson.

Table 5.2.1 Results by county for 2004 (*)

County	r^2	Prob. overall	Prob. K/C	Prob. %spoiled	Type	p D->R (%)	q R->D (%)
Baker(**)	0.399		0.022			13.0 +/- 4.9	-3.9 +/- 1.9
Bay	0.250	1.38E-4	3.12E-5	0.970	2	-13.5 +/- 2.2	-8.2 +/- 0.8
Bradford(**)	0.509		1.17E-4			3.1 +/- 2.8	-7.9 +/- 1.7
Brevard	0.288	2.12E-16	2.24E-17	0.878	2	0.0 +/- 0.2	-0.9 +/- 0.2
Calhoun							
Charlotte(**)	0.0		0.341			1.9 +/- 0.5	3.7 +/- 0.4
Citrus	0.288	3.53E-4	9.74E-5	0.761	2	2.4+/- 3.2	4.5 +/- 2.9
Columbia							
Dixie							
Duval							
Escambia	0.378	3.19E-10	6.28E-7	1.49E-4	1	-2.9 +/- 0.4	-2.4 +/- 0.2
Gilchrist	0.601	6.52E-3	5.86E-3	0.0977	1a	20.5 +/- 7.5	-3.3 +/- 5.2
Gulf							
Hamilton							
Hardee	0.688	6.62E-4	2.53E-4	0.952	2	-1.3 +/- 6.2	-19.9 +/- 3.9
Hendry	0.159	0.052	0.017	0.355	2	-1.6 +/- 1.6	-4.1 +/- 1.1
Highlands	0.357	1.90E-3	9.03E-4	0.421	2	3.9 +/- 1.4	-5.4 +/- 1.2
Hillsborough	0.630	1.04E-78	1.86E-78	4.35E-4	1	-8.0 +/- 0.3	-16.4 +/- 0.3
Jackson							
Lake (**)	0.179	2.00E-5	1.70E-5	0.015	1	9.7 +/- 0.8	4.6 +/- 0.6
Lee	0.082	2.97E-5	0.29	9.39E-5	4	-2.0 +/- 0.6	0.1 +/- 0.4
Liberty (**)	0.777		4.63E-4			14.3 +/- 10.0	-12.0 +/- 8.5
Marion (**)	0.168		2.30E-7			1.9 +/- 0.4	-4.8 +/- 0.3
Miami-Dade	0.091	1.09E-18	7.2E-19	0.171	1a	-5.6 +/- 0.1	4.2 +/- 0.1
Osceola (**)	0.334		3.3E-10			-8.0 +/- 0.6	-3.9 +/- 0.6
Polk (**)	0.476		7.75E-25			-4.1 +/- 1.1	-10.4 +/- 0.9
Seminole	0.124	9.27E-5	3.19E-5	0.061	1a	-2.0 +/- 0.4	-1.8 +/- 0.2
Suwanee (**)	0.769		2.34E-6			2.0 +/- 3.0	-15.8 +/- 2.1
Volusia	0.239	5.20E-12	6.09E-13	2.07E-3	1	-2.7 +/- 0.2	-2.6 +/- 0.2
Washington							
Union							

(*) Note that probability values for all counties in which spoilage is not available will change with as the second factor is introduced. While changes are expected to be small, these reports must be regarded as incomplete. p and q values are calculated neglecting spoilage.

(**) One-factor model. Spoilage data not available

Types: 1: both Gore/Nelson and %spoilage statistically abnormal, 1a: Gore/Nelson abnormal and %spoilage near abnormal, 2: Gore/Nelson abnormal and %spoilage normal, 3: spoilage abnormal and Gore/Nelson nearly abnormal, 4: %spoilage abnormal and Gore/Nelson normal, 5: %spoilage normal and Gore/Nelson normal, 6: both values nearly abnormal

5.3 Interpretations

Once again, a large number of counties show peculiar values of pseudocrossover or spoilage or both. The generally lower values of correlation coefficients suggest that fewer ballots are at issue than was the case in 2000. Charlotte, Lee, and Lake Counties show that counties that are heavily Republican can show normal pseudocrossover ratios, even in precincts that are 75% Republican. In the previous election, Charlotte and Lee showed suspicious pseudocrossover ratios.

In no county yet examined is it certain that there is no evidence of tampering. Charlotte is probably free of such traces, but spoilage has not been examined. In Miami, there may be evidence of tampering, but the small correlation coefficient suggests that a small fraction of votes would have been affected. Pseudocrossover is clearly linked to Kerry performance. But here, as determined by the slope of least squares analysis, strong Kerry precincts actually have a *lower* Kerry/Castor ratio, and the slope is strong.

Counties where a large fraction of the votes may have been affected were Bradford, Gilchrist, Hardee, Hillsborough, Liberty, Polk, and Suwanee. The strongest F-tests for tampering are Brevard, Escambia, Hillsborough, Osceola, Polk, and Volusia, as well as Miami; here it must be remembered that county size greatly affects the sensitivity of the test.

Large negative crossover fractions in Bay, Hardee, Hillsborough, Liberty and Polk Counties suggest the breakdown of a simple model in those counties and may be considered a possible additional sign of tampering. In Charlotte, and Lee counties, where there is not a strong dependence of %Gore on Gore/Nelson, crossover fractions are consistent with an intensely polarized electorate and essentially zero crossover. In Miami, the Democratic stronghold, correction for spoilage results in a fairly consistent picture of zero crossover. Whatever nominal party identification may be, people who vote for one party on the presidential level vote overwhelmingly for the same party at the senatorial level. This is seen in both the 2000 and 2004 elections.

The low values for spoilage should make it clear that very few people of any race deliberately spoil their presidential ballots. But note that some counties still show a targeted spoilage pattern.

6.0 Improving the model

There are some weaknesses in the model that need to be noted. The calculation of crossover for 2004 can be improved by explicitly incorporating senatorial spoilage. Presidential spoilage was roughly 0.5% of the vote, and senatorial spoilage was in the vicinity of 3%. To incorporate spoilage into crossover, some assumptions about the distribution of spoilage among the major and minor parties must be made. If one assumes that spoilage is distributed according to the actual vote, then the true Bush and

Kerry votes are 1.005 times their reported values, and the Castor and Martinez votes are 1.03 times its reported value. Under those assumptions, $1.005k = (1-p)(1.03)c + q(1.03)m$, where k are Kerry votes, c is Castor votes and m are Martinez votes This simplifies to

$$k = (1.025)(1-p)c + (1.025)qm$$

More generally, if one corrected for spoilage distributed randomly, the values of crossover for Republicans would be slightly larger *in magnitude* than those presented in Table 4.2.1 and Table 5.2.1, but the true crossover values for Democrats would be smaller in *magnitude*.

Another improvement that could be made is weighting data points for precinct size. A few precincts only have one or two voters, while "precincts" comprised of absentee ballots or early voting may contain a large fraction of the vote. While these extremes are rare, in a finalized analysis, they need to be accounted for.

It would also be desirable to examine crossover fractions and pseudocrossover ratios for non-controversial races. In 2000, the race for State Treasurer might provide some insights, though early work did not find any.

A minor point is that it would desirable to obtain finalized data. We obtained our results from county websites or directly from county supervisors. Discrepancies between these and official results have been noted above. Regrettably, full values for official precinct level statistics were not available even six months after election 2000 and there is no reason to believe that this election will be any different.

As far as other parameters to incorporate into a model, one of the most important is some measure of minority composition of the electorate and some measure of turnout *relative to registration*. If we are finding strange values of the crossover ratio but spoilage has been eliminated as a variable, ballot box stuffing could be explanatory. Senatorial spoilage is another variable that has not been controlled for.

7.0 Note. All data are available on request by contacting the author, who is pseudonymous, at OliverDawshed@aol.com. In the calculations for regressions in this paper, spoilage was estimated as the number of ballots spoiled in a race divided by the total valid ballots in that race. This definition, rather than the number of spoiled ballots divided by the total number of ballots has advantages in calculations, as shown in the Appendix.

8.0 Bibliography

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9. 0 Appendix A. Calculation of Crossover Fraction

In an idealized world, neglecting spoilage,

$$g = n-pn+qm \qquad \text{Eq. 9. 1a}$$

or equivalently

$$g= (1-p)n + qm \qquad \text{Eq. 9.1b}$$

where g is the gore vote tallied, n is the Nelson vote tallied, m is the McCollum vote tallied, and p and q are *crossover fractions* from Democrat to Republican and vice versa. So, by regressing Gore votes against both Nelson and McCollum, one can in principle obtain the crossover ratios.

A simple example illustrates how this works. Suppose that Gore received 100 votes while Nelson received 110 and McCollum received 90. There are an infinite number of solutions for this (which is why we need more than one precinct to figure out which is the correct one). One solution is that p = 0.15, corresponding to (0.15)(110) = 16 Nelson voters switching to Bush, and q = 0.07, corresponding to (0.07)(90) = 6 McCollum voters switching to Gore. Alternatively, if McCollum had received 110 votes and Nelson had received 90, p could be 0.07 if q were be 0.85.

To correct for spoilage, some kind of assumption has to be made about the distribution of spoilage. Let s = fraction of presidential ballots spoiled (spoiled presidential ballots/valid presidential ballots), t represent the fraction of senatorial ballots spoiled, and **T** represent turnout. Note that **T** varies from precinct to precinct and is a function, not a constant. To give an example, if there were 100 ballots, and 50 were Bush and 30 were Gore while 20 were spoiled, s = 20/80 and T= 100.

If spoilage is distributed randomly, then the true number of Gore votes is (1+s)g, the true number of nelson votes is (1+t)n and the true number of McCollum votes is (1+t)m. Then the corrected equation is

$$g(1+s) = (1+t)(1-p)n + q(1+t)m \qquad \text{Eq. 9.2a}$$

or equivalently

$$g = (1+t)(1-p)n/(1+s) + q(1+t)m/(1+s) \qquad \text{Eq. 9.2b}$$

If spoilage is random, then the crossover fractions can be calculated by reinterpreting the results of the regression obtained from Eq. 9.1b. One very important point is that the *sign* associated with the Republican → Democratic crossover fraction q cannot change from that predicted from Eq. 9.1b. Negative values for slope represent a breakdown of the model. Similarly, p can not exceed 1.0, resulting in a negative slope for the term associated with Nelson votes.

Applying equations 9.1a and 9.1b to the 2000 data result in physically impossible answers, as seen in Table 4.1.1. A statistically good fit for the 11 counties of the Panhandle is found (r^2 =0.985) with p= 11.2% +/- 1.8% and q = -5.0% +/- 1.0%. The negative value indicates a breakdown in the model. As noted, reinterpreting the data according to Eq. 9.2a and b will not change the sign associated with q.

Therefore, we are forced to a model that assumes that spoilage is not distributed randomly. This is not really surprising since the strong association of spoilage with %Gore has already been established.

These findings force us to explicitly recognize the role of spoilage in what would otherwise appear to be crossover voting. If all of the spoilage of the presidential race is suffered by one candidate, and spoilage is randomly distributed among the senatorial candidates, then two forms will be obtained for the equation. The first, in which Bush suffered all the spoilage is simple, since the number of Gore votes seen is the actual number cast.

$$g = (1+t)(1-p)n + q(1+t)m \qquad \text{Eq. 9.3a}$$

In this case, p and q can be obtained from reinterpretation of the slopes of Eq. 9.1b, and the conclusion that the crossover model fails is sustained.

If Gore suffered all the presidential spoilage, but senatorial spoilage is randomly distributed, then **T**s is just the total number of spoiled votes in a given precinct, the true votes intended for Gore are g + **T**s, and the equation simplifies to

$$g + \mathbf{T}s = (1+t)(1-p)n + q(1+t)m \qquad \text{Eq. 9.3b}$$

Again note that **T** varies from precinct to precinct according to the Gore vote and is not a simple constant.

One final note, to give a sense for typical values of crossover. The races for which one might want to study crossover tend to be competitive. If there's no opposing candidate, there's of course no crossover to study. But if a major party candidate runs, it's with the expectation that there's some chance of victory. Most election returns are no more extreme than, say, 70% for one candidate and 30% for the opposing party. For this reason, we can say that crossover ratios tend to fall in a well-defined range. Compared to a race that highly competitive, then, a net *crossover fraction* of 20% is sufficient to shift the result to the extreme. Such a crossover fraction would result in a *crossover ratio* of 30%/50% = 0.6, or if crossover went the other way 50%/30% = 1.7. Again to give perspective, the average over counties of the crossover ratio Gore/Nelson was 0.89 +/- 0.11.