18 April 2013

Chris,

The proposal you provided for analysis of vessel operations and compliance is great. Thank you.

Thanks, Greg. My responses are below in red.

Here are my thoughts/questions.

First, I wasn’t sure if you were proposing one (or more) of three different approaches, all of them, or perhaps a combination of them. If not too heavy of a lift and they each provide different approaches of value and consider separate questions, then I am in favor of doing all three.

Yes, the plan is to at least attempt all three. It may be, due to any one of a variety of circumstances, that one or more will not come to fruition, but I was going to work towards all three.

With regard to the “compliance metric”, I am still very much in favor (and unless there are major objections) of continuing to use PDGT10, as opposed to a maximum speed for each trip, or a more permissive average speed above 10 knots or a 1-2 knot buffer. We have thought long and hard about this and developed PDGT10 because it seemed to realistically characterize, but focused exclusively on, the faster trips. *However*, although specified in the rule, 10 knots is indeed an arbitrary cut-off – and seemed to us to be no less arbitrary than, say, 11.0, 14.0 or 11.8 (for example) knots. A different approach we might take is to consider *all* speeds. That is, for some (e.g., the change point and time series) of the analysis you are suggesting (if I understand you correctly), we may use no cut-off whatsoever. Well, we’d still need to select *some* speed threshold. For example, there are a lot of zero knots in the data base as ships continue to transmit AIS data while in port or while at anchor and can indicate up to 2 knot speeds while “swinging” at anchor. We have chosen 5 knots in some of our previous analysis, reasoning that this is probably the minimum (or, perhaps well below) speed a ship would need to maintain steerage (realistically, this would probably have to be something more like at least 8 knots). My only point is, if it would make for more meaningful analysis we don’t necessarily need a 10 knot cut-off. This seems to give some of our reviewers heartburn, too, who regard it as a strict measure of compliance.

I’m happy with PDGT10, particularly if it has already been deeply considered. It only raised the question of what proportion of a segment above 10 knots constitutes a violation?

On compliance -- our goal here is *not* to point fingers or to somehow indicate those regulated were somehow bad actors (the sentiment some reviewers seem to assign to us), but rather, simply to reasonably and objectively characterize what we have observed. So… am open to suggestions here. To us, PDGT10 (in addition to the histograms of frequency of speeds used above 10 knots) seemed to do this.

My only caveat with regard to using all speed records (i.e., above, say, 5 knots) is that I would be hesitant to send Jeff back to hours of re-analysis. Nonetheless, I offer it as a possibility if it would enhance the analysis, provide a more complete picture, and do away with the strict view of compliance or violation status.

As to the specifics…

Differences between SMA active periods. Yes (!), to the effect size analysis. (Is this a case in which the mean of *all* speeds would be useful?). Yes, to the calculation of distributions of compliance measures and to the re-sampling of empirical differences in distributions

Change-point analysis. Yes, I like this. (Another instance in which all speeds would be desirable? Or, is PDGT10 adequate?) Logit- or probit-transformations are fine with me. As to the time-interval (month, week, day), I prefer week. Whereas, each of the notification programs began at a time certain, I think it is most reasonable to assume that a change in behavior (if any) might be observed on, for example, a subsequent trip occurring days or weeks later. As to covariates, yes, country flag and ship type are good; could SMA be one? Others have suggested time of year (e.g., differences in weather) or even differences tides – but, I believe these would not necessarily be important factors….vessels need to keep schedules regardless of such factors and account for them.

As to change-point modeling across or within SMAs and ship types, here is what I would find most interesting, if doable. First, across all SMAs, all ship types. This would provide a picture of the response to the rule (and notification programs) that included the *entire regulated community*. That is, how did *everyone* respond? As a second tier, I think we might consider cargo vessels, only, for the following reasons. Cargo vessels are the majority of records in the data base and up to 80-90% of the trips are by cargo vessels in some SMAs. These tend to be the fastest ships studied (with the possible exception of cruise ships) and therefore would not only need to have the greatest potential change in behavior to honor the rule and would be most affected by it. Maximum speeds by tankers and commercial fishing vessels tend not to exceed 12 knots so there probably are not big changes in their speeds in response to the rule. The same is true of tugs and tows; their speeds are probably primarily below 10 knots. So, as a second tier, I suggest we do a change-point analysis of cargo vessels, only, across (and perhaps within – to determine if there are regional differences) SMAs. Then, consider the same for passenger vessels, only. Is that doable?

At first glance, I would definitely favor subgroup analyses for each SMA, or even ship type within SMA, since there seems to be quite a variation by ship type, based on the data visualizations we have already done. If the behavior is very heterogeneous among areas, it could actually hide an SMA-specific signal. However, there is certainly no harm in doing both a “global” model as well as local ones. I will follow your suggestions regarding the ship type sub-analyses.

Time-Series. I like this, too! Logit-transform and non-parametrics are fine with me. I defer to you on the choice of the non-parametric test and whether you think linear formulation of something more complex is most appropriate.

Hope this is helpful.

Great work. I am excited to see the results. I can organize a call to discuss if you like.

Greg