

COMPLIANCE RISK MODELING AND RESOURCE ALLOCATION IN LMSB

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OVERVIEW

The IRS is currently engaged in a major effort to improve its capacity to measure compliance risk among Large- and Mid-Size Business (LMSB) taxpayers and to use this information as a foundation for allocating scarce audit resources in a more effective manner. The effort has the potential of increasing corporate tax revenue both from direct enforcement and from indirect voluntary compliance, both of which are vitally important in the current constrained budgetary environment. Moreover, by making it possible to target enforcement resources more precisely on less compliant taxpayers, the effort has the potential of reducing the burden on more compliant taxpayers and therefore of increasing both the perception and reality of fairness in the tax system.

The effort involves developing explicit models of compliance risk and resource allocation. The compliance risk model is a statistical model of the extent to which taxpayers under- or over-report true tax liability on their current-year returns. The resource allocation model transforms the estimated compliance risk into a resource allocation decision designed to achieve the broad policy objectives of the IRS. This two-stage process has several important benefits. First, it allows one to develop a pure statistical model of compliance risk, uncontaminated by policy issues or other factors that are peripheral or unrelated to the available data. Second, the compliance risk model provides a flexible foundation for alternative resource allocation policies. Finally, the resource allocation model requires IRS policymakers to be explicit about the resource allocation policy they adopt.

It is important to point out that the development of the compliance risk and resource allocation models is taking place in the context of broader IRS business and information systems modernization programs. In the spirit of these programs, a fundamental tenet of the current effort is to make the models explicit. This makes it possible to critically analyze the models and therefore to establish a process for their continued improvement and refinement. Indeed, an aspect of the current effort is a consideration of how to structure the business processes in a way that encourages this process of improvement

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and refinement. These business processes involve the establishment of responsible groups as well as the development of data and analytic tools to support the work of the groups.

EXTENDED DATASET

The compliance risk and resource allocation modeling effort is based on an extensive dataset which links multiple sources of information on LMSB taxpayers and their related entities into a multi-year panel. The dataset includes tax return and financial statement information, audit results, and economic information (e.g., industry and market performance). The dataset is considerably richer than the one currently used for compliance risk and resource allocation modeling. In particular, it provides:

- More detail on the domestic characteristics of LMSB taxpayers and their related entities.
- More detail on the international characteristics of LMSB taxpayers, their related entities, and the countries in which they conduct business.
- Historical information on taxpayer activities and, as a result, information on year-to-year structural changes among taxpayers.
- Information from the financial statements of public companies and, as a result, information on book-tax income and balance sheet differences.

The extended dataset represents an initial step in the creation of the Shared Data Set (SDS), a comprehensive integrated data set currently under development in LMSB. SDS attempts not only to link multiple sources of information, but it also attempts to make it possible to make meaningful comparisons across the different sources of information.²

COMPLIANCE RISK MODEL

The compliance risk model is a statistical model of the extent to which taxpayers under- or over-report true tax liability on their current-year returns. The basic source of information on this measure of compliance risk is audit results from the AIMS closed-case database. Since these data may reflect taxpayer activities in other years (e.g., NOL and excess credit carryovers), we are adjusting the audit results data to eliminate the effect of these activities. This adjustment eliminates any bias that would otherwise exist in favor of taxpayers with offsets from other years, and, in particular, those whose offsets may reflect aggressive behavior. The model also ignores the number of hours devoted to audit, which eliminates any bias that would otherwise exist in favor of uncooperative taxpayers (i.e., those who require more time and effort to audit).

² See, e.g., Lillian F. Mills, Kaye Newberry, and William B. Trautman, "Trends in Book-Tax Income and Balance Sheet Differences," *Tax Notes* 96 (August 19, 2002), pp. 1109-24 for a discussion of some of the issues associated with comparing income and balance sheet information on tax returns and financial statements.

Since we have a limited theoretical understanding of the determinants of compliance risk, we are employing a structured data-mining approach to estimation. In particular, we incorporate into our model variables that capture the dimensions on which we believe taxpayers differ, as well as variables that we believe are indicative of compliance risk. In addition to considering the raw information from the extended data set, we also consider issue-specific measures of compliance risk that we have developed in close collaboration with issue experts. It is envisioned that, with continued expansion of the scope of these issue-specific measures and their refinement over time, they would ultimately provide information on the relative importance of issues on a return, as well as the risk-return trade-off associated with pursuing particular issues.³

RESOURCE ALLOCATION MODEL

The compliance risk estimates represent one of perhaps many inputs into a broader resource allocation model designed to achieve the policy objectives of the IRS.⁴ Indeed, while there are statistical reasons for modeling compliance risk independently, LMSB's resource allocation decision might consider such additional factors as:

- Mandatory work (e.g., Joint Committee cases).
- The indirect effect of the audit policy on voluntary compliance.
- The level of aggressiveness on any given return. A given level of expected audit results, for example, may reflect different levels of aggressiveness across companies of different size.
- The certainty of the expected audit result.
- Expected revenue after accounting for the effect of activities in other years (e.g., NOLs and excess credit carryovers). This raises the issue of the discount rate associated with the expected revenue flows across different time periods.⁵
- Expected resource costs (e.g., audit hours).
- Resource constraints (e.g., geographic distribution of audit resources).

³ The model is estimated using data from a sample of tax returns that were selected for audit *and* that have closed. Since some observations on the dependent variable corresponding to known sets of independent variables are not observable, and the sample selection process is non-random with respect to audit results, we employ a procedure similar to that proposed by Heckman to deal with the censored sample. See Heckman, J., "The Common Structure of Statistical Models of Truncation, Sample Estimation for Such Models," *Annals of Economic and Social Measurement* 5 (1976), pp. 475-492.

⁴ The Servicewide Research Council (SRC) has explored the general issue of the appropriate objective of workload selection systems in the Workload Selection Task Force chaired by Alan Plumley. The objective of a resource allocation model is closely related.

⁵ If an audit adjustment in a given year is fully offset by an NOL carryforward, for example, there would be no direct enforcement revenue in the current year but the potential of increased direct enforcement revenue in future years. As a result, the IRS should explicitly consider the relative value of revenue flows across different time periods.

The explicit (i.e., mathematical) representation of the resource allocation decision, I believe, would provide a foundation for refining the current resource allocation policy in a manner consistent with the broad policy objectives of the IRS. Indeed, while it may not be possible to measure precisely some of the components of the resource allocation decision (e.g., the indirect effect of the audit policy on voluntary compliance), making implicit assumptions explicit would provide a useful foundation for acknowledging and addressing some of the limitations inherent in the current policy.

PRELIMINARY RESULTS

Preliminary estimates from the compliance risk model suggest that we are better able to identify the determinants of compliance risk in 1996 as a result of the extended data set and the issue-specific compliance risk indicators we have developed in collaboration with experts. We present charts for all LMSB taxpayers and for all LMSB taxpayers broken down by activity code.⁶ These charts plot the actual cumulative audit results for 1996 by audit hours based on three criteria: 1) the *Optimal* criterion, which is a ranking of returns on the basis of actual audit results for 1996;⁷ 2) the *Extended* criterion, which ranks returns on the basis of models estimated using the extended data set; and 3) the *Limited* Criterion, which ranks returns on the basis of models estimated using the data on which the current compliance risk models are run. At any given level of audit hours, the height of each chart is the amount of direct audit dollars LMSB would have obtained under the different audit ranking criteria.

While the charts suggest that we are better able to identify the determinants of compliance risk for 1996, it is not yet clear that the results are generalizable beyond 1996. It may be that the encouraging results simply reflect an over-training of the 1996 data, a potential problem which one can get a handle on with the relatively independent 1997 test dataset currently under construction. It is also entirely possible that the underlying relationships and patterns in the data have changed as a result of changes in taxpayer and IRS activities, changes in industrial structure and the nature of competition, changes in technology, or changes in the macro economy. Regardless of the source of the changes, the issue of generalizability is problematic for the LMSB population. Indeed, in order to obtain the relatively complete audit result data one would need for a representative sample of the LMSB population, the farther back in time one needs to go, and therefore the less relevant the relationships and patterns in the data are likely to be.

In order to address the issue of generalizability, LMSB will test the validity of the training model on relatively independent data for 1997. In particular, we will compare actual audit results for the 1997 returns with the compliance risk model's estimate of audit results for those returns. In addition, we are also proposing to select a random

⁶ These charts are not included in the conference materials.

⁷ The term *Optimal* is used for expository purposes. This criterion would not necessarily be optimal if our objective were to minimize the deviation (positive or negative) of reported tax liability from true tax liability.

sample of 2001 returns, subject them to manual classification, and compare those results with the model's estimate of audit results. This latter test will reveal only whether or not the model is consistent with manual classification. Indeed, while the test would not allow one to determine that the model is, in fact, effective in estimating compliance risk, it would provide some comfort that the electronic and manual classifications are consistent.

The comparison of the results of alternative classification systems would not only provide some information as to the generalizability of the model, but it would also provide a foundation for the continued improvement and refinement of the model. By comparing the results of alternative classification systems, perhaps in combination with audit results information, experts could make more informed judgments about improvements and refinements to the model. The refinements could include not only an improved set of predictor variables for the statistical model but also adjustments to the statistically-estimated parameters based on *a priori* beliefs. LMSB envisions that this process of collecting and analyzing information and refining the compliance risk model would take place on a continual basis and become institutionalized in groups of economists, statisticians, and issue experts.

SIMULATION MODELING

There are two serious concerns, in my opinion, with the current compliance risk modeling effort. The first is that the statistical model, by its nature, only identifies historical relationships between compliance risk (e.g., audit results) and a set of predictor variables. Because it often takes a long time to audit LMSB taxpayers, we must rely on data that are many years in the past to identify these relationships in a somewhat representative sample of taxpayers. Although it may be possible to do a statistically valid test of the generalizability of the model to a more current year, the more current year is still not likely to be current enough to fully mitigate concerns about generalizability to future years. The second concern is that the model is not likely to capture important structural differences across companies. In particular, the model does not explicitly account for the number, type, and organizational structure of entities that comprise a company, nor does it account for the rules governing their structure or the resource flows among them.

To attempt to address these concerns, LMSB is considering the development of simulation models to assist in the refinement of the compliance risk model. Simulation models rely to a lesser extent on actual audit results and to a greater extent on proxies for compliance risk, such as change in estimated tax liability. This implies that they could be based on relatively current data. In addition, simulation models are flexible enough to explicitly account for important structural differences across companies. These models would allow us to estimate the sensitivity of a proxy for compliance risk to a series of changes in the characteristics of taxpayers. One might, for example, estimate the sensitivity of estimated tax liability to the existence of a subsidiary in a low-tax jurisdiction or to the characterization of transactions as debt or equity. The measure of

sensitivity could be used explicitly as a predictor variable in the statistical model of compliance risk, or it could be used to adjust the parameters of the statistical model.⁸

CONCLUSION

The IRS is engaged in an effort to improve its ability to measure compliance risk among LMSB taxpayers and to allocate its scarce resources more effectively. This effort involves the development of a statistical model of compliance risk based on a comprehensive taxpayer-level panel database. It also involves the development of a separate resource allocation model, which effectively transforms the estimated compliance risk into an audit policy that is consistent with the broad policy objectives of the IRS. In the spirit of the on-going business and information systems modernization programs, a fundamental tenet of the effort is to make the models explicit. This makes it possible to critically analyze the models and to establish processes for their continued improvement and refinement.

⁸ Simulation models could be used for identifying previously unidentified patterns in the data, which could be useful not only in compliance risk modeling but also in tax shelter detection.

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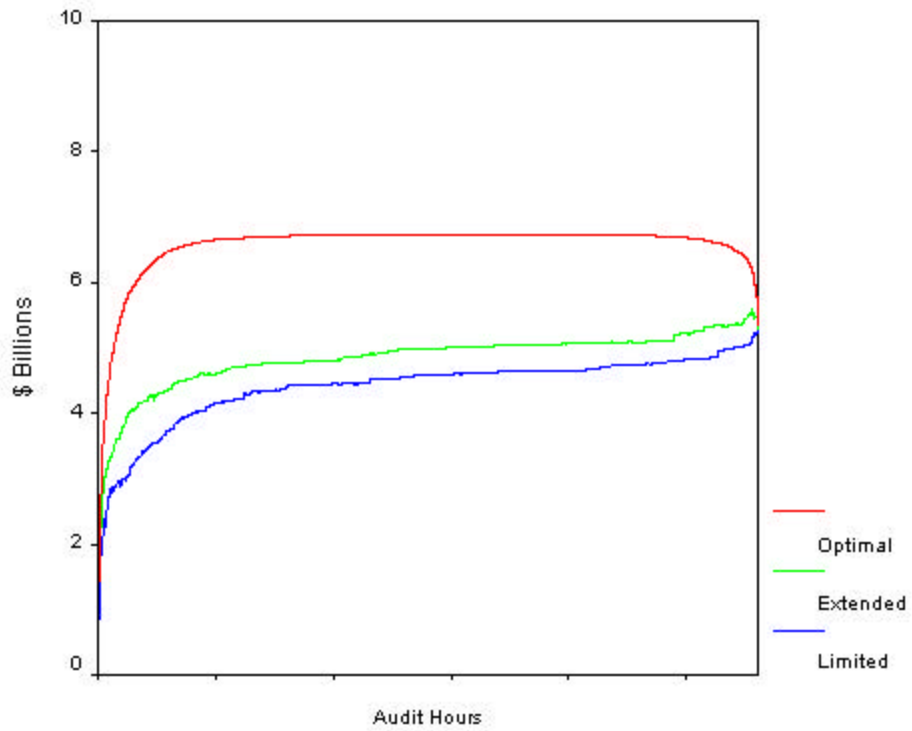
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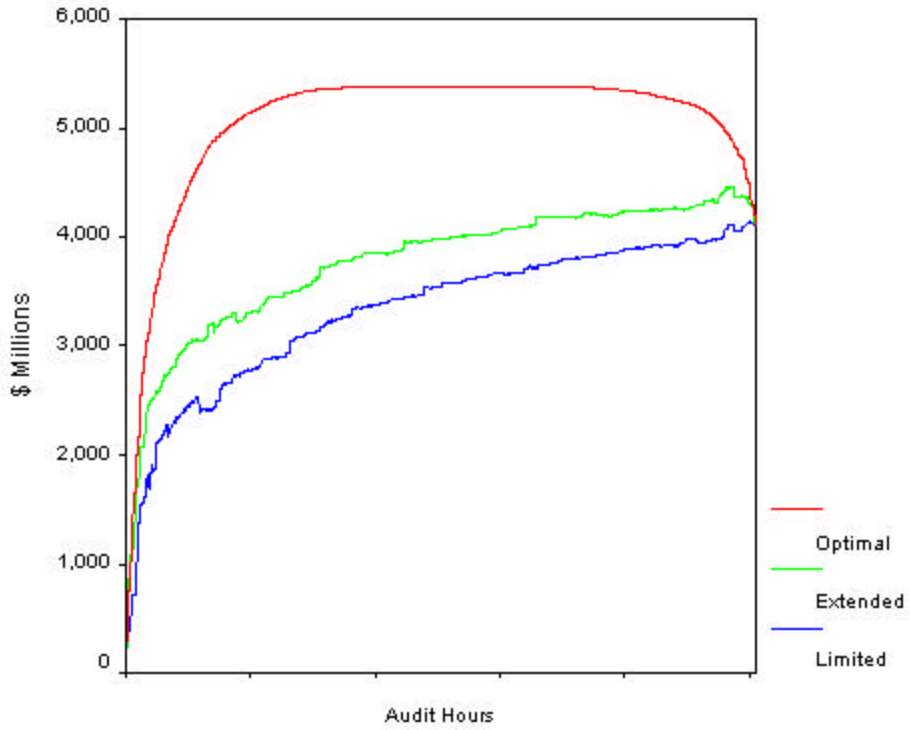
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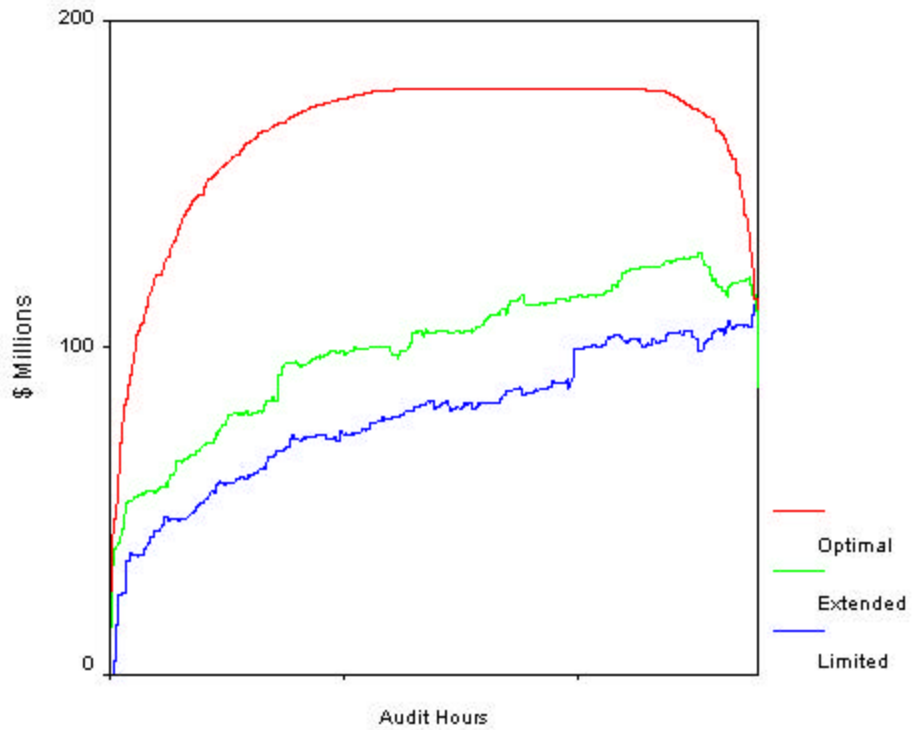
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ALL LMSB COMPANIES (ASSETS OVER \$10 MILLION)**



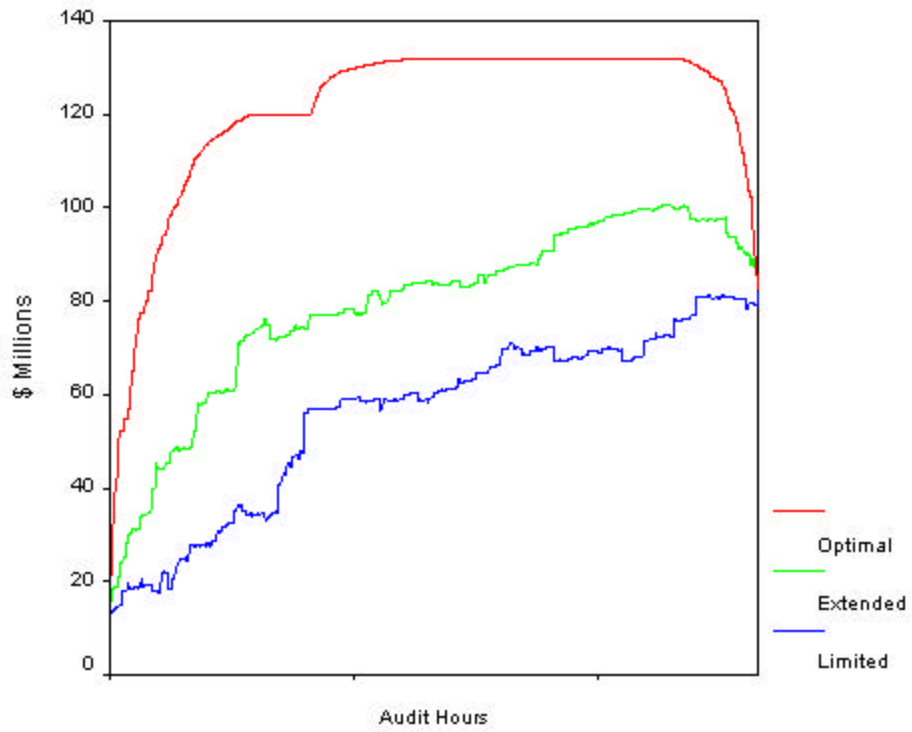
**CUMULATIVE AUDIT RESULTS BY AUDIT HOURS, 1996
ACTIVITY CODE 225 COMPANIES (ASSETS OVER \$250 MILLION)**



**CUMULATIVE AUDIT RESULTS BY AUDIT HOURS, 1996
ACTIVITY CODE 223 COMPANIES (ASSETS FROM \$100 - \$250 MILLION)**



**CUMULATIVE AUDIT RESULTS BY AUDIT HOURS, 1996
ACTIVITY CODE 221 COMPANIES (ASSETS FROM \$50 - \$100 MILLION)**



CUMULATIVE AUDIT RESULTS BY AUDIT HOURS, 1996
ACTIVITY CODE 219 COMPANIES (ASSETS FROM \$10 - \$50 MILLION)

