Constrained optimisation for tabular suppression in the ABS

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Transformation agenda

Who
• The ABS of the Future
• Users of ABS Data

What
• Is fundamentally transforming across all aspects of the organisation

Why
• To remain relevant and to capitalise on the opportunities of a dynamic information environment
• Ensure we continue to meet our legislative requirements and manage risk in an ever changing environment

How
• Underpinned by the Statistical Business Transformation Program (SBT Program)
• Transforming the way we collect, manage and deliver information and statistics

When
• 2020 Statistical Business Transformation Program complete
Tabular suppression in the ABS

Status quo
• DAAS
• SAS/Excel

SBT Program
• Developing standardised services for data confidentiality

2015
Alternatives considered
• Tau-Argus
Constrained optimisation method

Model of the Fischetti-Salazar process

Input data:
- Table values
- Primary suppressions
- Table structure
- Protection levels
- Suppression costs
- Special constraints

Build suppression model

Solve “Master LP”

MLP solution

Solve “Attacker sub-problem”

Any new constraints?

Yes

Add constraints to MLP

No

ASP solutions

Test ASP solutions against limits

Suppression model

Solve suppression model

Suppression pattern

STOP

(Continuous CO problem)

(= Integer CO problem)
A suppression pattern that….

- Satisfies the protection levels
- Maximises the utility of the table
- Minimises the sum of the cost of the suppressed cells

<table>
<thead>
<tr>
<th>Protection level</th>
<th>Total cost of suppressed cells</th>
<th>Number and total value</th>
<th>Additional measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Confirm for primary suppressions</td>
<td>• As an absolute value</td>
<td>• As an absolute value</td>
<td>• As they emerge</td>
</tr>
<tr>
<td>• Check if particularly large</td>
<td>• Relative to some optimal value</td>
<td>• Relative to the size and total value of the table</td>
<td>• For more complex tables (?)</td>
</tr>
</tbody>
</table>
Modular top-down approach • de Wolf, 1999

Table/collection of tables is broken down • Small or simple sub-tables
• Arbitrarily ordered
• Identify suppression pattern

Build a cumulative list of secondary suppressions • Suppressed on each sub-table
• Rerun sub-tables through the suppression model
• Repeat until no new suppressions

Robustness of method to be determined • Compare with true optimal solutions
• Fit for purpose
• Validation and quality assessment
Implementation

Tabular audit system ~ suite of quality measures

Primary suppression

CO method & modular method
Benefits & issues to consider

- Input data flexibility
- Use of common infrastructure
- Model flexibility

- Vulnerability
- Scalability
- Management of standards
Where to from here?

Feasibility

Work through unknowns

Implement & expand

Joint UNECE/Eurostat Work Session on Statistical Data Confidentiality, Skopje, September 2017
Questions?