Office for National Statistics
Swyddfa Ystadegau Gwladol

On the Potential Use of Admisistrative VAT Data for Estimating Short-term Output Growth in the UK

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Overview

- Background
- Issues with VAT data
- Methods of incorporating VAT data in STS
- Results
- Future plans

Background

Growing interest in using admin data to partially replace surveys.

Her Majesty's Revenue & Customs (HMRC) collects Value Added Tax (VAT) data from all VAT-registered enterprises.

Its use for short-term statistics (STS) could reduce respondent burden and survey costs.

But there are some issues...

Issue: Reporting Schedules

Enterprises report to HMRC according to one of 16 schedules.

Monthly (10%):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Quarterly:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Annual (0.2%):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

…

Issue: Timeliness

Responses received by HMRC as % of turnover:

40% of turnover within 30 days

94% of turnover within 40 days

100% of turnover within 188 days

The data then have to be compiled and transmitted.

Have to either use mature data (i.e. from the wrong period) or forecast for the survey period.

Issue: Matching to Business Register

Some large multi-site enterprises are split into several, sometimes many, reporting units on the business register.

For such enterprises, the VAT data needs to be apportioned appropriately.

Issue: Data Quality

Needs cleaning!

The Survey Used for Testing

Monthly Inquiry into the Distribution and Services Sector

Methods tested for NACE Rev. 1.1 divisions.

Each method keeps the sample *as-is* for large enterprises and complex enterprises.

Method 1: Replacement

No sampled data below an employment threshold – use forecast or mature VAT data for such strata instead.

For forecast VAT data, thresholds of 100 & 250 employment tested.

For mature VAT data (6 & 12 months before survey period) a threshold of the lower limit of employment band 4 was used (usually 100 employees).

Method 2: Rescaling from Larger Ents

As method 1 (replacement) but uses rescaled VAT data (forecast or mature).

Rescaling factor calculated for each combination of NACE division & month:

$$\frac{\text{survey estimate for larger enterprises}}{\text{VAT turnover total for larger enterprises}}$$

Method 3A: Rescaling from Reduced Samp

Reduced sample below an employment threshold – use rescaled mature VAT data for such strata instead.

Stratum sample sizes reduced to 5%, 10%, 25%, 50%, 75% (subject to minimum of 5).

3 rescaling factors tested:

- median of turnover ratios
- ratio of turnover totals
- trimmed mean of turnover ratios

Method 3B: Alt Reduced Samp Rescaling

As method 3A (rescaling from reduced sample) but applying 2 rescaling factors.

First factor relates reduced sample turnovers to the mature data in the mature data period using:

- median of turnover ratios
- ratio of turnover totals
- trimmed mean of turnover ratios

Second factor:

$$\frac{\text{survey estimate from reduced sample in survey period}}{\text{survey estimate from reduced sample in mature data period}}$$

Outline of Analysis

Focus on where methods perform well.

Use Root Mean Square Difference (RMSD) between survey estimates and estimates including VAT admin data.

Define “performing well” as RMSD <= 5.0pp

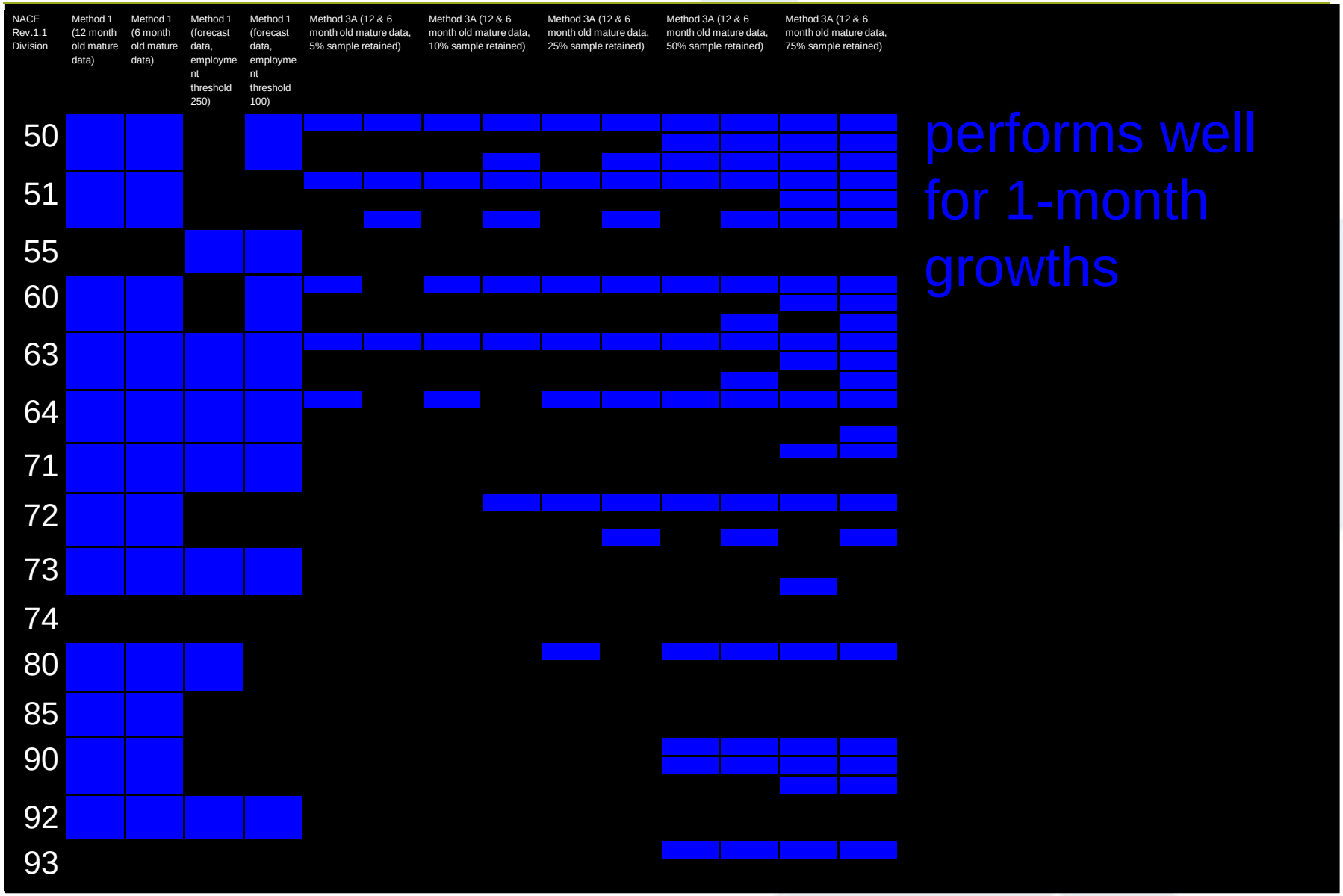
First Conclusions

For 1-month growths:

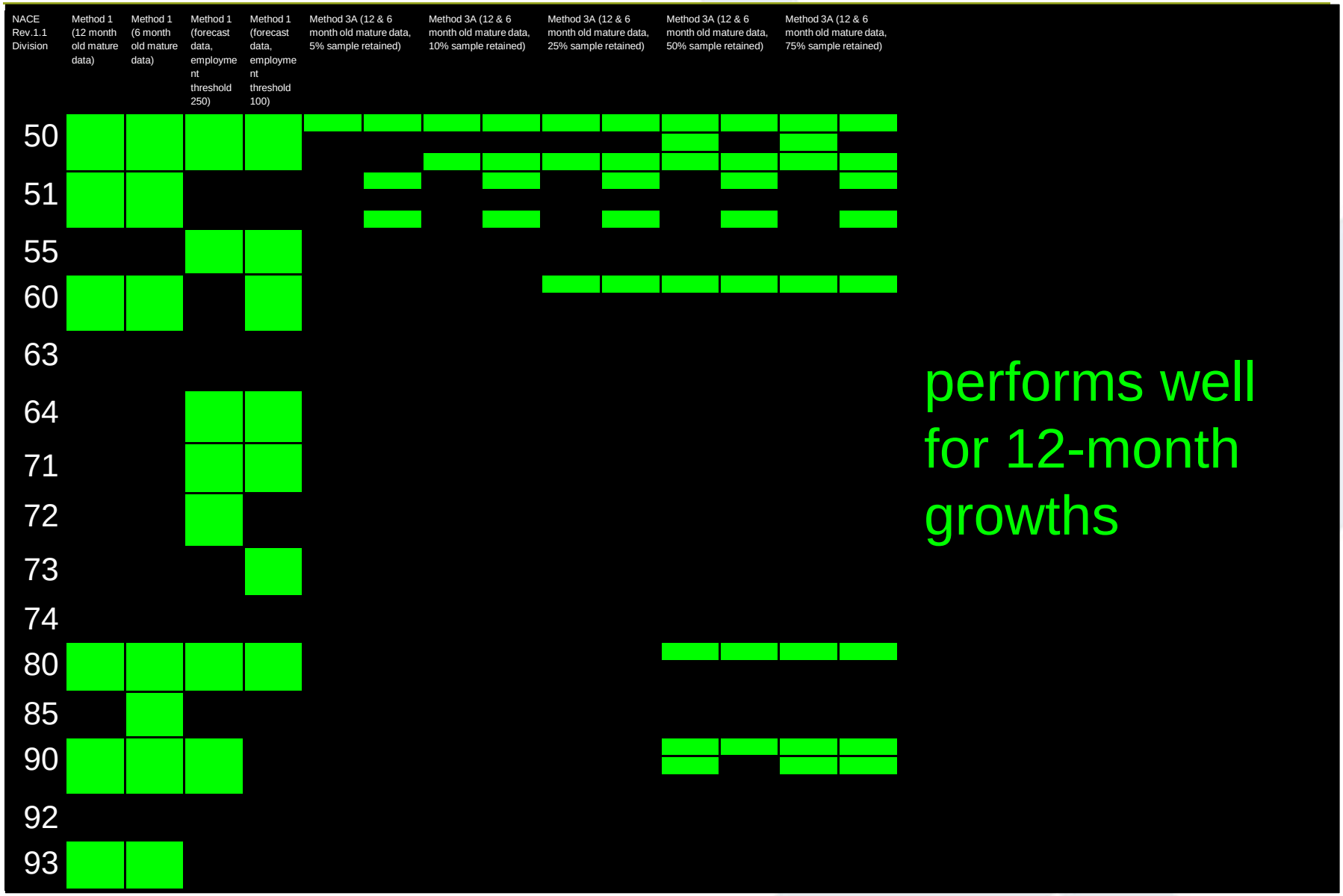
- Method 1 (replacement) nearly always performs better than method 2 (rescaling from larger enterprises).
- Method 3B (alternative scaling from reduced sample) performs badly nearly everywhere.

From now on we shall ignore methods 2 & 3B.

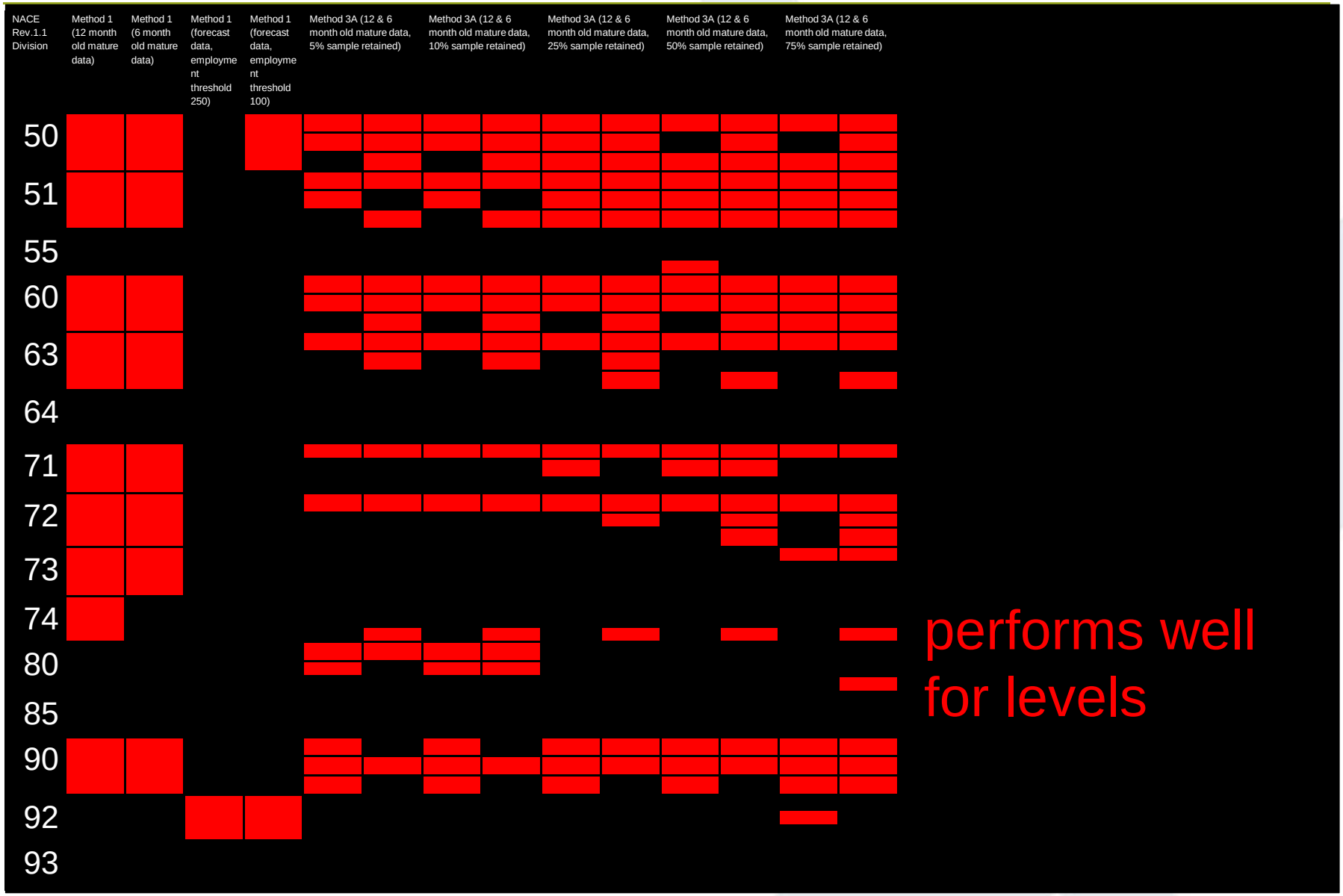
Colour-coded Table of Results (1-m growths)



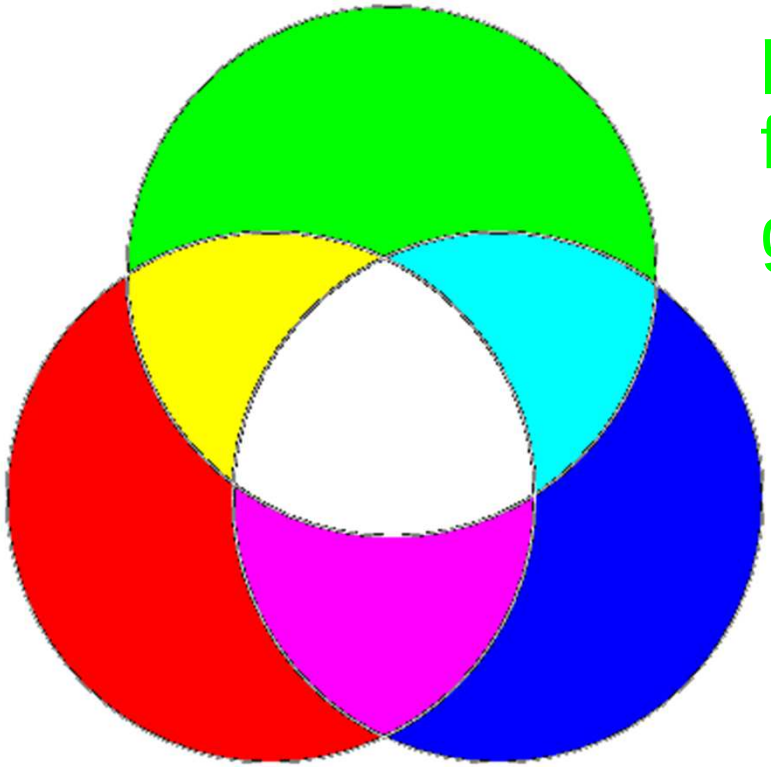
Colour-coded Table of Results (12-m growths)



Colour-coded Table of Results (levels)



Combine Using Primary Colours of Light

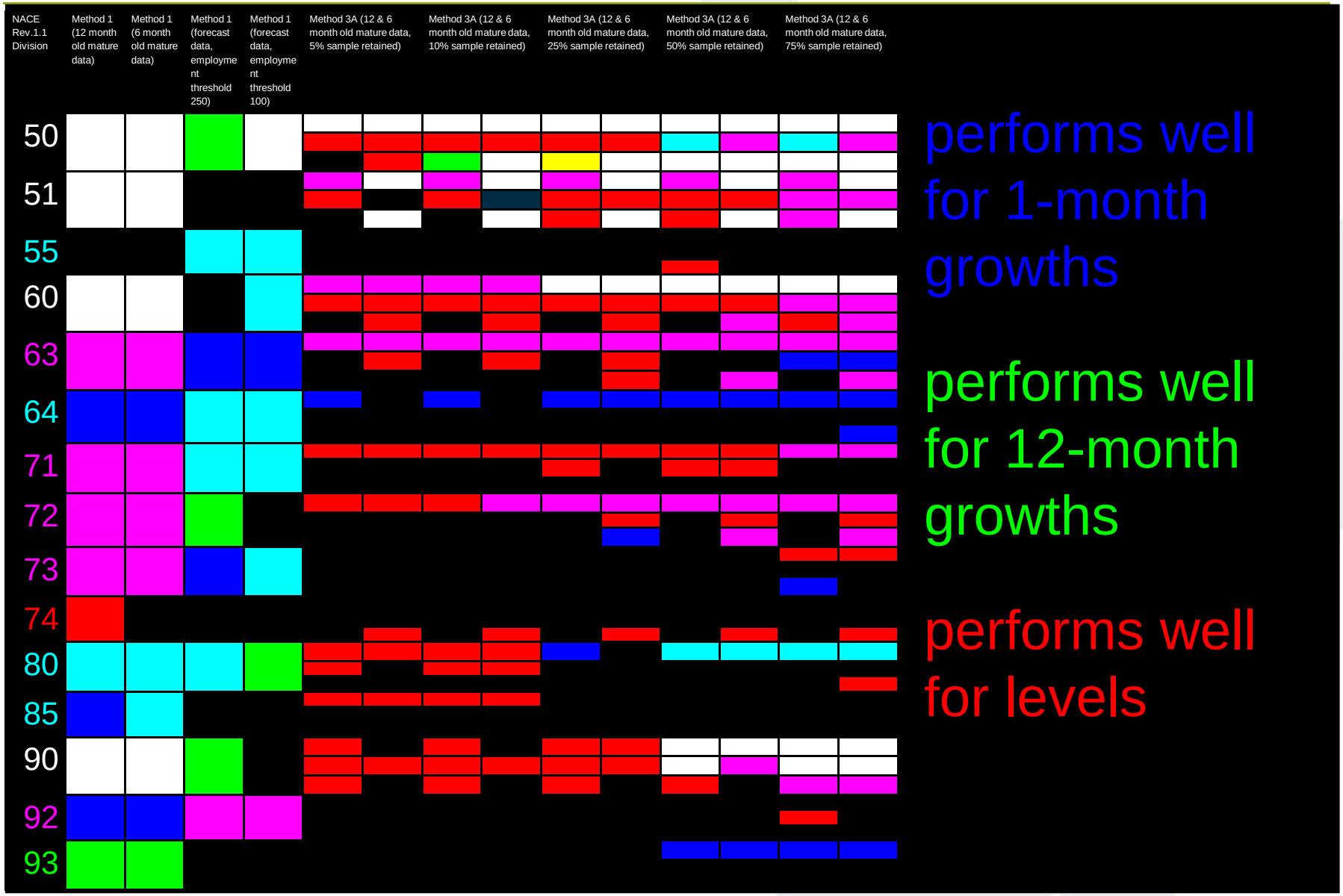


performs well
for 12-month
growths

performs well
for levels

performs well
for 1-month
growths

Colour-coded Table of Results (all)



Future Plans

- Test most promising methods in live environment.
- Extend to all industries and use NACE Rev.2.
- Revisit method for apportioning data into months.
- Seek to explain why methods perform well/badly in different industries.