

## Executive Summary

The Short-Term Statistics (STS) Unit uses a disproportionate stratified sampling technique. The main advantage of this sampling method is that all Main Industrial Groupings (MIGs) are represented in the sample, irrespective of their size. Further-more, this method allows oversampling from large enterprises, thus guaranteeing high percentage coverage of the retail trade volume. An alternative approach is to use a proportionate stratified sampling technique where all enterprises have equal probability of being selected in the sample. However, this sampling method yields low percentage retail trade coverage and is less likely to provide robust estimates of short-term statistics.

The STS Unit uses two methods to calculate stratum sample sizes, namely the Neyman allocation and the Stratified disproportionate random allocation techniques. The first method increases the sampling rates where the standard deviation of the retail trade volume of enterprises within the stratum is large. This ensures that the net sample is not distributed entirely on the basis of the stratum size, but also on the variability of the retail trade volume within each stratum. The second method allows the selection of varying proportions of large, medium and small-size enterprises from the population of enterprises by setting different values for the margin of error. The STS unit sets a very small margin of error for large companies to guarantee that almost all large enterprises are represented in the global sample. The margin of error for small enterprises is largest to reduce their over-representation in the global sample. Both techniques are appropriate and statistically sound for disproportionate stratified sampling. Moreover, correlation analysis shows a strong positive relationship between the two sample size calculation methods.

During the last four years the sample size exceeded 700 enterprises where approximately 68% are small units, 20% are medium sized units and 12% are large enterprises. This sample yields coverage of approximately 60% of the volume of retail trade. The non-response rate is around 6%. Throughout 2010 to 2014, 946 different enterprises were used to compile the retail trade indices and 438 of these enterprises were retained throughout the five years. This gradual change in the sample of enterprises guarantees that there are no extreme changes in the retail trade indices due drastic changes in the sample composition; however it allows the removal of enterprises whose products have been phased out of the market and the inclusion of new enterprises whose products have huge demand in the marketplace.

Since no data is available on quantities sold, the STS unit uses the turnover net of VAT to estimate turnover and uses the turnover net VAT deflated by the Harmonized Index of Consumer Prices (HICP) to estimate the deflated turnover. The HICP is compiled by Eurostat and national statistical institutes in accordance with harmonized statistical methods. The moving average and growth rate imputation methods used by the STS Unit to cater for missing data are both valid statistical procedures and follow international recommendations. Furthermore, almost all large companies are compelled to provide the data because of their significant impact on the retail trade index. The STS unit uses other non-statistical ways to minimize unit non-response. These include sending reminders to non-respondents and impressing upon respondents the importance of providing the requested data. Data inputting is scrutinized by the STS unit both at macro and micro levels using MS EXCEL Pivot tables. Plain data errors are identified and corrected instantly, while anomalous measurements and outliers are checked by statistics executives. This entails further correspondence with the participating enterprise to find reasons for the inconsistent values and make corrections accordingly.

The first task of this study was to compare the growth rate time-series of Malta's deflated turnover in retail trade with seven other EU countries throughout 2011 to 2014. Spain and Cyprus had the largest negative mean growth rate and Luxembourg had the largest mean positive growth rate for the deflated turnover. Luxembourg, Cyprus and Spain had the largest standard deviations which indicate that these countries had the largest volatility in the deflated turnover indices. Malta had a middling mean and a middling standard deviation of the growth rates for the deflated turnover.

Moreover, Malta's time series trend does not display any oddities compared to the other countries.

The second task of this study was to examine whether the employment index is a good predictor of the retail trade turnover index in 26 EU countries including Malta. In all countries the volatility of the employment indices was considerably smaller compared to retail turnover indices. Pearson correlation revealed that for some countries, including Germany, Estonia, Malta, Latvia, Lithuania, Luxembourg, Portugal, Greece and Cyprus the relationship between the two indices was positive, while for the remaining EU countries this relationship was very weak. Moreover, visual inspection and cointegration analysis both indicate that the relationship between the employment and retail turnover indices is almost inexistent. Malta's standard deviations of the employment and retail turnover indices are amongst the lowest indicating less volatility in these two indices compared to other EU countries.

The third task of this study was to assess the stability of the retail trade indices by analyzing data revisions. Visual inspection of data revisions throughout 2012 to 2014 display no visible bias since these revisions are small and alternate randomly between positive and negative values. A better way of analyzing data revisions is by checking for stationarity of the time series. The autocorrelations and partial autocorrelations of the revisions computed at different time lags are small. Moreover these values fall within the confidence limits at all time-lag separations implying that the revision time series fluctuates around zero in a random manner. The Dickey Fuller, the Augmented Dickey Fuller and Phillips-Perron tests all indicate that the revisions time series is a stationary process. This implies that the expected value and variance of a revision is constant over time. Moreover the covariance of any pair of revisions depends on the time lag but not on time.

The fourth task of this study was to conduct statistical inference on the mean revision by estimating 95% confidence intervals using revisions recorded from a number of releases. Three methods were used to estimate the standard error of the sample mean revision, which is essential to compute the 95% confidence limits. The first method assumes that the revisions are independent; the second method assumes that the revisions are serially correlated and the third method assumes the presence of heteroscedasticity in revisions. All the three methods yield the same conclusion that the mean revision is not significantly different from zero, which implies no bias in revisions.