When testing an internal control system, it is not cost-effective to test every transaction. Instead, auditors use probability-proportional-to-size (PPS) sampling—derived from attributes sampling theory. Auditors use PPS sampling to randomly select individual dollars (sampling units of a consistent size) from within a population, and then audit the balances, transactions, or documents (logical units). Each dollar amount in the population has an equal chance of being selected; however, the likelihood of any one logical unit being selected is directly proportional to its size (Ricchiute, 2006).

One major characteristic of PPS is that it tends to select larger transactions within an account balance to be examined. PPS approximates the proportion of a population that possesses a certain characteristic. For example, for purchases made over a predetermined amount, the auditor may want to gather evidence that proper approval has been obtained (Ricchiute, 2006).

To use PPS correctly, there are several items that need to be determined (Ricchiute, 2006) (Whittington & Pany, 2006):

- Define the population: Which class of transactions or account balances is the auditor going to test?
- Determine the sample size by determining the following elements and using a formula:
  - Population book value
  - Reliability factor (for overstatement errors)
  - Tolerable misstatement error
  - Anticipated error
  - Expansion factor
- The auditor needs to determine the sampling interval.

After specifying the expected number of overstatements and the risk of incorrect acceptance, the reliability factor for overstatement errors can be obtained from standard tables.

- The risk of incorrect acceptance is already calculated into the sampling plan and is accomplished through the reliability factor for overstatement errors, but the risk of incorrect reject is not determined explicitly. When using PPS sampling, the risk of incorrect acceptance shows an auditor’s assessment of the risk that the book account balances are not materially overstated when, actually, material monetary overstatement exists (Ricchiute, 2006).
- Using a standard table (Table 1) the reliability factor can be
determined at different risk of incorrect acceptance and various numbers of overstatement errors. The reliability factors are shown where the column and row intersect. For example, if the auditor determines that the number of overstatement errors is 3, and the risk of incorrect acceptance is 15%, then the reliability factor would be 6.02 (Ricchiute, 2006).

Closely related to an auditor’s planned level of materiality is the **tolerable error** in PPS sampling. This shows the maximum monetary error that can exist in an account balance without the financial statement being materially misstated. It is best to use PPS when the auditor does not expect any errors to be found (Ricchiute, 2006).

The **expansion factor** is determined using another table (Table 2) and the auditor’s risk of incorrect acceptance. In the example, the risk of incorrect acceptance is 15%, which means the expansion factor should be 1.4 (Ricchiute, 2006).

The **sample size** in a PPS sampling plan is determined using this formula (Ricchiute, 2006):

\[
N = \frac{B \times RF}{TE - (AE \times EF)}
\]

Where:

- \(N\) = Sample size
- \(B\) = Recorded book value
- \(RF\) = Reliability factor for overstatement errors
- \(TE\) = Tolerable error
- \(AE\) = Anticipated error
- \(EF\) = Expansion factor

After the sample size \(N\) is determined, the **sampling interval** must be determined using this formula:

\[
\text{Sampling interval} = \frac{\text{recorded book value}}{\text{sample size}}
\]

For example, if the sampling interval is 5,905, it means that every 5,905th unit from the total balance is selected, and the customer account related to
that unit is tested.

**PPS Advantages and Disadvantages**

Advantages of PPS (Whittington & Pany, 2006):

- It is generally easier to use.
- When there are few misstatements, PPS will generally result in a smaller sample size.
- Sample selection can begin before the entire population is available.

Disadvantages of PPS (Whittington & Pany, 2006):

- Special considerations are required to handle understated accounts and negative balances.
- When misstatements are found, PPS might overstate the allowance for sampling risk.
- For accounts with a moderate number of misstatements, the sample size may exceed that of the classical techniques.

**References**
