Process

1. Review invoices to determine service period. Use shipping date, performance date or other dates indicating service period. Calculate lead days for each payment.

2. Check that total amount and sample count of expense data with service periods matches the sample selected.

3. Determine lead days for each document number by calculating the payment weight of each payment related to an expense and applying the weight to the lead days of each payment.

4. Set sample so that document numbers that were selected multiple times are included in the data multiple times.

5. Calculate results by account class:
   a. Calculate stratum mean lead days and variance.
   b. Apply percent expense weight to the stratum mean and variance and total across all strata.
   c. Apply finite population correction factor to the variance of the mean.
   d. Sum weighted stats.
   e. Calculate confidence intervals and precision of mean lead days estimate.

Analysis Calculations

Lead days for each payment reference number are calculated by first determining the lead days for each expense invoice using the following equations:

$$ServiceDays_i = InvoiceToDate_i - InvoiceFromDate_i + 1$$
$$MidptDate_i = InvoiceFromDate_i + ServiceDays_i / 2$$
$$LeadDays_{i,j} = PaymentDate_{i,j} - MidptDate_i + 0.5$$

where *i* denotes the payment reference number and *j* the payment applied to the invoice.

Since multiple payments and transactions can occur for each expense, the lead days for each payment are then weighted by the payment amount, such that

$$LeadDays_i = \frac{p_{i,j}}{\sum_j p_{i,j}} LeadDays_{i,j}$$

where

$p_{i,j}$ = payment *j* for invoice *i*

Once the lead days for each invoice have been determined, the estimate of the stratified mean lead days for each account class can then be calculated as

$$\bar{x}_k = W_{k,h}\bar{x}_{k,h}$$

where

$W_{k,h}$ = expense dollars for stratum *h* stated as a percent of total account class *k* expense dollars

$\bar{x}_{k,h}$ = mean lag days for stratum *h* of account class *k*

The variance of the stratified estimate of the mean lead days is

$$v(\bar{x}_k) = \sum_k W_{k,h}^2 \frac{s_{k,h}^2}{n_{k,h}}$$

where

$s_{k,h}^2$ = variance of the mean lag days for stratum *h* of account class *k*

$n_{k,h}$ = sample size (payment reference numbers) for stratum *h* of account class *k*

Once the mean and variance have been calculated, the formula for the confidence interval is

$$\pm z\sqrt{v(\bar{x}_k)}$$

and the precision is calculated as

$$d_k = \frac{z\sqrt{v(\bar{x}_k)}}{\bar{x}_k}$$